The Integration of Geospatial Data Into the Surveillance and Management of HIV/AIDS in Cameroon

Thesis submitted for the degree of

Doctor of Philosophy

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ABSTRACT

In Cameroon, as in other Sub Saharan African countries, HIV/AIDS is a leading cause of morbidity and mortality, with an estimated 1,000,000 HIV infections and an increasing seroprevalence. There is no coordinated approach to HIV/AIDS interventions in Cameroon, which tend to be unevenly distributed, and often localised and isolated. Integrating spatial data is central in a coordinated and targeted response to combating the epidemic.

In Part One of this thesis, the current situation of HIV/AIDS in Cameroon is examined. Issues including the genesis and amplification of the virus amongst humans, as well as over space and time, are examined. Within the context of HIV/AIDS, the thesis also discussed the adequacy of health service provision and access in Cameroon. The concepts of equity and equality in accessibility are examined within the prevailing socio-economic and cultural factors in Cameroon. Current HIV/AIDS intervention policies in Cameroon are examined, including the creation of the National Committee to Fight AIDS, information campaigns and the development and adoption of a National HIV/AIDS Strategic Plan. The weaknesses inherent in the current intervention approach strongly support the case for the integration of a geospatial approach into the surveillance and management of HIV/AIDS in Cameroon.

The benefits of spatial data in the surveillance of HIV/AIDS are demonstrated in three case studies. First, Geographic Information System (GIS) analytical techniques are used to investigate geographic patterns of HIV-1 infection among 8,452 pregnant women screened at 24 health clinics in the Northwest Province of Cameroon between February 2000 and June 2002. Individual-level HIV-1 infection and community of residence data from the Cameroon

Baptist Convention Health Board Program for the Prevention of Mother-to-Child HIV Transmission (PMTCT) were georeferenced with the corresponding spatial data. ESRI ArcView 3.2, ArcGIS, and TerraSeer's SpaceStat software were used; Empirical Bayesian (EB) smoothing techniques were used to stabilize small-area estimates.

Spatial analysis by 28 subdivisions showed HIV-1 prevalence rates between 3.5% and 16.8% in the Northwest Province. Using EB smoothing methods, 55% of the subdivisions fell within 2% of the smoothed mean (10.3%). A broad arc-shaped geographic pattern of relatively high HIV-1 prevalence was found, adjoining the most important ring road and trading centers in the Province. Small-area analysis by village showed a number of 'hot-spots' with HIV-1 prevalence at 20% or higher. Incorporation of geospatial analysis into the PMTCT program demonstrated residential areas in need of enhanced prevention and HIV clinical care services.

In the second case study, GIS techniques are used to examine the concordance between the location of HIV/AIDS preventive and care services and the population. There are significant variations in the geographic accessibility of HIV/AIDS preventive and care services in the Northwest Province of Cameroon, with over 60% of the population being located more than 5 km from preventive and care services in the Northwest Province. Finally, the Mindistance model within GIS is used to optimise health service location in order to maximise health service coverage of the population in the Northwest Province of Cameroon. This analysis shows a significant difference in population coverage between the existing and optimized facilities, with an increase of 17 000 people located within 5 km of preventive and care services under the optimized model. In addition, to identifying potential location sites, the

optimal location of PMTCT facilities has also reduced the cost (distance) of accessibility to preventive and care services in the study area by 25%.

In mostly rural Sub Saharan Africa spatial HIV/AIDS analysis is an innovative and useful approach to identifying high-risk areas of HIV transmission among the population attending health clinics. Integration of spatial HIV data and small-area PMTCT service data allows for targeted allocation of scarce prevention and care resources to those communities in greatest need. In addition to improved research and data analysis, micro-level analysis makes it possible to track seropositives and their networks for prevention and care.

DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference is made in the text.

I give consent to this copy of my thesis being available for photocopying and loan.

Signed:_ Date: 06-09-04

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GLOSSARY AND ACRONYMS

AAT	Arc Attribute Table
ABS	Australian Bureau of Statistics
AEDES	Agence Européene pour le Développement et la Sante
AFASO	Association des Femmes Actives et Solidaires
AFSU	Association des Frères et Soeurs Unis
AIDS	Acquired Immunodeficiency Syndrome
AIDSCAP	AIDS Control and Prevention Project
AIDSTECH	FHI's AIDS Technical Assistance Project
ANC	Antenatal clinic
ARIA	Accessibility and Remoteness Index of Australia
BCC	Behaviour Change Communication
CBC	Cameroon Baptist Convention
CBCHB	Cameroon Baptist Convention Health Board
CDC	Center for Disease Control and Prevention
CFA	Central African Francs
CIDA	Canadian International Development Agency
CMH	Commission on Macro Economics and Health
CSM	Condom Social Marketing
CSW	Commercial Sex Worker
DSTAT	Direction de la Statistique et la Comptabilite Nationale
EC	European Community
ECAM	Enquete Camerounaise Aupres des Ménages
ESRI	Environmental Systems Research Institute, Inc.
FCO	Final Cost Objective

FGD	Focus Group Discussion
FGDC	Federal Geographic Data Committee
FHI	Family Health International
GDP	Gross Domestic Product
GISCA	GIS Cooperative of Adelaide
GOC	Government of Cameroon
GTC	Groupe Technique Central
GTZ	German Technical Assistance Cooperation
HEVECAM	Hévéa Cameroun/ Cameroon Rubber
HIPC	Heavily Indebted Poor Countries
HAPA	HIV/AIDS Prevention in Africa Project
HIV	Human Immunodeficiency Virus
IEC	Information, Education, and Communication
IMF	International Monetary Fund
I-PRSP	Interim Poverty Reduction Strategy Paper
IRESCO	Institute of Behavioural Research and Studies
ITM	Institute of Tropical Medicine (Antwerp, Belgium)
KABP	Knowledge, Attitudes, Behaviours, and Practices
LOA	Letter of Agreement
MEF	Ministry of Economy and Finance
MINEFI	Ministry of Economy and Finance
MINPAT	Ministry of Public Investment and Regional Planning
MOH	Ministry of Health
MOPH	Ministry of Public Health
MSF	Médicine Sans Frontière
MSTOP	MST

MTC	Mother to Child HIV Transmission
MTP	Medium Term Plan
NACC	National AIDS Control Committee
NACS	National AIDS Control Service
NACU	National AIDS Control Unit
NAT	Node Attribute Table
NGO	Non-Governmental Organization
OI	Opportunistic Infection
PATH	Program for Appropriate Technology
PE	Peer Educator
PHE	Peer Health Educator
PI	Prevention Indicator
PIF	Process Indicator Form
PLWHA	People Living with HIV/AIDS
PMTCT	Prevention of Mother-to-Child HIV Transmission
NACP	National AIDS Control Program
OCEAC	Organization de Coordination pour la Lutte contre les Endémies
OGIC	Oregon Geographic Information Committee
PARVY	Anti-Retroviral Project of Yaounde
PSI	Population Services International
RRF	Rapid Response Fund
SIV	Simian Immunodeficiency Virus
SLS	Service de Lutte contre le SIDA
STD/ STI	Sexually Transmitted Disease / Sexually Transmitted Infection
SW	South West
SWAA	Society for Women and AIDS in Africa

TB	Tuberculosis
ULS	Unité de Lutte contre le Sida - AIDS Control Unit
UNAIDS	Joint United Nations Program on HIV/AIDS
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USCR	United States Committee for Refugees
US DHHS	United States Department of Human Services
US FDA	United States Food and Drug Administration
UNFPA	United Nations Family Planning Assistance
UNDP	United Nations Development Program
VTC	Voluntary Counselling and Testing
WHO	World Health Organization

PART ONE

CHAPTER 1

Introduction

1.1: The global HIV/AIDS situation

The Human Immunodeficiency Virus (HIV) was unknown thirty years ago. In 1981, a new infectious disease, AIDS was identified in the United States (CDC 1981). HIV/AIDS has now spread to every region, population, age cohort and socio-economic group in the world. In the year 2003 alone, an estimated 5 million people were newly infected with the HIV/AIDS virus. Presently more than 45 million people are living with HIV/AIDS (UNAIDS and WHO 2003b). Figure 1.1 shows that the number of people infected with the HIV/AIDS virus varies considerably throughout different regions of the world. At least 95% of the infections are in the Developing world (Leete et al. 2003).

While Figure 1.1 shows that Sub Saharan African has the greatest number of HIV/AIDS infected people in the in the world, HIV infections are increasing rapidly in South East Asia and the Pacific, Eastern and Central Asia, Latin America and the Caribbean, the Middle East and North Africa. For instance, at the end of 2003, there were at least 8 million people infected with the HIV/AIDS virus in South and South East Asia. Hence, apart from Sub Saharan Africa, South East Asia is the most affected region. UNAIDS and WHO (2002c) estimate that there were 4 million HIV/AIDS infected people in India, 850 000 in China and 670 000 in Thailand.

It is difficult to know the real extent of the disease and its impact. However, it is estimated that between 1981 and 2001, more than 20 million people have died due to HIV/AIDS in the world (Leete et al. 2003:3). Table 1.1 shows that in 2003 alone, approximately 3 million people in the world died of HIV/AIDS and at least 67% of the deaths occurred in Sub Saharan Africa. As a result of the rapid increase in mortality, an estimated 14 million children in the world are orphaned (Leete et al. 2003:3).

In order to curb the epidemic and its devastating impacts, in 1996, the Joint United Nations Programme on HIV/AIDS was created by six United Nations (UN) Agencies: United Nations Children's fund, United Nations Population Fund, United Nations Development Fund (UNDP), World Health Organization, United Nations Educational, Scientific and Cultural Organization and the World Bank (UNAIDS 2003c:3). The Joint United Nations Programme on HIV/AIDS (UNAIDS) is the key supporter for global action on the epidemic through its leadership and support aims at preventing the transmission of HIV/AIDS.

Since HIV/AIDS is a global epidemic, in the last few years, substantial international efforts have been made by governments, civil society, NGOs and the private sector to scale down the epidemic. While it is not possible to discuss every effort made so far, it is important to identify some of the efforts including increases in funding to scale up HIV/AIDS prevention and care programs. For instance, in the State of the Union Address, on the 28 January 2003, President Bush announced his Emergency Plan for AIDS Relief that involved a five-year US $15 billion initiative to combat HIV/AIDS in Sub Saharan Africa and the Caribbean. This commitment of resources is intended to scale up prevention efforts and as a result potentially prevent 7 million new infections.

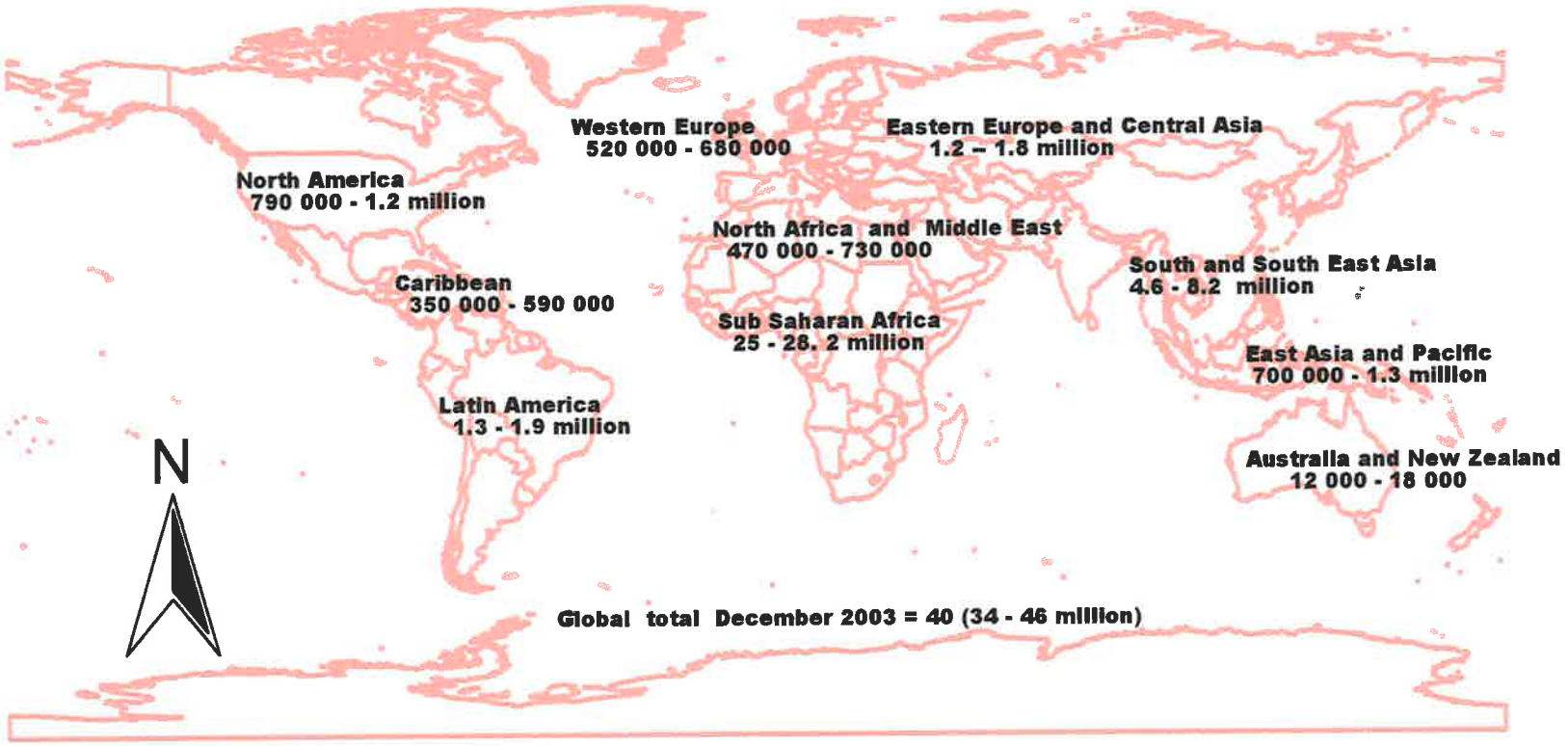


Figure 1.1: Global distribution of people living with HIV/AIDS at the end of 2003

Table 1.1: Global distribution of new HIV/AIDS infections and deaths in 2003

Region	Adult and children newly	Adult prevalence	Adults & child deaths due to
Sub Saharan Africa	3.0 – 3.4 m	7.5 – 8.5	2.2 –2.4 m
North Africa & Middle East	43 000 – 67 000	0.2 – 0.4	35 000 – 50 000
South & South East Asia	610 000- 1.1 m	0.4 – 0.8	330 000 – 590 000
East Asia & Pacific	150 000 – 270 000	0.1 – 0.1	32 000 – 58 000
Latin America	120 000 – 180 000	0.5 0.7	49 000 – 70 000
Caribbean	45 000 – 80 000	1.9 – 3.1	30 000 – 50 000
Eastern Europe &	180 000 – 280 000	0.5 - 0.9	23 000 – 37 000
Western Europe	30 000 – 40 000	0.3 – 0.3	2 600 – 3 400
North America	36 000 – 54 000	0.5 – 0.7	12 000 –18 000
Australia and New Zealand	700 - 1000	0.1 – 0.1	<100
Total	5 m (4.2 – 5.8 m)	1.1% (0.9 – 1.3%)	3 m (2.5 – 3.5 m)

m = million

Source: UNAIDS/WHO (2003b: 5)

In addition, HIV/AIDS treatment programs have gradually expanded. For example, On the 1 December 2003, the WHO and UNAIDS announced plans to provide HIV/AIDS treatment to three million patients worldwide by 2005. In the Emergency Plan for AIDS Relief announced by President Bush, it is estimated that 2 million HIV-infected people in Sub Saharan Africa and the Caribbean will be provided with antiretroviral treatment. Since it was established in January 2002, The Global Fund to Fight AIDS, TB, and Malaria has committed approximately US $ 1.5 billion in funding to support 154 programs in 93 countries worldwide. However, recently published data (April 2004) indicate that The Fund has only provided about US $ 310.8 million to combat HIV/AIDS, Malaria and TB in more than 77 countries (The

Global Fund 2004). Approximately 53% of the funding has been granted to 27 Sub Saharan African countries including Nigeria, Benin, Lesotho, Mozambique, Zimbabwe, Zambia and South Africa.

In Sub Saharan Africa and Cameroon (the subject of this thesis), HIV/AIDS is a leading cause of morbidity and mortality, with an estimated 1 000 000 HIV infections and an increasing seroprevalence. The ferocious spread of the disease in Cameroon and Sub Saharan Africa is facilitated by several factors, including high number of sexual partners, commercial sex activity, high rate of incidence of STD and high-risk sexual activity, most of which is unprotected.

1.2: The Cameroon context

Cameroon, a Central African country, is known as a microcosm of Africa (Neba 1999), because of its diversity in geography, people and culture. Cameroon lies between 2° to 13° north latitude and 8° to 16° east longitude and shares boundaries with Lake Chad in the north, Chad in the north east and the Central African Republic to the east, Congo, Gabon and Equatorial Guinea in the south, and Nigeria in the west (see Figure 1.2). The country is divided into 10 Provinces (see Figure 1.3), 58 Divisions and 268 Subdivisions (NIS, 2001). With approximately 15 million people, Cameroon is sparsely populated, with an average population density of 25 people per square kilometer. Currently, the population is growing at an annual rate of 2.3% (UNFPA 2003:16).

Cameroon is one of the few African countries with substantive economic potential (World Bank 1995a; World Bank 1995b). Its resources include, the rich tropical rainforest, fisheries,

minerals, fertile soils, hydroelectric power, and a favorable climate. It had rapid economic growth (7 to 10%) per capita after independence in 1960 until 1985 (World Bank, 1995b). In 1985 there was a sharp economic decline due to falling prices of agricultural products and petroleum. Per capita income dropped from US $1 020 in 1985 to US$ 635 in 1995 (Ntangsi 1999).

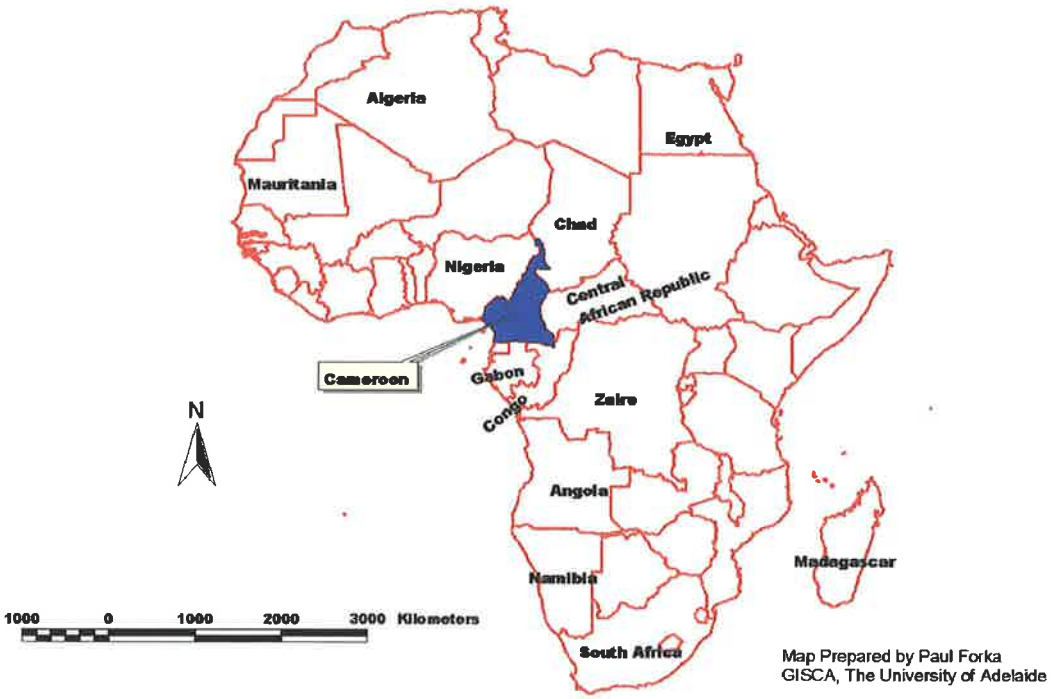


Figure 1.2: Location of Cameroon in Sub Saharan African

In the last two years, there has been an improvement in Cameroon's terms of trade. Because of this, GDP increased from a negative 3% change in GDP in 1997/98 to a positive 1.5% in 1999/2000 (MSP 2001). The economic hardship of the recession was reflected in unemployment which increased more than threefold from about 7% in 1983 to approximately 25% in 1993 (World Bank 1995b). Currently in Cameroon more than 50% of households are

poor and cannot afford basic necessities of health care, clean water and education (ECAM & DSTAT, 1996).

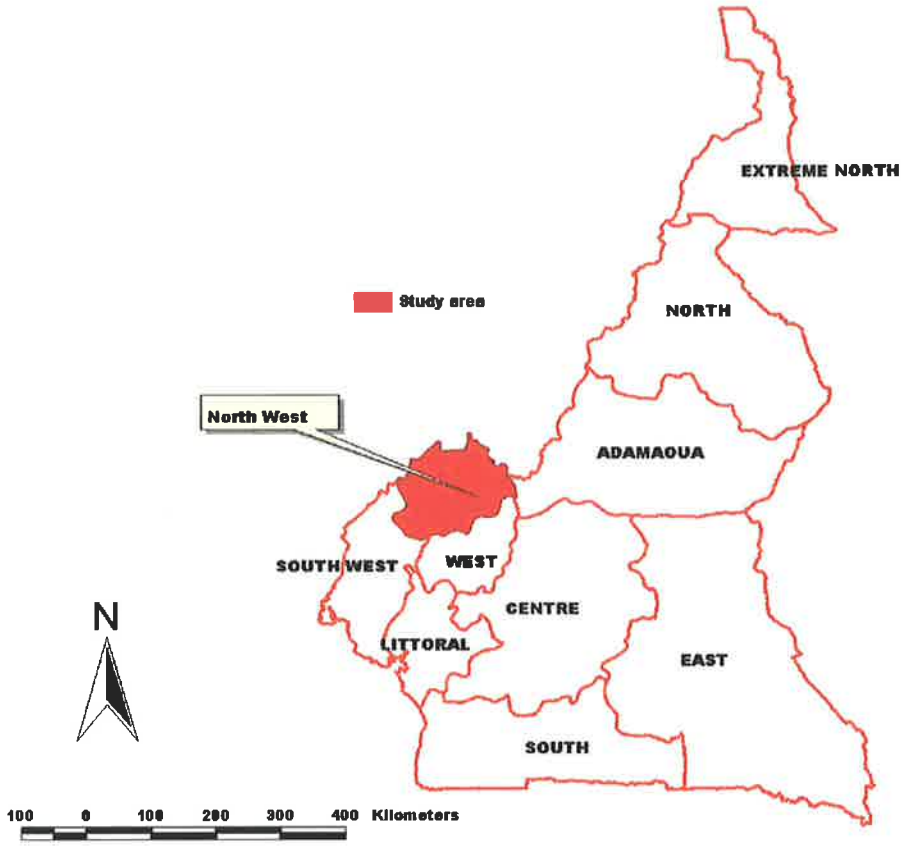


Figure 1.3: Location of the Northwest Province, Cameroon

The Northwest Province is one of Cameroon's ten Provinces. It is comprised of seven Divisions and 31 Subdivisions (MINIFE 2001). Together with the West Province, this part of Cameroon is generally referred to as the Grassfields. In the Grassfields, Chieftaincy-traditional institutions are common. Chieftaincy is central in the socio-economic and cultural life of North Westerners. In the Northwest Province there are approximately 1.6 million people and 51% of these are aged 0-15 (DSTAT 2000). An estimated 78% of North

Westerners live in rural areas where subsistence agriculture is the main activity (MINPAT and PNUD 2000)

In Cameroon, including Northwest Province, malaria as well as infectious, intestinal parasitic and skin diseases are the major causes of morbidity and mortality. However, the primary cause of morbidity and mortality in Cameroon is malaria. It accounts for 40 to 50% of all consultations, 23% of hospitalizations and consumes 40% of household budgets (MSP 2001). Recently published data indicate malaria prevalence rates of about 8% for the Northwest Province (MEF 2002). This represents 128 000 cases of malaria per annum. Among the first ten causes of morbidity, more than 54% were caused by malaria (NIS 2001). Other diseases including diarrhea, respiratory illnesses, TB, meningitis and pneumonia are also prevalent. HIV/AIDS is also one of the leading causes of morbidity and mortality in Cameroon. In 2001 an estimated 53 000 HIV/AIDS related deaths occurred in Cameroon (UNAIDS, WHO et al. 2002a). There are approximately 1 000 000 seropositives and infections are increasing in the population. HIV/AIDS related morbidity and mortality have already increased exponentially and it is expected to become the primary cause of death. The magnitude of the problem necessitates urgent intervention efforts.

1.3: Definition of HIV/AIDS

AIDS-the Acquired ImmunoDeficiency Syndrome is the late stage of an infection caused by the Human ImmunoDeficiency Virus (HIV). HIV belongs to the lentivirus family of retroviruses. These types of viruses cause illnesses that are characteristically asymptomatic until sometime after infection. As such, HIV/AIDS has an incubation period, which can be up

to ten years before signs of AIDS appear in humans. However, the incubation period varies according to the population type. For instance, in Nairobi (Kenya) prostitutes are recorded to develop AIDS on average around 4.5 years after HIV infection compared to 8 years in the Masaka region of Uganda (Cohen 2000). HIV/AIDS weakens the body immune system until it can no longer fight off infections such as pneumonia, diarrhoea and tuberculosis. These infections, known as opportunistic infections, occur in the final phase (AIDS) of the disease development. Death is the final outcome and occurs within one to three years of the first sign of AIDS (UNAIDS 1998).

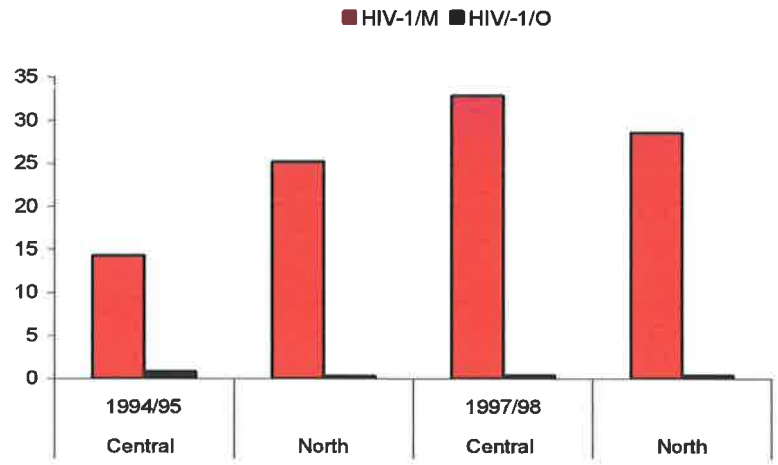
Characteristically, HIV/AIDS has multiple genetic strains, the two main types being HIV-1 and HIV-2 (UNAIDS 1999). HIV-1 has three distinct groups, namely M, N, and O, with at least nine identified subtypes of A-K (Brodine et al. 1995). HIV-2 is less virulent and is mainly found in West Africa (Herring and Saksena 2001, Hahn, 2000). This difference in virulence is attributed to the fact that developing AIDS is greater in HIV-1 than in HIV-.2. A study conducted in Senegal indicated that HIV-1 seropositives had a 65% probability of not developing AIDS five years after infection compared to 100% for HIV-2 patients (Marlink 1994). Table 1.2 shows various strains of HIV/AIDS in Cameroon.

Table 1.2: Multiple types of HIV/AIDS subtypes in Cameroon

Virus	Groups	Subtypes
HIV-1	M	A, B, C, D, E, F1, F2, G, H, J, K
	O	
	N	
HIV-2		A, B, C, D, E, F, G
SIV		Includes viruses from chimpanzee, African green monkeys and baboons, Sooty mangabeys and macaques

Source: compiled from (Herring and Saksena 2001, Hahn 2000)

These strains, particularly those of HIV-1 vary in their spatial dispersal, with none being confined to a specific geographic location. While subtypes A, C and D are common in most of Sub Saharan Africa, the situation is complicated in Cameroon because HIV-1 and HIV-2 types have been identified. Importantly, almost all the known strains of HIV-1 group M subtypes and some specifically group O and N, are exclusively found only in Cameroon (Hahn. et al. 2000, Barre-Sinoussi 1997). Figure 1.4 shows trends in prevalence rates of the two main types of HIV-1 strains in Cameroon. Approximately 90% of seropositives in Cameroon have HIV-1 group M strain. The O strain discovered in 1994 accounts for an estimated 3% of the infection (Ayouba et al. 2000). Prevalence data from Cameroon indicate a decline in HIV-1 group O infection since 1994 (see Figure 1.4). In 1997 another strain called HIV-1 group N was identified. This particular strain is not widespread and only six known cases have been diagnosed in Cameroon (Ayouba et al. 2000).



Data source: (Ayouba et al. 2001, CPC 1999-2000)

Figure 1.4: Trends in the prevalence rates of HIV-1/M and O strains in Cameroon

These rare and remarkably diverse strains pose serious challenges to HIV/AIDS detection notably in Cameroon and throughout the world. Current assays have failed to detect HIV-1 group O and N strains (Rehle et al. 1997, Herring 2001, Seppa 1998). This problem is exacerbated especially as potential new strains of the HIV/AIDS virus are unlikely to be detected because available assays can only detect already known strains.

1.4: Origin and transmission of HIV/AIDS virus to humans

The ability of pathogens to transfer to humans, from other species, is well known, such as influenza from swine, yellow fever from South American and African monkeys and HIV from monkeys and chimpanzees (Mayer 2000). The examination of the zoonoses and modes of transmission of HIV/AIDS brings to the fore the causality of the disease and the ways it spreads among humans.

The rain forest of Central Africa is a complex system with a diverse pool of genetic resources, both known and unknown. People in the rain forest region, notably the pygmies, have hunted monkeys and chimpanzees for food. The meat from these animals, commonly known as "bush-meat" in the region, is widely consumed. Despite their importance as a source of food, monkeys and chimpanzees are the natural hosts of the HIV/AIDS virus. In monkeys and chimpanzees this virus is known as Simian ImmunoDeficiency Virus (SIV; Hahn et al. 2000).

Equatorial Africa seems to be the likely origin of the pandemic particularly as it relates to the possible enzootic reservoir of the disease. The presumed dual origin (monkeys and chimpanzees) of the virus has resulted in two types of HIV/AIDS viruses, HIV-1 and HIV-2, both of which co-evolved with monkeys and chimpanzees. African primates are large

reservoirs of lentiviruses, for instance, HIV-1 is found in chimpanzees and HIV-2 in sooty mangabeys (a type of monkey). Both of these viruses (HIV-1 and HIV-2) consist of many sub types. These viruses mutate and replicate in their new hosts, becoming very lethal, and posing problems for managing HIV/AIDS. In their natural hosts, the viruses do not cause diseases as monkeys and chimpanzees have HIV/AIDS antibodies that co-evolved together with the virus (Bibollet-Ruche 1996).

It is thought that HIV/AIDS viruses entered human populations through zoonotic or cross species transmission of the Simian ImmunoDeficiency Virus (SIV). One hypothesis posed to explain the early outbreaks of HIV/AIDS, suggests that SIV was transmitted to humans as a result of cutaneous or mucous membrane exposure to infected animal blood (Gao et al 1999). Humans in Sub Saharan Africa often come in contact with wild primates, and as a result, the risks of zoonotic transfer of SIV are substantial. These risks are exacerbated in hunters, butchers of primates, as well as persons who consume uncooked contaminated primate meat. A recent study in Cameroon found that 16.6% of the bush-meat sold came from infected monkeys (Peeters et al. 2002). These activities expose humans to contaminated animal blood, secretion and even biting (Bibollet-Ruche 1996). Historically, hunting and butchering of primates are ancient activities that occurred in the rain forests of Central Africa. It is thought that cross species transfers of the lentiviruses from primates to humans have occurred on at least eight occasions (Hahn. et al. 2000). HIV/AIDS transmission and adaptation in the new host (humans) throughout the world has been through various modes, namely, non-sterilised needles, blood transfusion, sexual transmission and prenatal transmission.

1.5: Thesis aims and objectives

By 1999, more than 300 studies had been conducted on HIV/ADS in Cameroon, with the support of donor organizations (GOC 1999). These studies, both published and unpublished, have broadened our understanding of the epidemic in Cameroon. However, none of the studies have linked and/or integrated geospatial data into the surveillance and management of the disease. This study seeks to cover this gap by integrating spatial data into the surveillance and management of HIV/AIDS in Cameroon. A geospatial approach in the surveillance and management of HIV/AIDS is critical in tracking trends in the epidemic, targeting and allocating scarce resources for prevention and care as well as in policy planning. Since HIV/AIDS was identified, most of the intervention efforts to scale down the epidemic have largely been health based. In spite of the key role of health-based interventions in combating the epidemic, the continuous increase in HIV/AIDS related morbidity and mortality, as well as an increasing seroprevalence in Sub Saharan Africa and Cameroon, necessitates a multidisciplinary approach in curbing the spread of the disease. A multidisciplinary approach is essential in bringing together local communities, organizations and governments to scale up intervention efforts. While multidisciplinary approaches can pose many challenges, particularly in a country such as Cameroon, problems such as HIV/AIDS do not become more manageable unless confronted.

This study seeks to integrate geospatial data into the surveillance and management of HIV/AIDS in Cameroon. In this respect, it falls within the scope of the "Plan Strategique de Lutte Contre le SIDA au Cameroun 2000-2005", roughly translated as "the National Strategic Plan for the Fight Against AIDS in Cameroon (2000-05)". The ultimate aim is to integrate

HIV/AIDS, geographic and socio-economic data in a way that could enable a more informed debate on resource allocation, policy and program directions in the prevention and management of HIV/AIDS in Cameroon. In order to achieve the primary aim of the study, a number of specific objectives have been developed:

- To present a detailed and comprehensive profile of the contemporary situation of HIV/AIDS in Cameroon.
- To analyse the pattern of accessibility to health services in Cameroon and relate this to the accessibility of people with HIV/AIDS to appropriate services.
- To apply GIS analytical techniques in the Northwest Province of Cameroon to demonstrate the potential benefit of integrating spatial data in the surveillance and management of HIV/AIDS.
- Make recommendations for actions relating to the surveillance and management of HIV/AIDS in Cameroon.

1.6: Outline of the Thesis

This Thesis is organized in two different parts: Part One aims at using existing data to assess the current situation of HIV/AIDS and the state of accessibility to health services in Cameroon. Specifically, Chapter One introduces the Thesis, states the aims and objectives of the research and locates the study area. In Chapter Two, the current situation of HIV/AIDS in Cameroon is examined. It also looks at the genesis and amplification of the HIV/AIDS virus amongst humans, as well high-risk groups and the spread of the disease over space and time in

Cameroon. Chapter Three discusses the supply and accessibility of health services in Cameroon. It defines the concept of accessibility, taking into consideration the central features of equity and equality in accessibility. The socio-economic and cultural factors that affect accessibility to health services in Cameroon are also examined. In Chapter Four, the current HIV/AIDS intervention policies in Cameroon are examined. These include the creation of the National Committee to Fight AIDS, information campaigns and the development and adoption of a National HIV/AIDS Strategic Plan. The case for a spatial approach is set in Chapter Five by examining current intervention efforts in Cameroon, and barriers to implementation of intervention efforts.

Part Two of this Thesis aims to demonstrate the potential role of spatial data in the surveillance and management of HIV/AIDS. Spatial analysis case studies in the Northwest Province of Cameroon are used to argue the case for the integration of GIS in combating HIV/AIDS. Chapter Six focuses on the benefits and challenges of integrating GIS into the surveillance and management of HIV/AIDS in Cameroon and Sub Saharan Africa. Chapters Seven, Eight and Nine provide case studies to demonstrate the potential benefits in the integration of GIS and/or spatial data in the surveillance and management of HIV/AIDS in Cameroon. In Chapter Seven, GIS analytical techniques are used to investigate geographic patterns of HIV/AIDS in the Northwest Province of Cameroon. GIS COST-DISTANCE mapping techniques are used in Chapter Eight to assess the concordance between the location of preventive and HIV care services, and the population in the Northwest Province of Cameroon. Chapter Nine uses location-allocation models to plan health service locations in the Northwest Province of Cameroon. Chapter Ten concludes by examining the policy implications of the research findings. It brings together evidence from Part One and Part Two

of the thesis, which are examined within the context of the research aims and objectives. It also concludes by examining the importance of the findings in this thesis and the potential for application of the methods used in other settings in Cameroon and Sub Saharan Africa.

CHAPTER 2

Data and Methods

2.1: Introduction

In order to achieve the aims and objectives of this study, a range of information sources and data collection methods were used. This chapter critically discusses the different sources of data used in the study. It also encompasses the methods and problems encountered in the data collection. Essentially the study employed a 'mixed methodology' involving both qualitative and quantitative analyses. It is argued that collecting information relating to the study topic is difficult and it is necessary to use a wide range of approaches and methods in order to shed light on issues of HIV/AIDS in Cameroon. It is important to indicate that because different data sources and spatial analyses techniques are used throughout the Thesis, Chapters Seven, Eight and Nine each contains the chapter-specific methods used in the spatial analyses.

Data are observations or facts which when collected, organised and evaluated, become information or knowledge (ABS 2000). In respect to HIV/AIDS, these data vary in quality from place to place because of the screening capacities of hospitals, stigmatisation of the disease and the time between infection and seroconversion (Cohen 2000). In Cameroon, these issues exacerbate HIV/AIDS information problems and make its surveillance and management complex.

2.2: HIV/AIDS data

There are important benefits to knowing one's HIV status, however HIV/AIDS is a disease that is very complex and stigmatising, particularly in African communities (Goldin 1994). The disease is characterized by a long incubation period before manifesting itself. As HIV/AIDS is a sexually transmitted disease, it is associated with promiscuity, pollution and uncleanliness, thus reinforcing the stigma. People are frightened to carry out voluntary screening and to seek treatment in hospitals when sick, because being tested positive implies being ostracized by the family to die in a few years without care. This has made HIV/AIDS detection difficult in Cameroon.

Although there are other ways through which HIV/AIDS is transmitted, including blood transfusion and maternal foetal transmission, in Cameroon and Sub Saharan Africa, HIV/AIDS transmission is erroneously perceived to be largely a function of the behaviour of prostitutes and their clients. Socially the disease does not occur randomly but in a network of persons, reflecting their way of life. Consequently the disease is sometimes seen as divine punishment (Wilton 1996, Pierret 2000). This characterisation has perpetuated the stigma. It implies a choice between self-identifying and attracting negative responses, or living in silence and being virtually unnoticed (Takahashi 1997). People living with HIV/AIDS are tagged as potential sources of infection. Worse still HIV/AIDS is a terminal disease without a cure particularly in Cameroon and Sub Saharan Africa. In view of these factors, people avoid being tested and do not discuss their serostatus even to their partners. Collecting HIV/AIDS data is therefore a daunting task.

2.3 Types of HIV/AIDS data

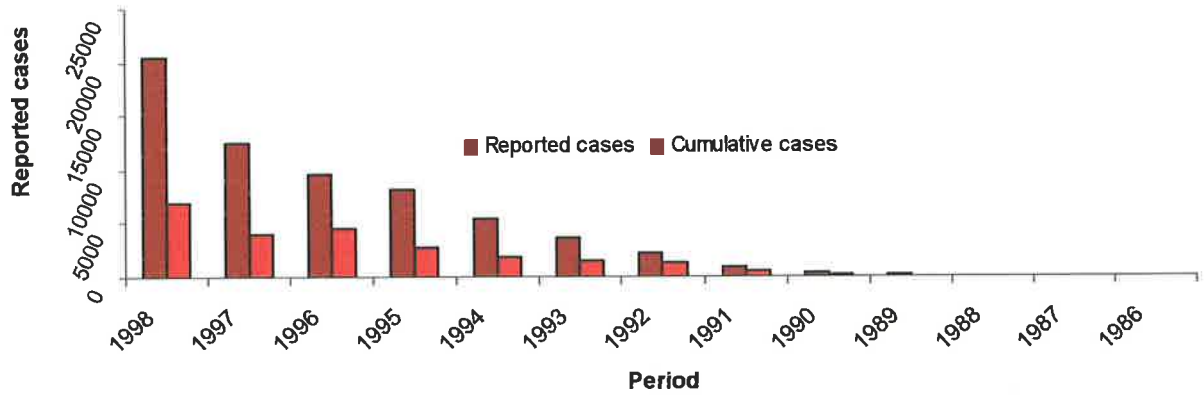
The surveillance and management of HIV/AIDS needs information and this has necessitated the gathering of data about the epidemic. In Sub Saharan Africa and Cameroon, HIV/AIDS surveillance reports contain tabular and graphic information about AIDS, HIV case reports and AIDS deaths, including data by regions, sites, mode of exposure to HIV, sex, age group, vital status, date and place of diagnosis, number tested, and case definition category (UNAIDS et al. 2002a). These reports are published yearly by the country's National HIV/AIDS Control Programme, Ministry of Public Health, hospitals, blood banks, TB and STD Control Centres, and donor organizations.

The data used in this study were obtained from several published sources: MOPH publications including NACC data, the World Bank, WHO, UNAIDS, USAIDS, the 1998 DHS and scientific journals. Data are also obtained from hospital records, including those of Shisong and the Cameroon Baptist Convention Health Board (CBCHB). In Cameroon, morbidity and mortality data are collected using standardized collection forms. On the whole, in Cameroon, HIV/AIDS data are collected using two methods: case reporting and sentinel surveillance.

2.4: Case reporting in Cameroon

Recommended by WHO and UNAIDS, case reporting requires that the aggregated HIV/AIDS data of hospitals, laboratories, STD clinics, and TB clinics are reported by the Ministry of Public Health to the WHO. This reporting is based on the clinical manifestations of the disease such as tuberculosis, weight loss, fever and diarrhoea (see

section 3.2). After diagnoses, data on AIDS cases in Cameroon are reported to the MOPH by heath clinics on AIDS case forms. The MOPH base on the WHO guidelines develops AIDS case report forms. Data from the completed AIDS report forms are aggregated and analysed in the health clinics and at the districts district level. Finally, the number of AIDS cases in Cameroon is aggregated from all the AIDS cases reported by health facilities in all the ten provinces. These AIDS are reported by the MOPH to WHO annually as cumulative AIDS cases in Cameroon. These surveillance data for Cameroon are represented in Figure 2.1. The lack of specific data on diseases in Cameroon and the unreliable nature of the limited data available from hospitals have made case reporting problematic. Also, because few patients access health care services, it implied that those patients who have not entered the health care system are excluded in AIDS case reporting.



Data source: Adapted from (WHO 2000)

Figure 2.1: Reported cases of AIDS in Cameroon, 1985-1998

In addition, the latency of HIV/AIDS makes case reporting an inadequate tool for estimating the prevalence rate, as case reporting is of symptomatic patients, thus asymptomatic seropositives are excluded. Prevalence rates predictions using this method

are undermined particularly during the early phase of HIV/AIDS infection. Despite these weaknesses, AIDS case reporting is useful in predicting the burden of HIV/AIDS related morbidity and mortality information. These data are vital for short term planning of health care services for the management of HIV/AIDS.

2.5: Sentinel surveillance

Due to the inability of AIDS case reporting to predict with certainty current levels of HIV infection in a population, the World Health Organization instituted and recommended that National AIDS Control Programs (NACPs) use sentinel surveillance. The objectives of sentinel surveillance include: the need to assess the magnitude and distribution of the epidemic (space and time); to create awareness; identify high-risk groups; formulate policies; and allocate prevention resources (GTZ 1999). In 1985, the first AIDS case was reported in Cameroon and it is in this time that HIV/AIDS surveillance started.

Sentinel HIV surveillance is defined as, the collection of HIV/AIDS prevalence data serially in selected (sentinel) groups. These include commercial sex workers, antenatal women, military men, truckers, as well as TB and STD patients within the population, to monitor trends in HIV infection over time and space (Hugo 2001, WHO 1999). This is because sentinel surveillance is characterised by repeated cross-sectional sereo-survey and needs easily accessible populations such as antenatal women, military men and STD patients (GTZ 1999).

HIV sentinel surveillance began in Cameroon in 1989 in two sentinel surveillance sites: Yaounde and Douala (see Figure 2.2). Over the years the sites have gradually been

extended. In 1993 four more sites were created in Bamenda, Limbe, Garoua and Bertua (NACC 2001; Figure 2.2). However, between 1996 and 1998 only four of these sites were used. Between 1989 and 1994 approximately 300 blood samples per surveillance area were collected over an 8-12 week period, repeated twice a year.

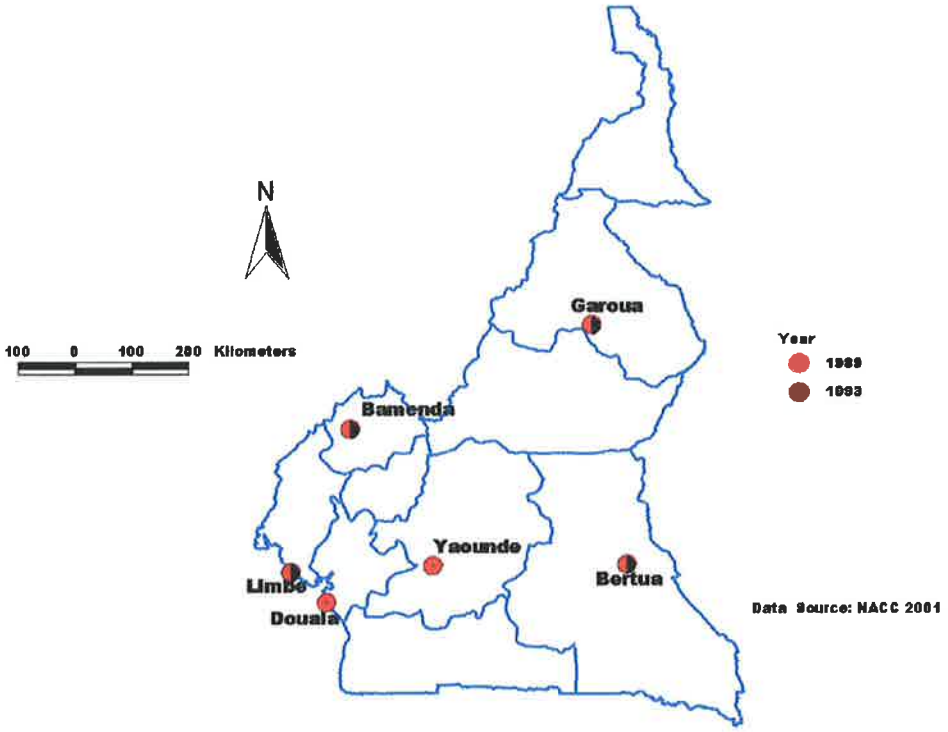


Figure 2.2: The first sentinel HIV surveillance sites in Cameroon, 1989-1993

Since 1995, the sample size increased to 400 per site and surveillance was repeated once a year (NACC 2001, AIDSCAPS 1996). In 2001, between 21 and 320 blood samples were collected from each of the 31 antenatal sites in all the ten provinces of Cameroon. HIV/AIDS data generated through sentinel surveys are extrapolated beyond the sampled population and the geographic area to derive prevalence rates for Cameroon. Bilateral, multilateral and NGO organizations for example, the European Union, German Technical Cooperation (GTZ) and "Projet Santé, Fécondité, Nutrition (PSF)," provide critically

needed financial and technical support to the National AIDS Committee to conduct sentinel surveillance.

In spite of the benefits of sentinel surveillance in predicting prevalence rates trends over time, by population and by place, it is problematic. Sentinel surveillance requires large financial investment as well as infrastructure in order to extract blood samples from the population. As such, only a small section of the population can be surveyed. HIV/AIDS has a long incubation period of 3-6 months before signs of infection are detectable in the blood samples extracted from the population (Catton 2001, UNAIDS 1997a). HIV/AIDS tests such as ELISA are unreliable because of the intrinsic quality of the test and the skills of the laboratory technician performing the test (UNAIDS 1997a). Thus, false negative and/or positive diagnoses of HIV/AIDS help to undermine currently available assays. Despite these difficulties, sentinel surveillance remains the most reliable system of gathering HIV/AIDS data (GTZ 1999).

Generally, HIV/AIDS epidemiological data relates to information on its prevalence and distribution. Various methods are used to collect information on HIV/AIDS in Sub Saharan African including, sentinel surveillance, AIDS case reporting and population-based serosurveys. In Cameroon, AIDS case reporting and sentinel surveillance data give an indication of the levels of HIV/AIDS infection in the general population. However, changes in HIV/AIDS infection rates over time are difficult to analyse in many contexts because of the lack of complementary information on behaviour (FHI and UNAIDS 1998). Since HIV/AIDS is spread mainly through human behaviour, the collection of data on behaviours that put people at risk of HIV infection is critical in designing and

implementing effective HIV/AIDS programmes (FHI and UNAIDS 1998). Thus, in Cameroon, in 1998 and 2000, the Demographic Health Surveys collected data on behaviours including, condom use, premarital sex, multiple partners, knowledge and attitude of the population in relation to HIV/AIDS (DHS 2000).

2.6: Sentinel surveillance in Cameroon (March-July 2000)

In spite of the necessity to survey such high-risk groups, the latest sentinel surveillance for Cameroon (April 2001) was limited only to antenatal attendees. Paradoxically, this subpopulation group is classified as a low-risk group. The last sentinel surveillance involving only high-risk subpopulations of prostitutes and STD patients was in 1996-1997, and that of truckers was last carried out in 1993-1994. Therefore, these current HIV/AIDS data for Cameroon are grossly undermined by the exclusion of subpopulation groups with higher-risk of infections.

NACC data are extracted from the records of the sentinel surveillance for 3655 pregnant women in Cameroon. Figure 2.3 shows the spatial (Divisions) distribution of sentinel sample size in Cameroon. This is a relatively small sample size for a country with almost 15 million people. Between March and July 2000, blood was extracted from antenatal attendees with their consent and tested for HIV and syphilis. Throughout Cameroon pregnant women in the age group 15-49 years old were tested for HIV/AIDS in 29 sites. A non-random, quota sampling method was used to select the subjects. The main reasons for using this particular method are because it is less costly and easier to administer. As Cameroon is a low-income country with a GDP per capita of US $521 in the year 2000/2001 (NIS 2001), this method was considered the most suitable. Despite the benefits,

this quota sampling method did not meet the basic requirement of randomness in the selection of antenatal clinics and antenatal women in Cameroon.

This lack of randomness in the surveys is because an element of bias was introduced, whereby only sentinel surveillance sites and antenatal clinics located 50km from the provincial capitals where involved in the sero-survey. The implication of this geographic barrier is that hundreds of antenatal clinics in inaccessible rural areas had no chance of selection and consequently were excluded from the survey. The 8 to 12 weeks survey included only those antenatal women that were coming to the antenatal clinic for the first time. It is important to indicate that in 1995-1998 an estimated 63% of births occurred at home (MSP 2001, DHS 2000). As a consequence, there is a strong indication that many antenatal women who accessed informal health care services (traditional) were excluded from the survey.

Further, the survey was not representative because vital infection information, such as the prevalence rate among the partners of seropositives, STD patients and paediatric HIV/AIDS cases, were not examined. The only available information about the partners of seropositives is their employment situation. Table 2.1 indicates the prevalence rates for HIV/AIDS infected antenatal women in Cameroon by partners' occupation. In spite of these data, seroprevalence rates among employed men in Cameroon have not been extrapolated.

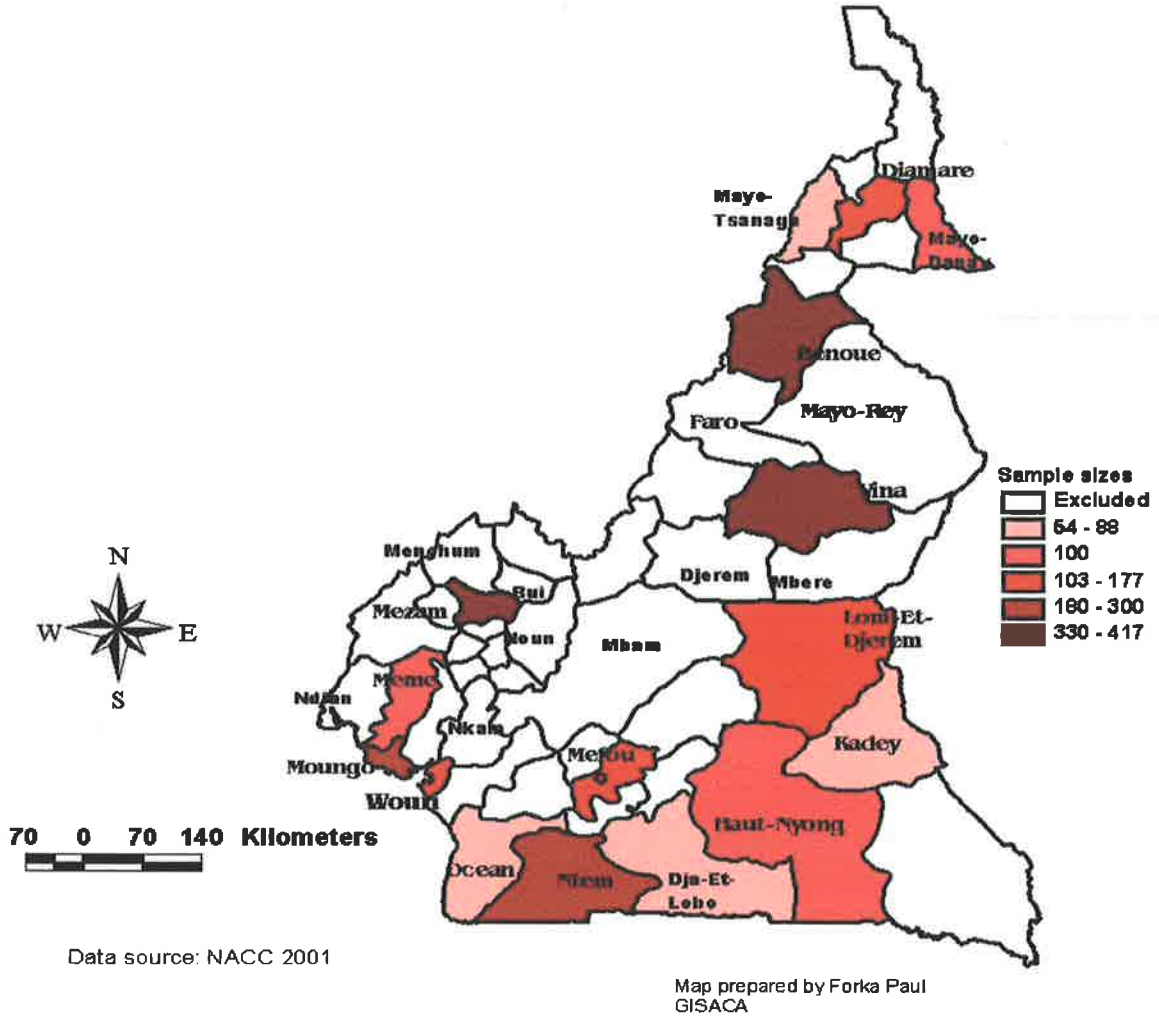


Figure 2.3: Sentinel surveillance sample size distribution, 2001

Published data from 1996 indicate similar prevalence rates of approximately 15% for both the military and the truckers (US Bureau of Census 2000, UNAIDS 2000d). The survey of the partners of seropositives is vital in indicating prevalence trends. It is also important for instituting preventive and curative measures in combating the virus within the general framework of the National Strategic Plan to combat HIV/AIDS (GTC 2000). Despite the extrapolation of the estimate from the data to represent the prevalence rate for Cameroon, the data had no information on the HIV/AIDS prevalence in villages and rural areas.

Despite these weaknesses, the data comprise the only recently available and larger sero-survey sample size data ever collected by NACC in Cameroon.

Table 2.1:Partner's occupation and risk of HIV/AIDS infection

Occupation of partner	Traders	Military men	Farmers	Truckers	Unemployed	Others
Prevalence rate	21.1%%	13.6%	10.6%	12.7%	10.00%	33.7%

Data source: Adapted from (NACC 2001)

In the survey, approximately, 55% of subjects were from urban areas and 45% were from semi-urban areas, despite the fact that 51% of the population live in rural areas (DSTAT 2000). Urban areas are usually defined by countries as part of census procedures, and are usually based on the size of localities, classification of areas as administrative centres, or classification of areas according to special criteria such as population density or type of economic activity of residents (DESIPA 1995). Therefore, the definition of an urban area even within a country is problematic. In this context, the NACC's classification of antenatal sites by locations of urban and semi-urban seems arbitrary. In this sero-survey, neither the administrative nor population size criteria was used to justify the location of antenatal sites as either urban or semi urban. In Cameroon two criteria, namely administrative status and population size, are used to classify settlements (Neba 1999). During the 1987 population census in Cameroon, two criteria were used in defining an urban area. First, a settlement that fulfils the functions of a chief town in an administrative unit (District, Subdivision, Division or Province) was considered urban. Second, an agglomeration of 5 000 or more people in an area with water and electricity installation, a daily market, a well developed health centre and a complete primary school system were considered urban (Neba 1999). Thus, the classification used in the sero-survey to list the

towns of Kumba and Mokolo, for example, with populations of 106 000 and 157 000 in 1999 respectively (DSTAT 2000), as semi-urban is severely undermined.

The survey also uses a classification by age (see Table 2.2), ranging between the ages 15 to 49 years. The median age in the sero-survey was 24 years. In the survey, 32% of the antenatal women were between the ages of 20 and 24. This is the cohort hardest hit by HIV/AIDS. The current prevalence rate for this age cohort stands at 12.2%, compared to 11.8% for Cameroon (UNAIDS et al. 2002a). A critical factor identified by the survey is the youthful nature of the population. More than 64% of the population is less than 24 years old, constituting the group most vulnerable to HIV/AIDS infection. In this regard, the data contain crucial evidence on the commencement of sexual activity among adolescents in Cameroon.

The NACC data showed the age of first sexual activity ranges between 15 and 34 with the mean age of 15.7 years. This finding is consistent with those of a UNAIDS sponsored study carried out in 1998 {Buvé, 1999 #189}. The high level of premarital sexual activity partly explains the increase in HIV/AIDS prevalence rate among 15 to 19 years old. The latest (2002) HIV/AIDS surveillance data in Cameroon indicate a prevalence rate of 11.5% in the age cohort 15 to 19 year olds (UNAIDS et al. 2002a). This is because adolescents involved in premarital sexual activities are exposed to the risk of HIV/AIDS infection for longer periods. Information on the age of first sexual activity is of fundamental importance in targeting prevention in Cameroon and Sub Saharan Africa. In spite of the risk of HIV infection associated with premarital sexual activities, Meekers and Calvès (1997a) argued

that premarital sexual is a useful experience in limiting the need for sexual activity experimentation outside of future marriage and in doing so enhances marital stability.

Table 2.2: Sample size and seroprevalence by age group among antenatal attendees

Age group	15-19	20-24	25-29	30-34	35+
Sample size	825	1178	825	520	307
Percentage of sample	22.6	32.2	22.6	14.2	8.4
HIV/AIDS prevalence	11.5	12.2	9.8	9.2	8.1

Source (NACC 2001)

One other important feature of the NACC data is the marital status of antenatal women; 65% of antenatal women were in a marital relationship. These data consequently indicate a decline in marital relationship compared to the 1976 population census, in which 80% of the 20-24 year olds were in a marital relationship (Neba 1999). The decline is partly attributed to delaying marriage due to the cost involved, and increased level of girls' education and urbanisation (Meekers and Calvès 1997a; Meekers et al. 1997b). In Cameroon, monogamy (a marriage of one man to one woman) and polygyny (a marriage of one man to multiple wives) are the two main types of marriage. In this study, marriage type is a less significant factor in HIV/AIDS infection because prevalence rates among antenatal women in either polygamous or polygynous relationships is 10% (NACC 2001).

HIV/AIDS prevalence rates between antenatal women in a marital relationship, and those who are single, separated and/or divorced are significantly different. HIV/AIDS prevalence rates are 14% for single and 32 % for divorced antenatal women. The high prevalence rates

among single and divorced pregnant women demonstrate the vulnerability of women who are not in stable relationships and/or have multiple sexual partners.

The dataset also contains information on prevalence rate by educational status. Such information is important because in most countries the HIV epidemic is driven by behaviours (multiple sex partners, high-risk sexual contacts and premarital sexual activities) that expose humans to the risk of infection (UNAIDS et al 2002b: 9). Education and information play a vital role in the diffusion of HIV/AIDS. Millions of people in Cameroon and Sub Saharan Africa know about the transmission and prevention of HIV/AIDS because of educational campaigns. For instance, in Cameroon, 90% of 15 to 24 year olds compared to 96% for Zimbabwe and 99% for Malawi, know of HIV/AIDS (UNAIDS et al. 2002b). Despite the vast information campaign to educate people about the transmission of HIV/AIDS, millions of people in Africa south of the Sahara remain vulnerable to HIV/AIDS infection. This is because the virus is spread mainly by behaviours (sexual and prostitution) that are generally private and are difficult to discuss (FHI and UNAIDS 1998). Available data indicate that in Cameroon, approximately 54.6% of males and 27.6% of females in the age cohort 15 to 49 years old had sex with non-regular partners. Similarly, 36% of males and 10.5% of females in the age group 15 to 25 years old had sex with more than one partner (DHS 2000).

It is vital to indicate that high-risk behaviours are probably facilitated by ignorance and illiteracy. Widespread poverty in Sub Saharan Africa has a direct bearing on literacy in the region because it limits governments' abilities to provide education and information to counter the spread of HIV/AIDS. In these data, however there is not a significant

difference in prevalence rates by educational status. In the survey, the HIV/AIDS prevalence rates for illiterates and literates are 13% and 12% respectively. These high prevalence rates are not reflective of the high level of awareness indicated earlier. Furthermore, the asymptomatic nature of the disease after seroconversion makes it difficult to understand the relationship between seroprevalence rate and education.

Migration is also a key feature of the NACC data. An increase in population mobility during a period of rapid increase in HIV prevalence rates in the world and in Sub Saharan Africa in particular, has a significant impact on the dispersal of HIV/AIDS across large geographical areas (Kristine et al. 1992; Cohn et al. 1994; Decosas et al. 1995; Akopkpari 1998; International Migration 1998 vol. 36 no. 4). Sub Saharan Africa has a long history of population movement (migration and refugees). Countries with high rates of population movements, including South Africa, Mozambique, Tanzania, Burundi and Rwanda, tend to have high prevalence rates of HIV/AIDS (Tagne 2004). Available data indicate that more than 30 000 refugees lived in Cameroon at the end of 2001 compared to for example 520 000 in Tanzania (USCR 2002). Thus, in Cameroon there has not been a large influx of refugees compared to other African countries. In Cameroon, the most mobile people are truckers, migrant labourers, itinerant traders, the military, and commercial sex workers, who are mostly between the ages 15 and 45 years. People within this age group are the most affected by the HIV/AIDS epidemic.

The dataset includes migration information for large geographic areas, and contains information on the duration of stay of the subjects in their current areas of residency prior to the survey. Subjects who were born or had lived for more than 10 years in their current

area of residence had a prevalence rate of approximately 12%, while those who had resided in the area for less than 10 years had a prevalence rate of 11%. As such this dataset does not show great differences in prevalence rates in terms of duration of stay. It is important to note that short-term migrations involving itinerant traders and truckers are excluded in the study. Itinerant traders and truckers play a critical role in the spatial diffusion of HIV/AIDS in Sub Saharan Africa (US Bureau of Census 2000, HIV/AIDS Committee 2000, UNAIDS 2002a). The increase in urban population to 38% and 50.1% in 1987 and 1999 respectively (DSTAT 2000), is partly due to rural urban migration. Population mobility is a crucial factor in the transmission of the HIV/AIDS virus (Hugo 2001). It is particularly important in Cameroon because of high prevalence rates in mobile populations. For example, HIV/AIDS prevalence rates are 45% among commercial sex workers and the military, and 15% among truckers (HIV/AIDS Committee 2000; UNAIDS et al. 2002a). Handyside et al (1998:11) also emphasised the key role of Douala, as the main transit port for Cameroon and other Central African countries: Central African Republic and Chad.

According to Prof. Graeme Hugo (pers.comm.12 September, 2003), of the University of Adelaide, the mobility pattern of seropositives facilitates the prediction of the direction of the next wave of the HIV/AIDS epidemic. Mobility data of seropositives are important in Cameroon because families living in towns often take infected members back to the villages to avoid the extra cost of transporting a corpse (Forka 2002). Hugo (2001:1) noted that, as HIV is spread by actions requiring close contact between individuals (sexual intercourse) the mobility of HIV-positives and people at high-risk of infection is crucial to understanding the patterns of transmission and spread of the disease, and for developing interventions to combat the epidemic. These mobility data allow trends such as this to be

monitored, facilitating the siting of prevention and testing sites geared towards HIV/AIDS surveillance in specific communities. Historically, the connection between population mobility and the spread of sexually transmissible diseases (gonorrhoea) was noted in Cameroonian men in 1949 (Hunt 1989). The sexual behaviour of migrants may include the non-use of prophylaxes, and prostitution, which makes them potential sources of new HIV/AIDS infections (Decosas et al. 1995, Bond, 1996). This pattern of sexual behaviour is an indication that seropositive migrants are great transmitters of HIV/AIDS particularly when they move from urban to rural areas. In Cameroon, for example in my village of Kimar-Sop, seropositives who worked and lived in urban areas and return to the village for care have had indiscriminate sexual relationships with young girls and even married women.

Notwithstanding the deficiencies in the 2001 antenatal sample survey dataset, the information forms the basis determining the current HIV/AIDS prevalence rate for Cameroon. The NACC estimated the present national seroprevalence rate of 11.8% by aggregating the data for the ten provinces and calculating the mean.

2.7: Socio-economic data

Cameroon is beset with problems of lack of social surveys for which data are available. Although a household expenditure survey was conducted from September to December 2001 (MEF 2002), the most recent comprehensive survey for which socio-economic data are available was in 1996. Hence, this study uses two main sources: a household expenditure survey conducted in 1996; and "Etudes Socio-Economiques Regional au Cameroon" carried out in 2000. The Department of Statistics and National Accounts

carried out the household expenditure survey with crucial financial and technical support from the European Union and World Bank. Approximately 1700 households in urban and rural areas were surveyed. The results of the survey indicate that more than 50% of Cameroonians are in the low-income bracket. This means that the annual income per head of a low-income earner is less than 148 000 Franc CFA or US $203 (ECAM & DSTAT 1996). However, available data from the 2001 household expenditure survey indicates a significant decrease in the low-income bracket to 30.1% of households, of which 12.3% are in the urban areas and 39.7% in rural areas (MEF 2002). Improvement in the Cameroon terms of trade is a key explanatory factor. These studies not only grouped people into low, medium and the high-income earners, but also grouped the population by gender, occupation and location.

Socio-economic data used in the study are also from "Etudes Socio - Economiques Regional au Cameroun". The Ministry of Public Investment and Regional Planning, in collaboration with the United Nations Development Programme (UNDP), collected these data in 1999. This particular dataset has detailed socio-economic and demographic data for 268 Subdivisions of Cameroon. The socio-economic variables in these two datasets are complementary to the epidemiological data. Nevertheless, the use of socio-economic variables is problematic because approximately 87% of people in Cameroon are employed in the informal sector (DSTAT 2000). The implication is that many in the informal economy do not declare their income and do not have a legal bank account, partly to avoid paying taxes. This affects the completeness and quality of socio-economic data collected in Cameroon.

Another source of data used in the research is the "Health Atlas" of Cameroon. The Ministry of Public Health, in conjunction with Agence Européene pour le Développement et la Sante (AEDES), compiled this data source in 1999. These data depict a comprehensive picture of health service provision and accessibility in Cameroon. Indeed, the Atlas contains data for 1689 health centres, 130 Divisional, nine Provincial and eight National hospitals. These data include the number of medical personnel (doctors and nurses), equipment (beds and microscopes) and population of the service area per facility, and show the level health service provision in Cameroon. Similarly, These data also indicate the level of access to health services in Cameroon. For instance, there is information on annual consultations, hospitalisation rate, diseases diagnosed (HIV/AIDS, TB) and types of services rendered (transfusion and birth) per health facility in 1999.

As geography affects population mobility and the location of health services, the " Health Atlas" contains location data, indicating the accessibility of preventive and care services. Thus the distance covered by a percentage of the population in a hospital catchment has been quantified. According to this dataset, 54% of the people in Cameroon are within 5 km of a minimum health care service (De Caluwé and Lecharlier 1999). This figure needs to be interpreted with care because health facilities lack personnel and basic medication. In addition, data from some health facilities, including the Manyemen General hospitals in the Southwest Province, are not included in this accessibility study. Also, health facilities and their data are not geographically referenced, thereby limiting their use in a spatial (GIS) analysis.

2.8: Population data

The decennial census conducted in 1987 is the main source of information about the number, distribution and characteristics of the population in Cameroon. The Ministry of Public Investment and Regional Planning published these data, containing population information for ten provinces and 58 Divisions, as well as villages in Cameroon. Population information collected in the 1987 census also included gender, income and unemployment data for Cameroon.

Population information from censuses are essential for policy and planning, both at the national and regional levels. However, in Cameroon, as in other Sub Saharan African countries the last census was conducted more than 15 years ago. According to Leete and Mubiala (2003) a census is a costly data collection activity for countries. Thus the heavy financial cost involved in carrying out population censuses, is the dominant factor in explaining why there had not been a recent population census in Cameroon. As indicated earlier, the economic recession of the mid 1980s to the mid 1990s severely limited the ability of Cameroon to carry out a recent population census.

It is important to indicate that the detailed results of the 1987 population are not yet released. Thus, not only are baseline population data for Cameroon outdated, they are incomplete and scarce. According to Ntangsi (1999: 23) people conducting research in Cameroon often complain not only about the scarcity of data and also about the difficulties of accessing these data, as all official data tend to be treated as confidential. As a result, recent population data available for Cameroon are projections based on the outdated and unreliable 1987 census figures. These data need to be interpreted with care because they

might not depict an accurate representation of the population. Therefore, given the aims and objectives of the present study, several sources of data are used in order to provide more comprehensive picture of HIV/AIDS in Cameroon. The lack of population information is indicative of the problems of data availability in Cameroon.

2.9: The HIV/AIDS survey 2001-2002

Another source of data used in the research is a survey of HIV/AIDS patients in the Northwest Province of Cameroon, carried out by the researcher in 2001 and in 2002. The aim of the survey was to more fully appreciate the impact of an HIV-infection on seropositives and their families, in particular in terms of access to prevention and HIV care services. The self-administered survey was also carried out because at the beginning of the research it was difficult to access comprehensive HIV/AIDS data from Cameroon. In spite of later securing the PMTCT dataset (see in section 2:13), it was still essential to conduct the survey for several reasons. First, the survey, and particularly in depth interviews and focus group discussions with HIV-positives in Kumbo Youth Centre and in an undisclosed location in Bamenda, provided detailed insights that cannot be obtained from just analysing a set of survey data. Second, the survey was conducted with the aim of using the results to validate the several sources of data used in the study. Finally, it was also aimed at contributing to the development of methodologies in research that involve HIV/AIDS patients.

The field research was conducted in two phases. The first phase, which took place from October to December 2001, consisted primarily of the collection of secondary data, a pre-test survey, reconnaissance visits and obtaining the relevant authorisations needed to

execute the second phase of the research, which was entirely devoted to conducting the survey. During this period, I visited most of the government departments, hospitals and non-governmental organizations in Yaounde, Bamenda and Kumbo, in relation to HIV/AIDS and health service information. These organisations include the MOPH, NACC, Yaounde Central hospital, GTZ, Military hospital, Provincial Delegation of Public Health in the Northwest Province, Department of Statistics and National Account, HEVETAS, and the Shisong and Bamenda General Hospitals. The aim was to obtain a range of secondary data on HIV/AIDS prevention and care as well as socio-economic and population information on Cameroon. I also obtained partial geographic boundaries of the Northwest Province from HEVETAS Bamenda, for use in the spatial analyses.

2.10: Ethical clearance and authorizations

Before the first visit to Cameroon, I submitted a research proposal to the University of Adelaide Ethics Committee for an official University permit. This was because the research involved two issues of an ethical nature: consent and confidentiality. In the application to the University of Adelaide Ethics Committee, these issues were extensively discussed. Once the University of Adelaide Ethics Committee was satisfied that these issues were to be adequately addressed in the course of the research, an official permit was granted on the 14 August 2001. This authorisation was issued on the condition that the Cameroon Ethics Committee was to also approve the research.

While in Cameroon, in October 2001, a similar application that included the 'research proposal' and a copy of the authorisation from the University of Adelaide Ethics Committee, was submitted to the Cameroon Ethics Committee. The Cameroon Ethics

Committee is a supervisory government body that ensures that guidelines on research issues, such as consent and confidentiality are followed. The Committee also facilitates research that is, or will be, of benefit to the community. The approval was obtained from the Cameroon Ethics Committee on the 26 November 2001 (see Appendix 1). These approvals facilitated primary data collection, and assured the hospitals and patients of the security of the data collected and the confidentiality of the patients.

An HIV/AIDS positive situation is very sensitive and traumatizing (FHI and UNAIDS 1998), and as a result it is not unusual for some patients in Cameroon to isolate themselves. In this context, research that involves HIV/AIDS patients is problematic because of confidentiality issues. In addition, stigmatisation also made access to HIV/AIDS patients difficult. As I visited organisations, formal requests were made to the hospitals to carry out a survey of HIV/AIDS patients. The Director of the General hospital in Yaounde utterly denied my request and drove me away. However, the senior management of the GTZ, Shisong and Bamenda General hospitals, approved the research when I demonstrated with the two ethical authorisations that the absolute confidentiality and informed consent of all the patients would be maintained. To guarantee the respect of confidentiality, these organisations also insisted that members of the research team should involve HIV/AIDS counsellors.

As access to patients is problematic, it was difficult to have a sampling frame from which a random sample could have been chosen in order to ensure adequate representation of the respondents. Due to these problems, it was decided earlier to carry out the research in Shisong and Bamenda General hospitals, and in Kumbo and Bamenda towns, where access

to patients was guaranteed (see Figure 7.1 and 7.2). Overall a random sampling method was adopted in these areas.

In selecting the health facilities to carry out the survey the following criteria were used:

- Health facilities with a large number of in-patients and outpatients, and where the senior management would cooperate and facilitate the research (access to patients).
- A hospital with good diagnostic facilities.

In regards to the community survey, the main criteria for selection were:

- An area with a large number of people, so as to mask the confidentiality of HIV-positives identified.
- An area identified by the GTZ and with facilitated access to the patients.

2.11: Pre-testing of questionnaires

In the first phase of the survey, a 'pilot survey' involving ten hospital-based and ten community-based questionnaires were also carried out in Shisong hospital for the Hospital-based survey and in Bamenda for the Community-based survey. The aims of the pre-test were to ensure that the survey questions satisfied the aims and objectives of the research, and to allow enough time for the modification of the questions. For instance, after the analysis of the pre-tests, the survey questions were increased to include questions about patients and their partners. Also, the pre-test allowed for the better organisation of the research, so as not to interrupt the normal work regimes of the hospitals. In the 'pilot survey', patients often regarded me as an official from Europe offering some medical assistance. Hence, very often patients discussed their specific individual and household problems. Sometimes the responses were not relevant to questions asked in the survey. To

handle situations such as these, we had to listen patiently to the respondents and then guide them to answer the questions asked in the survey. This experience proved very useful in improving the survey method and skills.

The second phase of the research was carried out between October 2002 and February 2003 in the Northwest Province of Cameroon. A significant sample size of 70 patients per hospital and 70 patients per community (covering two hospitals and two communities) was used to enable statistical analysis. The choice of the total sample size of approximately 250 patients was also determined by financial and time constraints. The identification of the respondents was crucial to the survey. Since HIV/AIDS is asymptomatic in the early period of infection, respondents in the hospitals were identified via their medical records. Finally, respondents in the community were identified with the help of GTZ who accepted and advised PLWHA about the research. In December 2002, in Kumbo and Bamenda, the GTZ organised two successive meetings that I participated in with HIV/AIDS patients. As the GTZ has helped to create more than 40 associations of PLWHA throughout Cameroon, attendees of the meetings were members of these associations. The venues of the meetings, attendees, times and proceedings of the meetings were kept confidential. Documented material was not given out in order to avoid patients being identified later via such material, particularly for illiterate patients. Issues discussed included the aims, objectives and benefits of this particular research.

To collect the data two anonymous survey questionnaires were used: community-based; and the hospital-based surveys. The questionnaires were anonymous in order to maintain the confidentiality of the patients. A questionnaire was used to provide a structured format

for the interview and to reduce bias that may result from using a survey team. The questionnaire was a combination of open-ended and multiple-choice questions. The questionnaire for the interviews with HIV/AIDS patients in hospital is composed of 14 questions grouped in two main sections. One group of questions were open-ended, as the social and economic conditions as well as individual experiences of HIV/AIDS patients are different. It was also problematic for the research team to anticipate and determine a fixed set of responses for each question because these questions touched on a wide variety of issues such as distance to facility, condom use, waiting time and cost of transportation. The other group of questions were closed and designed to obtain information about the patients' socio-economic and demographic situations.

Questions for the community based-survey were similar to those for the hospital based-survey. However, in the community survey, the questionnaire sought to establish why the patients were in the community and not in the hospitals. Thus, issues covered included, last visit to hospital, when and why discharged and the type of treatment. A sample of the questionnaires are included in the (see Appendix 2).

In spite of the numerous revisions and testing, the questionnaires still suffered some minor problems when implemented in the field. For example, the questions on sexual history of patients: "Do you have any other partner, if yes, have you had sex with this person, within the last 6 months" was difficult for patients to answer. This was because among other things having another sexual partner implied that they were spreaders of the disease.

Twelve trained HIV/AIDS counsellors assisted in the survey, seven in the hospitals and five in the communities, and six of these counsellors were HIV/AIDS positive patients. The questionnaires were discussed with the interviewers who had some experience in dealing with HIV/AIDS patients and/or were patients themselves. The use of trained counsellors, in particular HIV/AIDS positive counsellors, reassured the patients of the respect of their confidentiality and also motivated it them to participate in the research. We were also able to transmit to the patients potential benefits of the research in scaling up intervention policies to combat HIV/AIDS in Cameroon.

Prior to completing the questionnaire, verbal consent of patients was obtained. Patients' were advised that their participation was voluntary and if they so wished could withdraw their consent and participation at any stage of the interview. The survey was conducted largely in Pidgin. Substitute interviewees (parents, guardian) were used for the terminally ill who were unable participate in the survey.

Approximately 161 patients were surveyed at the Shisong and Bamenda General hospitals (see Table 2.3). As Table 2.3 indicates, female respondents accounted for more than 60% in both the Shisong and Bamenda General hospitals. A plausible explanation from my field experience for the higher percentage of females surveyed is that female respondents were largely in the childbearing age group of 15 to 39 years and were seeking prenatal care. It is important to note that female respondents were very nervous about their seropositive status and also forthcoming, seeking information on how to improve their health situation.

Table 2.3: Survey respondents by gender and marital status per hospital facility

	Shisong	Bamenda	Total	Total (%)
Male	43	21	64	39.7
Female	66	31	97	60.3
Married	69	30	99	61

n=161

Source: HIV-positives survey October 2002-Febuary 2003

This also explains why the 25 to 39 years old age cohort constituted the bulk of the respondents interviewed in the two hospitals (Table 2.4). Table 2.5 shows the socio-economic characteristics of the respondents. Overall, 77% of the interviewees were employed. These data show that traders, in particular itinerant traders called 'Bayam Sellam' in Cameroon, constituted 34% of 37 HIV/AIDS respondents who were traders in both hospitals.

Table 2.4: Respondents by age group per hospital facility

Age group	15-24	25-29	40+
Shisong	14	75	24
Bamenda	7	29	12
Total	21	104	36
Total (%)	13.0	64.6	22.4

n=161

Source: HIV-positives survey October 2002-Febuary 2003

Chapter 3 of this study (section 3.6) discusses subpopulations at high-risk of HIV infection. Table 2.5 is indicative of the high-risk of infection-associated occupations that are characterised by substantial mobility for example, trucking

Table 2.5: Respondents by occupation and by hospital facility

Occupation	Traders	Drivers	Professionals	Others
Shisong	26	6	33	23
Bamenda	11	3	13	9
Total	37	9	46	32
Total (%)	30.0	7.2	37.0	25.8

n employed=124

Source: HIV-positives survey October 2002-Febuary 2003

In the Community-based survey, 114 patients were surveyed in order to fully understand the problems of accessibility to preventive and HIV care services among seropositives in Cameroon. The practice of returning seropositive patients to their homes by hospitals, and due to the belief that diseases characterised by wasting and/or diarrhoea are caused by witchcraft and can only be treated traditionally (Azevedo et al. 1991, Ndubani 1998), reinforced the need for the community-based survey. Throughout local communities in Cameroon, significant numbers of HIV/AIDS related deaths occur regularly. The local population identifies the ailment through symptoms such as wasting and herpes that are locally known as "god fires".

2.12: Major problems encountered in the field research

During the second phase of the survey, individual-level HIV-1 infection and community of residence data from the Cameroon Baptist Convention Health Board Program for the Prevention of Mother-to-Child HIV Transmission (PMTCT) were also obtained. It is important to note that the PMTCT data constitute a major source of data used in this study.

The characteristics of the targeted population and the research areas had significant impacts on the survey, resulting in some accessibility difficulties. These characteristics includes,

the large geographic area of the Northwest province, interviewing HIV-positives who are terminally ill and spatially dispersed, the hilly terrain and, the muddy and dusty nature of the roads. Finally, the low educational levels of some respondents made limited their ability to understand and answer the questions. To address these problems, some measures were taken:

- Focusing the survey region in the subdivisions of Kumbo, Jakiri and Bamenda Central in Northwest Province of Cameroon;
- Highlighting the focus of the interviews and simplifying the questions in order to capture the data and information which this study is concerned about; and
- Counsellors who assisted in the survey were assigned to conduct the community-based survey of local communities (in quarters of subdivisions).

In addition, an HIV infection is a very sensitive issue and this problem was manifested during the survey. The hospitals, organisations and patients that I worked with were concerned about discrimination and/or stigmatisation, resulting from the disclosure of an HIV positive status. As such, some patients were very reluctant to share specific information about their seropositive status, especially in the in depth and key informant interviews of seropositves. Some patients were hesitant to even identify the name of their villages, particularly those from smaller villages. This problem was also exacerbated because the respondents did not perceive any direct benefit, such as medication from the research that would improve their health situation. Another problem encountered in carrying out the survey was that some patients denied to be interviewed and some were very aggressive and rude in the course of the interview.

Further, there was an element of bias introduced by conducting the survey in two hospitals and two communities. The survey did not provide a chance to select patients in other hospitals and communities.

2.13: Data on prevention of Mother-to-Child Transmission (PMTCT) of HIV

Through an Internet search in mid 2002, I found that the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF), a non-profit organization based in the United States was involved in efforts to eradicate paediatric HIV/AIDS in Cameroon. After I inquired, the EGPAF introduced me to their partners in Cameroon. Specifically, through Thomas and Edith Welty, Associate Directors of the AIDS Prevention and Control Program of the Cameroon Baptist Convention Health Board. In order to establish a relationship, we corresponded for several months. A key outcome of these correspondences was a research proposal titled "A spatial Analysis of CBCHB-PMTCT Data," which I submitted to the CBCHB Ethics Committee in October 2002.

While in Cameroon, in November 2002 to conduct the second phase of the research, I met with members of the CBCBH Ethics Committee in the Cameroon Baptist hospital in Kumbo to discuss the research proposal and their concerns about confidentiality, as well as the publication of research findings. Through the influence of Prof. Welty the research approval was expedited and the PMTCT data were transferred electronically from the United States to Adelaide. It is important to indicate that the PMTCT data are analysed in Chapter Seven, thus this section deals entirely with the method through which the PMTCT data are collected.

The Cameroon Baptist Convention Health Board (CBCHB) is the health care branch of the Cameroon Baptist Convention, a private not-for profit health organization. The CBCHB has a network of 61 health facilities scattered through 6 of Cameroon's 10 provinces. The system links 40 primary health centers in tiny, remote villages, with 21 integrated health centers and with the 2 large medical centers that provide tertiary care. In the last 3 years, the CBCHB introduced programs for the prevention of mother-to-child transmission of HIV.

The PMTCT Program, funded through the Elizabeth Glaser Pediatric AIDS Foundation started in February 2000 and has grown rapidly. Although, the PMTCT data used in this research were collected in the period 2000-2002 in the Northwest Province, currently over 35 000 pregnant women have been counselled and tested for HIV in 92 facilities throughout Cameroon (PMTCT 2003). In PMTCT facilities, more than 3 000 pregnant women have diagnosed positive and been treated with nevirapine to prevent mother to child HIV transmission. In Cameroon, the PMTCT Program also provides training, HIV rapid test kits, nevirapine for prophylaxis, supervision, and data collection and analysis free of charge to all participating facilities.

While ELISA and Western blot HIV assays are the most widely used (MMWR 1998), the PMTCT Program uses simple and rapid HIV assays. According to the WHO (1998) there are a number of benefits in using simple and rapid assays. These include:

- Rapid tests are performed in an average of 10 minutes, enabling health-care providers to supply definitive negative and preliminary positive results to

patients at the time of testing, potentially increasing the overall effectiveness of counseling and testing. In comparison, results from Enzyme Immunoassays currently used for HIV screening often are not available for 1-2 weeks.

- Technically, rapid tests are easier and more feasible to implement at the health center level, where there are no highly qualified laboratory staff and sophisticated equipment.

Voluntary counselling testing is not complete without the results of an HIV antibody test. The only way to know whether a person is infected with the HIV virus is to carry out an HIV test. In Cameroon, consented antenatal women, their spouses and babies born to HIV-positive mothers take an HIV test that involves

- Pre-test counselling;
- Demography information (name, age, sex and marital status) is collected and registered;
- Blood sample is collected for all prenatal tests;
- Determine-a simple and rapid HIV test is used to carry out HIV test. In remote health centers where there are no laboratories, Oraquick is used because it can use saliva instead of blood;
- A confirmatory test with the use of HIV spot and HIV check is performed for all positive results;
- Laboratory staff deliver the results to an HIV/AIDS counsellor;
- Finally, the patients are post-test counselled and given the HIV test results.

The collection and analysis of data is an essential part of the PMTCT Program. Table 2.6 summarises the total numbers of pregnant women counseled and tested for HIV in PMTCT facilities in Cameroon. There is a thirteen-fold increase in the numbers of pregnant women tested in PMTCT facilities. Although the numbers tested positive has increase since the program started in 2000, Table 2.6 shows a decrease in seroprevalence among antenatal women in PMTCT facilities over time. This is probably due to community AIDS education programs of the PMTCT Program. It is however too early to conclude that this decrease in prevalence rates will continue.

Table 2.6: Antenatal women tested for HIV in PMTCT facilities in Cameroon, 2000-2003

Year	Pre-counseled	Screened	Percentage screened	HIV-positives	Mothers treated	Babies treated
2000	1 469	1 391	94.7	10.5	55	55
2001	4 022	3 826	95.1	9.9	147	147
2002	12 277	11 414	93.0	9.5	433	413
9/2003	14 737	13 604	92.3	7.7	314	316
Total	32 505	30 235	93.0	8.8	949	931

Source: (PMTCT 2003)

Although the PMTCT Program has expanded rapidly, in Cameroon the CBCHB (2003) identified three main problems that affect the collection of HIV/AIDS data through the PMTCT Program. These include delays in the delivery of donated test kits from overseas and delays in obtaining data from remote health facilities. The lack of health care personnel and transport make it difficult to track HIV-positive mothers and their babies, consequently post infection data is limited and incomplete (CBCHB 2003).

2:14: Data analysis

The analyses of these data are crucial in establishing guidelines and policy recommendations. The data are analysed using a series of tools. Firstly, qualitative analysis was undertaken, that entailed discussing, comparing and contrasting the findings of the study. In addition to the GIS software described later, the data collected was recoded, entered and processed in Microsoft Excel to perform the statistical analyses including the calculation of means, medians and correlations between variables. The results of these analyses are presented in the tables, graphs, charts and maps used through out the Thesis for example, in Chapters 3, 4, 5, 6 7 8 and 9).

2.15: Limitations of data from Cameroon

In developing countries including Cameroon, data collection is problematic because of inadequate resources, including skilled personnel and finances. Quality data are critical in the surveillance of HIV/AIDS, without which effective prevention and treatment programs cannot be administered. However, survey data including HIV/AIDS data from Cameroon are of questionable quality because of underreporting and misreporting. Patients must be present for medical attention at locations that collect and process data. This type of system, which is extremely common in Sub Saharan Africa, will underreport the true burden of disease in a community or village (GOC and The World Bank 1999). The lack of diagnostic equipment in health facilities, particularly in rural areas, implies that diagnoses of diseases, including HIV/AIDS, are at times clinical especially in remote communities. Inherent in clinical diagnosis is the problem of case confirmation (GOC and The World Bank 1999).

Data collection, especially that of vital events such as births, deaths and marriages in Cameroon is regulated by the 1981 Civil Status Registration Ordinance No. 81-02- 29. The ordinance stipulates the registration of vital events data by parents in the local council within 30 days of the event's occurrence, at a cost of 600 francs (US $ 0.82) of fiscal stamps. However, the legislation has not been enforced and the data generated is of questionable quality. Births, marriages and deaths are registered in most instances because of their perceived benefits. For example, birth certificates are a prerequisite for school enrolment, employment in the formal sector and family allowances. Deaths certificates are required to transport corpses and for inheritance decisions via the courts. However, most inheritances are decided at the levels of families, consequently limiting the need for registrations. It is difficult to gather information particularly when the respondent has not perceived any benefit. Also, the costs of fiscal stamps, transportation fares to registration centres and the long waiting time at the registration centres deter respondents from registering these events (Ndong et al. 1994). Some births are registered 50 years after they occurred. Due to the high prevalence of traditional marriages and the cost of civil marriages, people do not register marriages except if one of the partners works in the public service. These problems hinder the collection of data from seropositives on their age and marital status.

Costs, apathy and the lack of benefits in the registration of vital events, have culminated in inadequate reporting of events. It is not unusual in Cameroon for data to be falsified. Dates and place of births are adjusted to gain employment and government contracts as well as admission into educational institutions. Young employees in the public service

sometimes have fraudulent marriage certificates when they are not married as an excuse to work in the towns. Employees inflate the number of children they have in order to increase the amount of family allowance benefits they can access. Finally, cultural diversity in Cameroon affects the way people experience events (illness) and answer questions concerning the events. In Cameroon, there is widespread perception that diseases can be caused by sorcerers, witchcraft, or can be a pay back for breaking of traditional laws. These beliefs about diseases among Cameroonians can lead to under-reporting or non-reporting of undiagnosed ailments. The potential to define the problem clinically and epidemiologically is limited because many people particularly those in remote villages, do not have access to health care and/or health service facilities, which also lack diagnostic equipment. As a result of these problems data collected in Cameroon needs to be interpreted with care. While general data collection is problematic in Cameroon, the collection of HIV/AIDS data is even more challenging. As indicated earlier, the stigma associated with, and the long incubation period of HIV/AIDS, hamper the collection of data concerning the epidemic. In addition to the stigma and the long incubation period, there is the definitional problem of HIV/AIDS in data collection.

Different definitions of HIV/AIDS are used in different countries, based on population factors such as paediatrics, adults and relative occurrence of opportunistic infections, as well as the laboratory infrastructure and training available. Cameroon uses the WHO 1986 Bangui definition for AIDS surveillance. The Bangui definition is centred largely on symptoms such as TB, diarrhoea, weight loss, fever and persistent cough longer than one month, as being indicative of an AIDS case (WHO 1986). These AIDS defining symptoms have been very prevalent in Africa long before the disease was first discovered in the early

1980s. It is therefore difficult to recognise AIDS because many people have diseases with similar symptoms (such as diarrhoea and weight loss). Hence, the collection of HIV/AIDS data is difficult if based on these symptomatic conditions. However, in 1987 in Abidjan, the WHO modified the definition to include the presence of antibodies. The problem with antibodies' assays is that some are not 100% effective (UNAIDS 1997a). The lack of trained personnel, inadequate storage facilities and the high temperatures of up to 35° in many parts of Cameroon, have the potential to produce inaccurate results. Furthermore, the Bangui and Abidjan definitions only define HIV/ADS in people more than 12 years old, thereby excluding paediatric cases of HIV/AIDS.

In Cameroon and Sub Saharan Africa, seroprevalence rates are based on small scale sample sizes. At this scale, the concentration of high prevalence rates and the behavioural characteristics of groups in the communities, all of which interact and influence HIV/AIDS transmission, are concealed. HIV/AIDS data represented at such a scale are flawed because in sero-surveys, small, non-representative and geographically bias sample sizes are used (US Bureau of Census 2000). When these data are generalised in the analyses to extrapolate beyond the sample population and geographic area, they generate misleading information. For instance, estimates of sero-prevalence rates for commercial sex workers in Yaounde in Cameroon are often generalised to represent high-risk urban populations of these countries, even though Yaounde is not representative of all urban areas of Cameroon. In addition, commercial sex workers do not represent all high-risk groups, which the military and truckers in Cameroon. In view of these problems all HIV/ADS data collected in Cameroon and Sub Saharan Africa, need to be viewed and used with caution.

2:16: Conclusion

Research into the integration of spatial data in the surveillance and management of HIV/AIDS in Cameroon and Sub Saharan Africa in general is problematic because of inadequate and incomplete data. The varied sources of data described in this Chapter are indicative of the magnitude of the problem. However, it is only through research that problems of obsolete and incomplete data can be resolved. The use of several data sources including, NACC, MOPH, the HIV/AIDS survey 2001-2002, WHO, UNAIDS, GTZ, hospital records and the PMTCT data in this study provide a more comprehensive analysis of the current situation of HIV/AIDS in Cameroon.

CHAPTER 3

The HIV/AIDS Situation in Sub Saharan Africa and Cameroon

3.1: Introduction

Currently there are an estimated 40 million people in the world infected with the HIV/AIDS virus and Sub Saharan Africa remains the most severely affected with approximately 28.2 million seropositives (UNAIDS and WHO 2003b). Figure 3.1 shows that at least 10% of people aged 15–49 are infected in 16 African countries including several in southern Africa, where approximately 20% in this age group are infected.

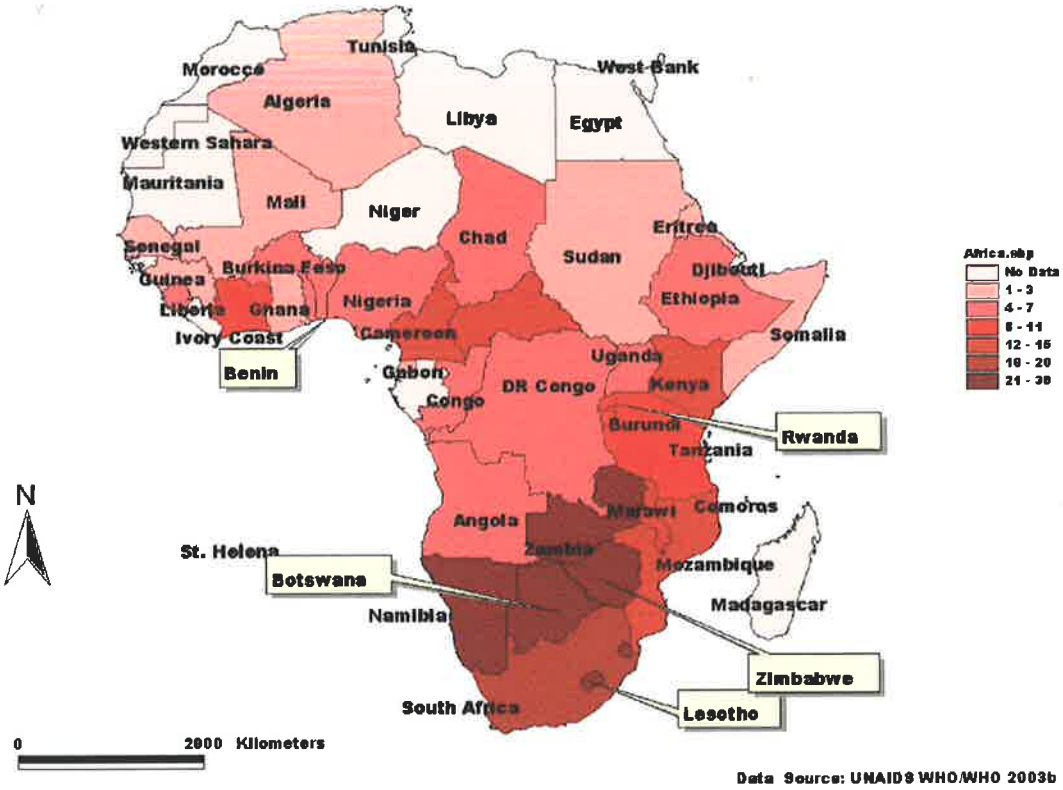


Figure 3.1: HIV/AIDS seroprevalence rate among people aged 15-49 year olds in Africa at the end of 2002

Although Sub Saharan Africa currently accounts for more than 70% of the world HIV/AIDS infections, Figures 3.1 and 3.2 show that the spatial distribution of the disease is not uniform throughout the region. According to UNAIDS and WHO (2002c) HIV/AIDS prevalence rates are highest in Eastern and Southern Africa, varying from 38.8% in Botswana, 33.7% in Zimbabwe, 21.5% in Zambia, and 15% in Kenya to 13% in Mozambique. In West Africa, the prevalence rates are less than 4%, with the exception of the Ivory Coast which has a prevalence rate of 9.7%. It is critical to note that while Botswana has the highest seroprevalence rate in the world, South Africa has the largest number of HIV/AIDS infected people in the world. UNAIDS and WHO (2002c) estimate that over 5 million people are HIV-positive in South Africa. A comparison of HIV/AIDS prevalence rates in Sub Saharan Africa in 2002 (Figure 3.1) and 1999 (Figure 3.2) shows prevalence rates increased from 3% to 8% in several countries: Botswana, Lesotho, Namibia, Swaziland, Zambia, Zimbabwe and Cameroon in the period.

While Figure 3.3 shows the percentage increase in seroprevalence rates, Figure 3.4 shows that HIV/AIDS prevalence rates decreased between 1% and 5% in the period 1999 to 2002 in some Sub Saharan African countries: Ivory Coast, Burundi, Uganda and Ethiopia. The reasons for the declines in prevalence rates, particularly in Uganda were earlier thought to be as a result of errors in HIV/AIDS surveillance and the removal of prevalence infections through mortality rather than declines in the rate of new infections (UNAIDS 1998; Stoneburner and Low-Beer 2004). However, behaviour change, including condom use, reducing the number of sexual partners and delaying to involve in sexual intercourse are the explanatory factors. As a result, prevalence rate among pregnant women in the age cohort 15-19 year olds tested in Nsambya hospital, Kampala (Uganda) declined from 22% in 1990 to 10% in 1996 (UNAIDS 2001d).

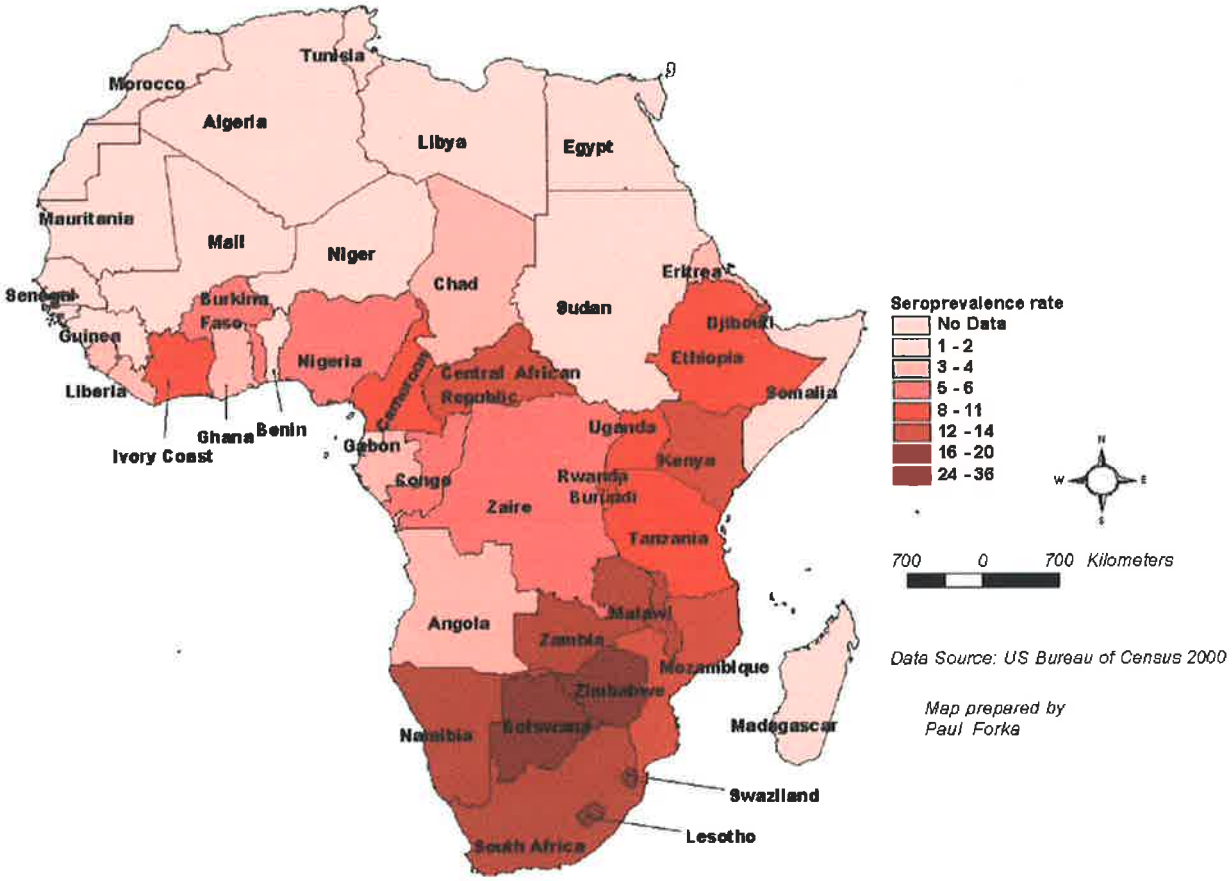
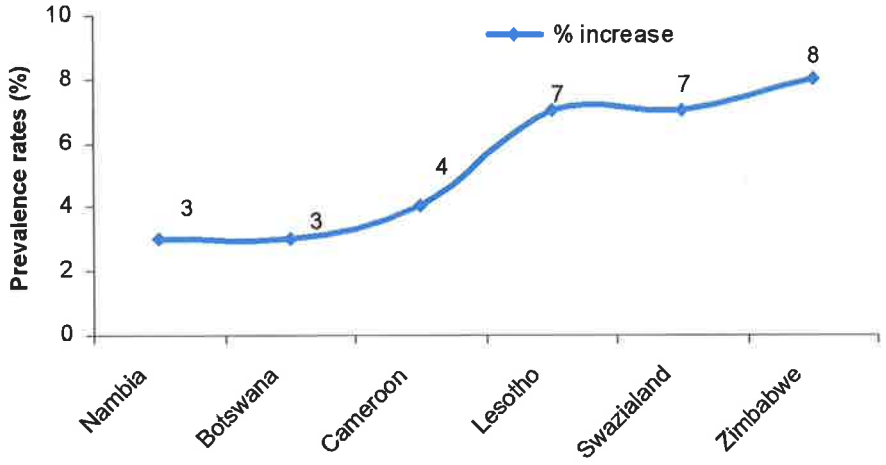


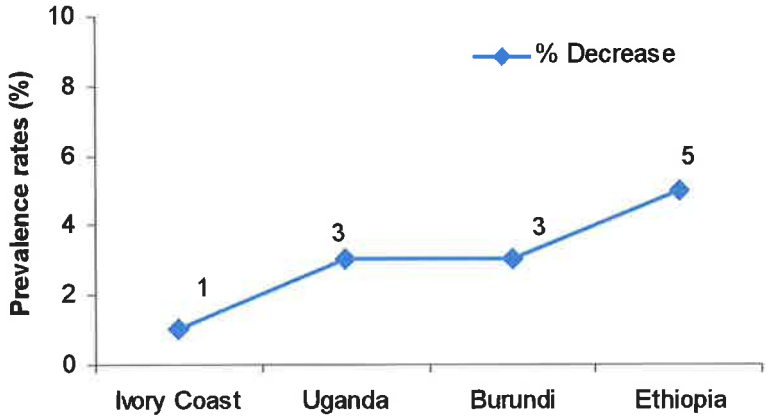
Figure 3.2: HIV/AIDS seroprevalence rate in Africa at the end of 1999

The latest HIV/AIDS surveillance results (April 2001) in Cameroon indicate a worsening prevalence rate of 11.8% among the sexually active population compared to the relatively low prevalence rate in the period 1986-1992 (see Figure 3.5). This represents an estimated 937 000 infected people. This figure is expected to increase further with an estimated number of around 650 people infected with the virus in Cameroon daily (UNAIDS et al 2002a, HIV/AIDS Committee 2000).



Data source: (US Bureau of Census 2000, UNAIDS and WHO 2002)

Figure 3.3: Percentage increase in prevalence rate in selected Sub Saharan African countries, 1999-2002

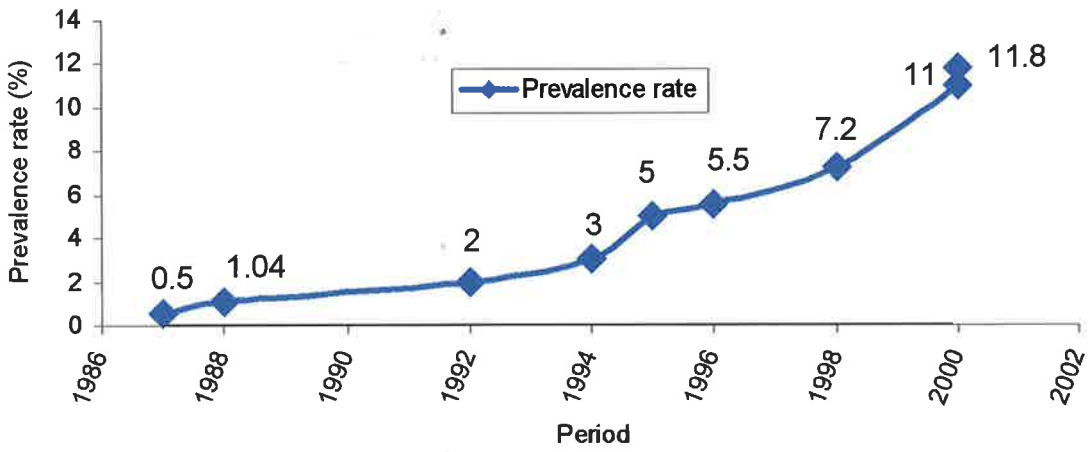


Data source: (US Bureau of Census 2000, UNAIDS and WHO 2002)

Figure 3.4: Percentage decrease in prevalence rate in selected Sub Saharan African countries, 1999-2002

In Sub Saharan Africa in general and particularly in Cameroon combating the HIV/AIDS epidemic is a matter of grave urgency. HIV/AIDS morbidity and mortality has increased

exponentially in Sub Saharan Africa, and resultant effects on the demographic structure of the population are substantial. For instance, in Botswana, in 2002, without HIV/AIDS life expectancy would have been 72, but was actually 34 years. Similarly, in Cameroon, in 2002, life expectancy was approximately 48 to 50 years as a result of AIDS instead of 63 years (Stanecki 2004: 21). Not only are large numbers of people dying and life expectancy falling, but these deaths are also age selective. The most affected are those in the 15-24 age cohort who are also those who in the long term are potentially the most productive. The implications of HIV/AIDS for demographic changes, economic structure, socio-cultural and the physical environments are enormous. The magnitude of the problem makes HIV/AIDS the single most critical health and development problem in Sub Saharan Africa.



Data source: (HIV/AIDS Committee 2000, UNAIDS 2002a)

Figure 3.5: Trend in HIV/AIDS prevalence rates in Cameroon, 1986-2000

Figures 3.6 and 3.7 present the current situation of HIV/AIDS in Cameroon, based on 2000 survey data (NACC 2001). Figure 3.6 shows that prevalence rates ranged from 6.0% in the West to 17.0% in the Adamawa province. The highest prevalence rate for Cameroon is found in the dominantly Moslem North in the provinces of Adawawa (17%) and Extreme North (13%), where general health, education and development indicators are the lowest. For example, trained health personnel in 1998 assisted only 25% of all births in Adamawa, North and Extreme provinces, compared to 88% in the Northwest and Southwest provinces (see Figure 4.3; DSTAT 1999: 16).

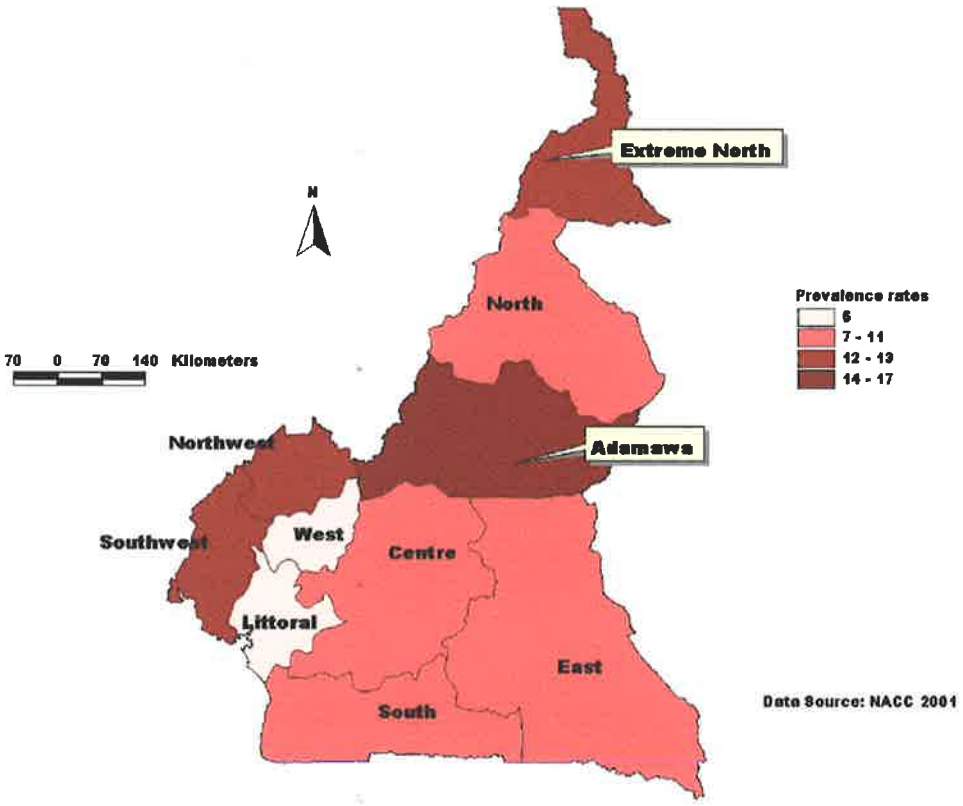


Figure 3.6: HIV/AIDS seroprevalence rates in Cameroon at the end of 2001

The high prevalence rate in the Northern provinces needs to be interpreted with care as throughout Cameroon a limited sample size was involved in the serosurvey carried out in 2000

(see Chapter 2 section 2.6). Figure 3.7 shows the spatial (Division) distribution of HIV/AIDS prevalence in Cameroon, aggregated to determine HIV/AIDS prevalence rate for the provinces. It is problematic to have accurate prevalence rates for the provinces, as 75% of the 58 Divisions in Cameroon have no prevalence data.

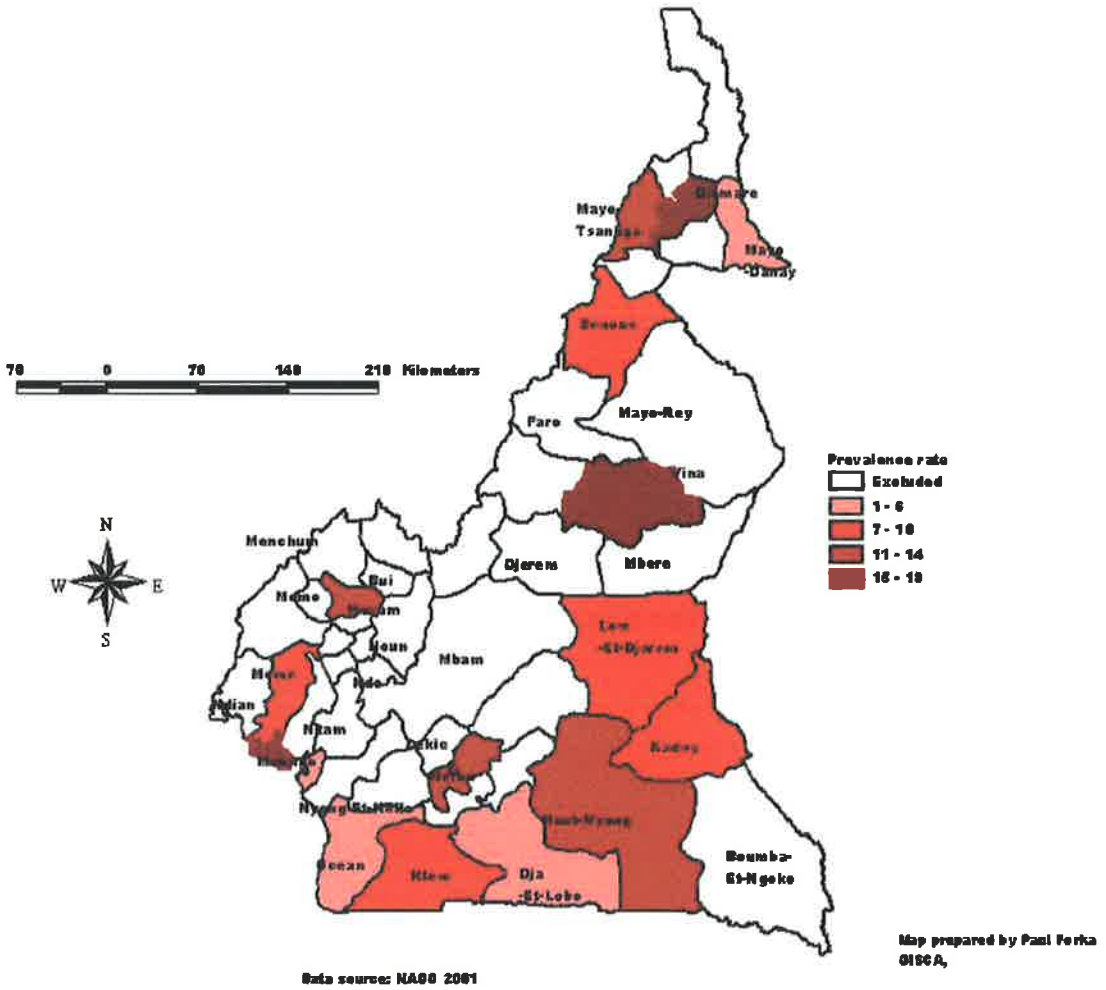


Figure 3.7: Spatial (Division) distribution of HIV/AIDS seroprevalence rates in Cameroon at the end of 2001

The littoral province has a prevalence rate of 6%, a result which does not reflect the accurate seroprevalence situation of the province in which Cameroon's economic capital, Douala, is

located. The serosurvey in the city of Douala was carried out in only two sites namely Diedo and New Bell antenatal clinics. The sample size of 276 for a population of 1.5 million people is not representative of Douala let alone the entire province of 2 million people (DSTAT 2000).

3.2: Heterosexual transmission

The first cases of HIV/AIDS in the human population were diagnosed in homosexual men in the United States in the early 1980s (Mann et al. 1992). However, in the African case, AIDS is predominantly a disease of the heterosexual population, and homosexuality is largely viewed as a taboo. This view is expressed at the highest level, for example, Sam Nujoma, President of Namibia (1996), stated that homosexuality is 'un-African' and 'un-natural' {AIDS Analysis Africa, 2001 #320}. As a result of such negative perceptions of homosexuality, infections associated with this mode of transmission are not usually reported. HIV/AIDS data on the modes of transmission need to be examined carefully because there are unreported cases of homosexual transmission. Although there are no data, homosexual transmissions have been noted in prison environments in Cameroon (AIDSCAPS 1996). However, HIV/AIDS has diffused ferociously in the heterosexual populations of Sub Saharan Africa. The spread has occurred through bodily fluids that include blood, semen, cervico-vaginal secretions and breast milk (UNAIDS 2001e).

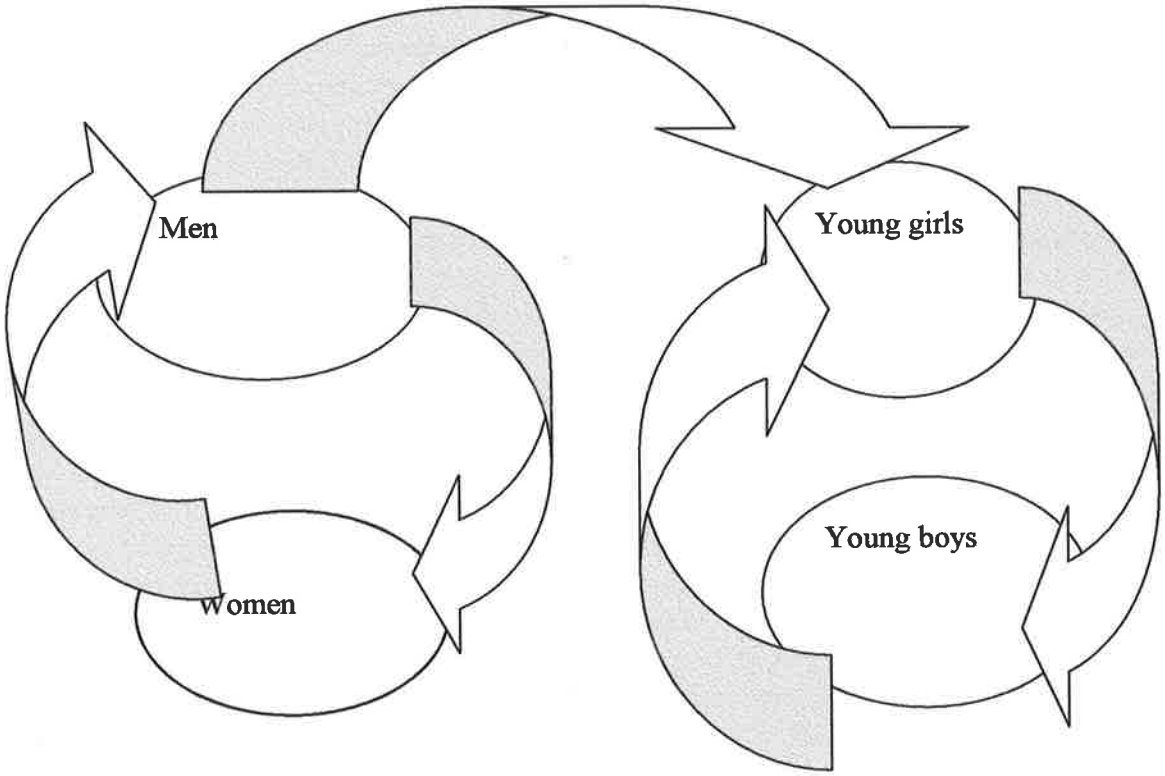
In Cameroon, like most of Sub Saharan Africa, approximately 90% of HIV/AIDS transmission is through heterosexual relationships (MSP 2001). Thus, other modes of transmission, such as blood transfusion and the use of non-sterilised needles, account for approximately 10% of the infection. Heterosexual accounts for the one to one male to female ratio among seropositve

cases (Quinn et al. 1986). However, differences exist between male to female and female to male transmission rates. HIV/AIDS is transmitted effectively from males to females and therefore infection rates are higher among women than men (Cohen and Trussell 1996)

HIV/AIDS prevalence rates in Cameroon and Sub Saharan Africa vary by age and by sex. The most affected age cohort is between 15-24 years old. In Cameroon the number of young infected females between 15-24 years old is two times that of young adolescent males. Results of a study in Yaounde in 1997-1998 indicated that 8% of females were HIV positive, compared to 4% of males (US Bureau of Census 2000). In Botswana the prevalence rates for this age cohort (15-24 years) are four to twelve times higher in young females than young males (AIDS Analysis Africa 2001 vol. 2:13). This is thought to be largely as a result of sexual relations between older men and young women, which are common in Cameroon and Sub Saharan Africa (see Figure 3.8). Differences in age between adolescent females and their older husbands, at times more than 50 years forced younger spouses to seek sexual satisfaction with younger males outsides of marriage (Twa Twa et al. 1997, Buve 1999). Also, the practice of multiple sex partners facilitated by polygyny which is widely and culturally accepted in Sub Saharan Africa, permits men to marry and/or have more than one sexual partner (Caldwell et al. 1989). As a result, a seropositive male can infect two or more adolescent females. Furthermore, peri and post partum sexual abstinence before and after birth, during menstruation and death ceremonies has led non-polygynous men to look for sexual relationships outside marriage (Caldwell et al. 1989, Hunter 1994).

The potential for HIV/AIDS to propagate is substantial in a polygynous situation, because one primary infection via the man and/or any of the spouses can trigger many secondary

infections. Also, adolescent girls are involved in sexual intercourse earlier and as a result are vulnerable to sexually transmitted diseases (STDs), including HIV/AIDS, because of the longer period of exposure. The earlier people become sexually active, the more likely they are to change sexual partners and in doing so are exposed to HIV/AIDS infection (Forka 2000). Increases in prevalence rates among females in the age cohort 15-24 years old result from increased sexual activity with partners who do not use condoms and the lack of information on sexually transmitted diseases, as well as the easier penetration of sexually transmitted disease pathogens in the cervical mucus of adolescents (Anarfi 1997).



Source: Adapted from (AIDS Analysis Africa 2001 vol. 12 no. 1: 2)

Figure 3.8: Inter-generation transmission of HIV/AIDS

HIV/AIDS data in Cameroon and Sub Saharan Africa are presented in two main (but poorly defined) groups: low and high-risk groups of HIV/AIDS infection. This categorisation is underlined by the fact that high-risk groups, including commercial sex workers, truckers and the military, are more vulnerable to HIV/AIDS than low-risk groups such as pregnant women and blood donors. However, the categorisation is flawed as it assumes some sort of uniform behaviour among individuals in a subpopulation group, for example by antenatal attendees. The categorisation of antenatal women as a low-risk group is misleading because some antenatal women are also commercial sex workers. Further, it is not unusual for a pregnant woman to have an extra-marital affair during pregnancy because the risk of becoming pregnant from an extra- marital relationship, with possible resultant marital instability, is eliminated. The classification ignored the fact that individual behaviour is the fundamental cause of HIV/AIDS transmission and amplification. For example, prostitutes (high-risk group) who use condoms with their clients are less likely to be infected compared to pregnant women (low-risk) who do not use condoms in a casual sexual relationship. In spite of the problems inherent in the definition of these groups, this categorisation is useful in determining the vulnerability of HIV/AIDS infection and transmission.

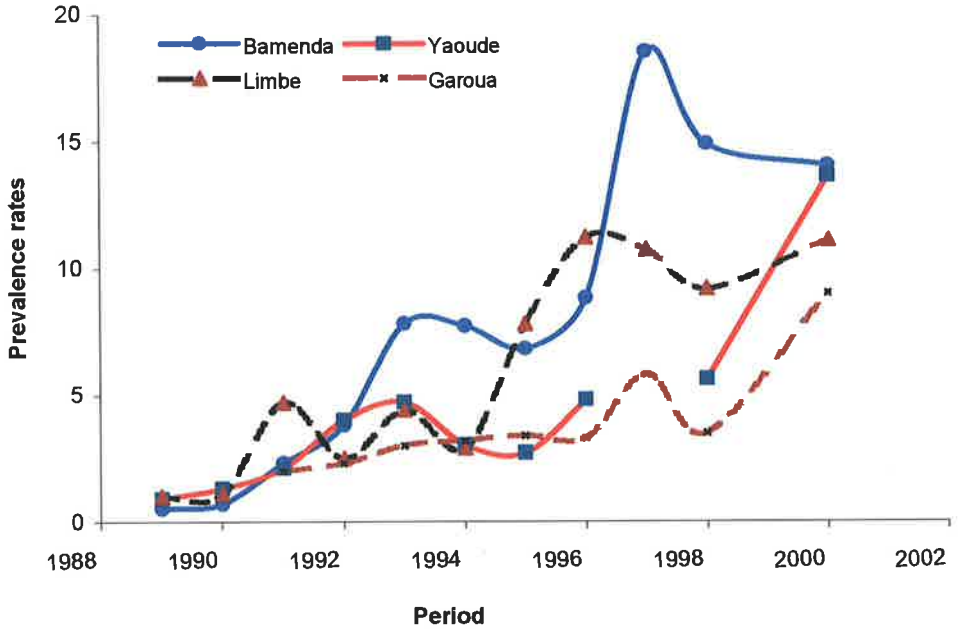
3.3: Subpopulations at low-risk of HIV/AIDS: Pregnant women and blood donors

Sentinel survey data of pregnant women from various sites in Cameroon indicate that HIV/AIDS prevalence rates have increased significantly from 0.5% in 1987 to approximately 18% in 2000 (UNAIDS et al. 2002b). Figure 3.9 shows a four to twelve fold increase in antenatal prevalence rates among low risk populations in the towns Bamenda, Garoua, Yaounde and Limbe, between 1987 and 2000.

These remarkable increases demonstrate that Cameroon has moved from a low prevalence rate country of less than 5% in 1985 to an epidemic country of approximately 12% in 2002. The latest (April 2001) sentinel survey of antenatal attendees indicates that prevalence rates have increased from zero cases in towns such as Ngaoundere in 1989 to approximately 17% in 2000 (HIV/AIDS Committee 2000). These skyrocketing antenatal prevalent rates do not justify the categorisation of pregnant women as a low-risk group. The use of antenatal data to extrapolate prevalence rates in Sub Saharan Africa is largely based on the assumption of one to one male to female and/or female to male transmission. As some pregnant women may also be commercial sex workers, they are thereby reservoirs and transmitters of HIV/AIDS. Antenatal women who practice commercial sex activities might have co-infections from different sexual partners. In addition, pregnant women may be more vulnerable to infection from their partners seeking extra-marital sexual relations, for example, during pregnancy and breast-feeding.

In view of this, the assumption of one to one male to female infection is undermined. Precise trends of HIV/AIDS in Cameroon that are derived entirely from antenatal data therefore need to be treated with care. The increase in numbers of seropositive pregnant women in Cameroon indicates that maternal HIV/AIDS transmission is substantial. Although maternal foetal transmission is independent of heterosexual transmission it is strongly associated with heterosexual activities. Maternal foetal transmission occurs in three circumstances namely, before birth in utero, in the process of delivery via the mother's blood, and after birth through breast milk. The presence of the HIV antibodies in the cord of a newborn indicates the baby is HIV positive. Globally, an estimated 570 000 to 600,000 children were infected by their

mothers in 1997 and 90% of them were found in Sub Saharan Africa (Cohen, 2000). As at 2001, 69 000 children are infected with the HIV/AIDS virus in Cameroon (CPC 1999-2000, UNAIDS, 2002b). In 2000 about 80 000 pregnant women in Cameroon were infected and this represents a higher risk of maternal foetal infection (CPC 1999-2000).



Source: (US Bureau of Census 2000)

Figure 3.9: Prevalence rates of antenatal women in some towns of Cameroon

The situation had been complicated by the pro-natalist population policy of Cameroon that encouraged breast-feeding (World Bank 1995a), as this is a medium through which seropositives mothers transmit the HIV/AIDS virus to their children. While breast-feeding is desirable in most circumstances and should be encouraged, in terms of HIV/AIDS, it is a major cause of child infection. This requires educating mothers on the dangers of virus transfer and providing access to alternative methods of feeding for HIV-positive mothers.

Data from the Yaounde Central hospital in Cameroon indicate that of the 43 HIV/AIDS positive women who gave birth in 2000, approximately 50% of them breast-fed their children (Hopital de Jour 2001). A study conducted in Kenya of 197 uninfected children at birth, delivered to HIV positive women, showed that 38% of the children were infected with the HIV/AIDS virus in the first six months of their lives via breast milk (Cohen, 2000).

In addition to antenatal women, blood donors are also considered a low-risk subpopulation group. Many lives are saved annually through blood transfusion. An estimated 70 000 blood bags are collected annually from donors in Cameroon for transfusion (Hopital de Jour 2001). It is also a risky activity because infections such as HIV/ADS, malaria and hepatitis can be transmitted effectively via blood transfusions. Specifically within the context of HIV/AIDS approximately 5% to 10% of all infection in the world has occurred through the transfusion of contaminated blood and blood products (UNAIDS 1997b, Piot 1988). Malaria patients, antenatal women, anaemia patients, and accident victims in Cameroon are the most at risk of transfusion transmissible infections, including HIV/AIDS. HIV/AIDS prevalence rates among transfusion recipients in 1987 were as high as 4% in Yaounde, Cameroon (US Bureau of Census 2000). Recent HIV/AIDS prevalence information among blood recipient in Cameroon is lacking. Nevertheless, prevalence rates among blood donors (Table 3.1) indicate the potential of transfusion in contributing to the amplification of HIV/AIDS.

Table 3.1 indicates the direction of prevalence rates among blood donors in Cameroon. The true picture of prevalence rates among blood donors is highly likely to be much higher than depicted in Table 3.1, particularly in rural areas. This is because the blood transfusion system in Cameroon is hospital based as there is no national and/or central system (GTC 2000). On

average, 90% of blood donors in Cameroon are family members, voluntary donors constituting 10% (Hopital de Jour 2001). This is largely a family donor replacement system, where by families of people needing transfusion are asked to donate the same quantity as that given to their relative (UNAIDS 1997b). Before 1987 in Cameroon collected blood was transfused directly if compatible, or stored in hospital blood banks. Blood screening before transfusion began in Cameroon and most of Sub Saharan Africa in 1987 (Irwin et al. 1991). In spite of this, blood screening is a process that requires good laboratory equipment, trained personnel and test kits, all of which are in short supply in health facilities in Cameroon.

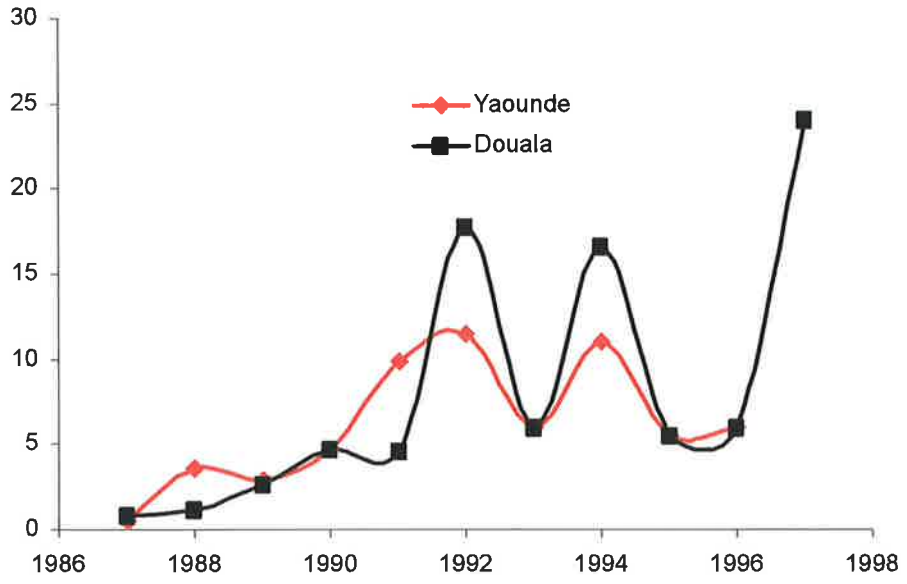
Table 3.1: Percentage HIV positive among blood donors in the Yaounde Central Hospital

Year	Donors	Percentage positive
1999	8786	7.1
2000	10308	6.5

Data Source: (Hopital de Jour 2001).

HIV/AIDS has a long period of latency (3 to 8 weeks after infection) during which antibodies of the virus cannot be detected (UNAIDS 1997b). HIV/AIDS testing of blood donated within the latency period may give a false-negative result, despite the donor being infected. In addition, false negative results may occur due to poor storage of assays and/or inadequate training of laboratory technicians in conducting the tests. Prevalence rates among blood donors tested in Cameroon have steadily increased from less than 1% in 1987 to more than 24% in 1997 (see Figure 3.10). These data indicate substantial risks associated with transfusion transmissible HIV/AIDS in Cameroon. These prevalence rates also show that

HIV/AIDS in Cameroon has attained an epidemic proportion, and the categorisation of blood donors as a low-risk group is not justifiable.



Source: (UNAIDS et al. 2002a, US Bureau of Census 2000)

Figure 3.10: HIV prevalence rates among blood donors in two major cities: Douala and Yaounde, 1987-1997

It is of fundamental importance to indicate that improvements in data collection and records keeping are important in explaining of current increases in prevalence rates, especially with the introduction in Cameroon of the Health Management Information System (HMIS) in 1997. The HMIS has resulted in uniform standards for epidemiological data in Cameroon. Thus, statistical data collected through the HMIS provide more reliable information to monitor epidemiological trends including changes in morbidity and mortality, service delivery and health resources in Cameroon (World Bank 1995a).

3.4: Subpopulations at high-risk of HIV/AIDS: Commercial sex workers, truckers and the military

The term prostitute is used for a person who engages in sexual activity for payment. Recent studies linking the spread of infectious diseases particularly HIV/AIDS and prostitution in Sub Saharan Africa include, Campbell (2000), Gysels et al. (2002). Dunkle et al. (2004), Okonofua et al. (2004) and Duncan et al. (1994). Within the specific context of Sub Saharan Africa, prostitution is dominated by females and heterosexual relationships. Prostitution is stigmatising in Sub Saharan Africa and Cameroon (Golding 1994) and many women are engaged in it because of poverty and lack of opportunities particularly in the rural areas. This explains the movement of many women from economically unattractive rural areas to more attractive destinations of cities in Cameroon, such as Douala, Yaounde and Bamenda. Many of these women are employed as service workers in bars, hotels and drinking spots. In these environments it is only a small step into the business of prostitution (Decosas 1996).

Mobility is therefore a major feature of commercial sex activities. In addition to seeking employment, commercial sex workers are stigmatised as unclean, polluting and spreaders of sexually transmitted diseases, including HIV/AIDS. Thus commercial sex workers move to areas even beyond national borders, where they are less known, to practice their occupation.

Specifically in Cameroon commercial workers move to industrial, commercial and transportation centres where they contribute to extensive geographic sexual networks for example, Maimboum-a commercial and transportation crossroad between Cameroon, Chad and Central African Republic. The towns of Ekok, Mamfe, Kumba, and Douala, in the

commercial corridor between Cameroon and Nigeria, are attractive destinations. Prevalence rates in commercial sex workers have increased remarkably since 1985. Data on commercial sex workers in Cameroon indicate prevalence rates of 34% in Yaounde, 45% in Douala and 54.8% in Maimboum (US Bureau of Census 2000, Chambon 1995). However, these data are not good indicators of the current prevalence situation among commercial sex workers in Cameroon because they are based on 1985, 1992 to 1995 serosurveys. Prevalence rates among commercial sex workers in Cameroon are below the extremely high levels seen in other towns of Sub Saharan Africa such as Nairobi, Harare and Lilongwe, which have prevalence rates as high as 88% (see Figure 3.11).

Prostitutes or commercial sex workers are a high-risk group or a reservoir of sexually transmitted diseases, including HIV/AIDS (Nsila et al. 1991) as they are the most sexually active group and have a large customer base. Although in Cameroon there is no study that indicates the number of sexual encounters prostitutes have per week, in South African gold mining communities prostitutes have between 2 and 18 sexual encounters per week (Campbell 2000). Even though these sexual contacts do not indicate the number of partners involved, a study conducted by the Ugandan Ministry of Health showed an average of 3.2 partners per night or approximately 830 partners per year (Aiimwe-Okiror et al. 1998).

The frequency of sexual contacts and the large number of clients involved make prostitution a high-risk occupation in acquiring and transmitting sexually transmitted diseases, including HIV/AIDS. The high prevalence rates of other sexually transmitted diseases among commercial sex workers facilitate HIV/AIDS transmission (Nsila et al. 1991). Prevalence rates of STDs, including chlamydia and gonorrhoea, are high in Cameroon. The latest

available data (April 2000) on syphilis indicate prevalence rates of approximately 8% for Cameroon. In Yaounde, prevalence rates for chlamydia are as high as 66% (CPC 1999-2000). There is a spatial variation of syphilis prevalence rates from about 2% in the North West, West and Adamawa provinces to almost 27% in the South West province (NACC 2001).

The military, truckers and commercial sex workers are major groups with high prevalence rates of STDs in Sub Saharan Africa. Sexually transmitted diseases particularly chlamydia, gonorrhoea, and syphilis are ulceratic and cause lesions, which disrupt the genital track of both men and women (Brown et al. 1993). These ulcers and lesions enhance the susceptibility of STD patients, including commercial sex workers, truckers and military personnel, to HIV/AIDS through the walls of the vagina and/or penis. Consequently, HIV/AIDS prevalence rates among STD patients have increased remarkably to an estimated 16 to 17% in the towns of Bamenda, Douala and Yaounde.

Suppliers of commercial sex as well as demanders, are high-risk groups in the amplification of HIV/AIDS. Hence, the bridging role of truckers and military men, who are customers of commercial sex workers but also have other partners is of critical importance in disseminating HIV/AIDS between high-risk populations and low-risk populations, such as spouses (Morris et al. 1996). A number of factors explain the consistent demand for commercial sex in Cameroon and Sub Saharan Africa. Due to urbanisation, education and economic hardship in Sub Saharan, including Cameroon young adolescent males tend to delay marriage (Calvès 1999). These single men who defer their marriage increase the demand for commercial sex to satisfy their sexual needs. The role of post partum sexual abstinence, described in the early section of the chapter is also a vital factor in the genesis of high demand for commercial sex.

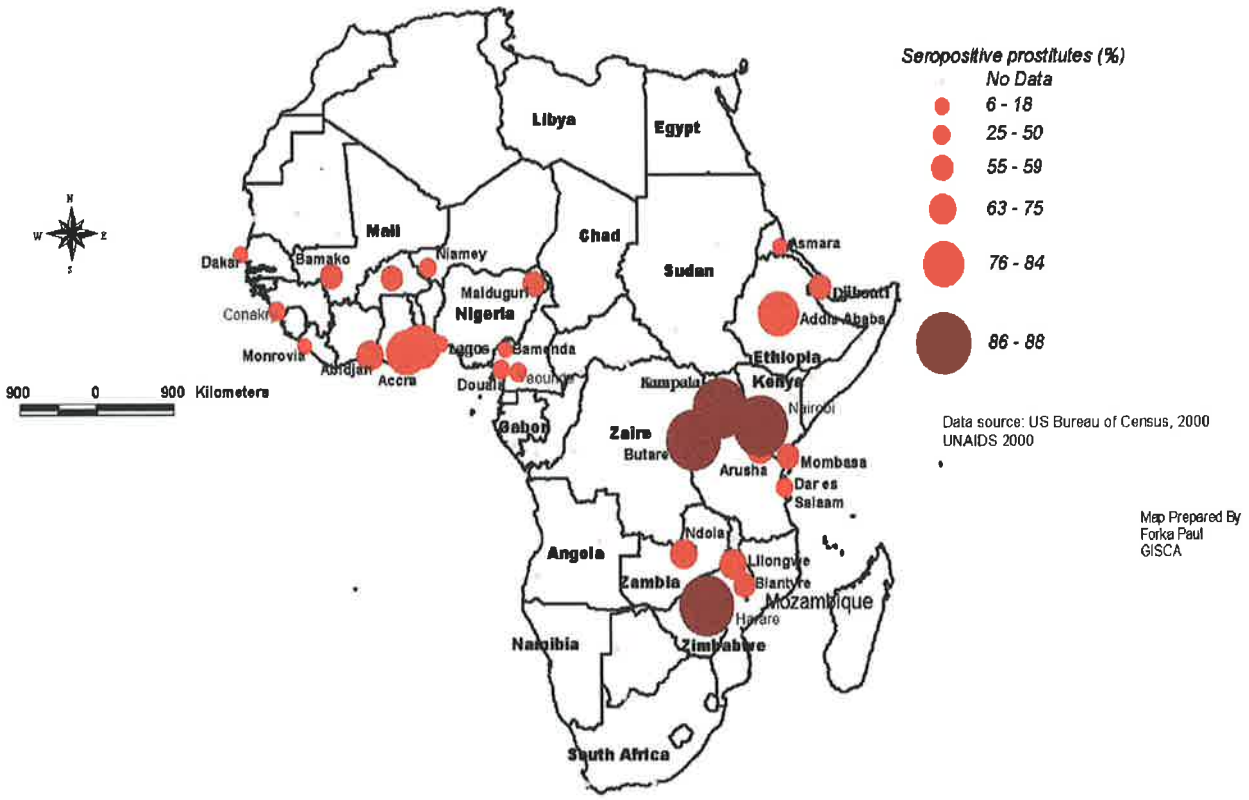


Figure 3.11: Seroprevalence rates for commercial sex workers in selected Sub Saharan African towns, 2000

Trucking is one of the occupations classified as high risk because it entails mobility over long distances and truckers are separated from their family for long periods. Cameroon truckers spend an average 14 days away from their families on each trip (HIV/AIDS Committee 2000). Approximately 68% of truckers in Cameroon had sex during trucking and 25% had sex every night (HIV/AIDS Committee 2000). Trucking and the truckers can spread Sexually Transmitted Diseases (STD) including HIV-AIDS over long distances, due to the frequency of their movements to and from areas with high prevalence rates (Morris et al. 1996).

The absence from their families for long periods can force them to have sexual partners in many towns as they spend nights on the road. Their role in the spread of STDs and AIDS is paramount, thus playing an important role in the diffusion of HIV/AIDS. Most truckers are between 30-40 years old and often have younger assistants between 15-25 years. Truckers and their assistants lack any formal education. Prevalence rates among truckers in Cameroon are higher than in the general population. For example, between the commercial corridors with Nigeria that extend from Douala, Kumba, Mamfe and Eko, truckers have a high prevalence rate of 15%, compared to 11.8% for the entire population (HIV/AIDS Committee 2000, US Bureau of Census 2000, UNAIDS 2002a). In comparison, the situation is even worst for Kenya with prevalence rates of 27-28% for truckers, compared to 11.6% for the general population (US Bureau of Census 2000).

Similarly, military men are a higher-risk group than the population at large in Cameroon and elsewhere. High prevalence rates among this subpopulation group demonstrate the magnitude of the risk. For example, in 1996, approximately 15% of 1800 military men tested were HIV positive (HIV/AIDS Committee 2000, US Bureau of Census 2000, UNAIDS 2002a). A number of factors explain the elevated risk of infection among the military in Cameroon. First, military men like truckers spent lengthy periods away from home and the resulting loneliness and stress facilitate the grave demand for commercial sex services. Second, the salaries of military men in Cameroon are significantly higher than most other occupational groups, consequently commercial sex workers are attracted to sites around military barracks to concomitantly provide alcohol and sex for readily available cash. Finally, studies indicate that prevalence rates of STDs are 2 to 5 times higher among the military than the general population (UNAIDS/WHO 1998).

Sexual relationships between commercial sex workers and their customer are responsible for the rapid diffusion of the disease. According to Campbell (2000) commercial sex workers prefer condoms during sexual encounters in order to prevent HIV/AIDS infection, however many of their customers, including truckers and military men prefer 'flesh to flesh' sex. In these circumstances the risks of commercial sex workers acquiring HIV/AIDS and subsequently transmitting it are substantial. Sexual behaviours of customers, particularly the denying the use of condoms, are the greatest threat to acquiring and transmitting HIV/AIDS rather than the large number of partners.

The categorisation of clients has made the use of condoms problematic. Broadly, customers of commercial sex workers in Sub Saharan Africa and in particular Cameroon are of two types namely, casual and regular partners (Gysels 2002). Casual partners are those who are new, and settle their bill before any sexual encounter, whereas regular partners are those who are frequent and their financial supports are consistent and not tied to sexual encounters. Thus, casual partners largely use condoms whereas regular partners do not (Zekeng et al. 1993, Gysels 2002). Some casual partners pay more in order not to use a condom and the fear of losing the business forces the cash-strapped women to drop the requirement of condom use. As a result, there is no sharp boundary between a casual and a regular partner. This depicts a chaotic situation where many casual partners becoming regular and therefore do not have to use condoms. Commercial sex workers are thus reservoirs of HIV/AIDS diffusion, as these regular and casual partners acquire HIV and in turn transmit it to their other partners in other areas.

3.5: Conclusion

In conclusion, HIV/AIDS is now the single most import health and development issue in Cameroon and Sub Saharan Africa (FAO and UNAIDS 2001:1). The number of infections are growing daily and Cameroon has moved from a low prevalence country of less than 5% in the early 1990s, to a high prevalence country of more than 10% in 2001. The exponential increases in morbidity and mortality have necessitated a grave need for remedial actions such as targeting preventions and increasing the accessibility of infected people to health care services (the focus of this research). It is only through measures such as these that Cameroon can avoid the magnitude of HIV/AIDS already seen in Southern and East African countries.

CHAPTER 4

Access to Preventive and Care Services in Cameroon

4.1: Introduction

The concept of accessibility has many definitions: it is a measure of locational advantage relative to all regions; it is the potential for opportunities for interaction and/or some future use of a service, and the actual utilization of a service (Joseph and Phillips 1984); it is the ease or capacity to reach service facilities, including health services and interact with them from another location (Joly 1999, Goodall, 1987). Thus, accessibility is an imprecise and complex concept with contextual definitions. However, location, proximity and mobility are some of the central characteristics of the definitions, making accessibility a geographic concept. In Cameroon and within the context of this particular study, accessibility is the ease of reaching and/or utilizing preventive and care facilities.

Accessibility to health services is an important factor contributing to the health of populations (Perry and Gesler 2000). Accessibility is determined by the location of services and their clients, as well as prevailing socio-economic, cultural and physical factors. Data on accessibility to health services are inadequate and outdated in Cameroon. However, information relating to consultation, availability of facilities and medical personnel are vital in understanding the level of accessibility in Cameroon.

Inequality in accessibility originates because there are underlining differences that exist between people in different geographic locations. The spatial separation of people engenders

spatial inequality and in essence inequality in the accessibility to health service facilities. Geographic variations in socio-economic and cultural environments contribute to differences in opportunities between different geographic regions. These influences exacerbate inequalities in spatial accessibility. For example, there are substantial spatial inequalities between people in the tropics and temperate regions of the world.

Friedrick Engels writing to Karl Marx in 1875 summed up the central role of locational spatial inequality:

> "Between one locality and another there will always exist a certain inequality in the conditions of life" (cited in Smith 1994: 49).

In Cameroon, as in other countries, the development of planning policies indicates the response by societies to improving the level of accessibility of the population to health services. However, in Cameroon these have tended to exacerbate spatial inequalities in accessibility, as most of the health care resources tend to concentrate in areas of origin of the ruling elites and/or areas with substantial political influence. Figure 4.4 shows that, among the ten provinces in Cameroon, the number of hospital facilities ranges from one per 19 961 people in the South province to one per 89 731 people in the Far North province (NIS 2001). Thus government policies in the spatial location of health services can aggravate spatial inequalities and accentuate spatial differences in accessibility.

> People tend to realise that social arrangements are not natural phenomenon but human creation. And what was made by human beings can be changed by human beings" (Brian Barry 1989 cited in Smith 1994: 52).

Egalitarians strongly believe that spatial inequality perpetuates social injustice in accessibility, including inequalities in access to preventive and care services. Thus, social justice can be attained via the elimination of spatial and socio-economic inequalities (Green 1988). Whilst

inequality in accessibility cannot be eliminated entirely, equality and equity in accessibility can be established with a reduction of inequality.

4.2: Equality, accessibility and Cameroon

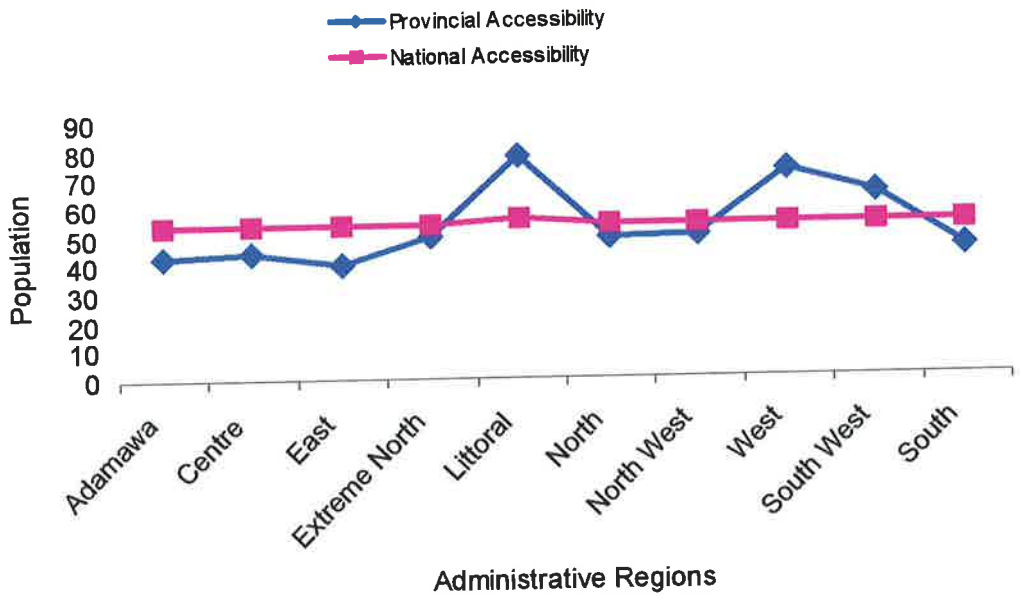
It is unrealistic to believe that people in need of preventive and care services can have equal access. Individuals have different needs for health services, and even the treatments of patients suffering from the same ailment may be administered differently. This can be due to a variety of factors including geographic environment, age, and sex of the patient. These differences in treatment inevitably generate inequalities in accessibility to health care services.

In Cameroon, equality and equity in accessibility are central policy objectives of the Sectorial Health Policy, which:

> Aims at improving the state of the health of the population through an increase in accessibility to integrated and quality care for the entire population" (MOPH 1992).

The 1992 Cameroon Sectorial Health Policy emphasizes spatial equality of access to health services. Consequently, the spatial distribution of health care facilities should have a relationship with the people that are the potential users. At the global level, spatial accessibility of health services is defined as the patient being not more than an hour away from the health facility by local means of transportation (World Bank 1994b). In Cameroon, approximately 70% of the population reside within one hour of travel time to a public health facility (Litvack and Bordart 1993). However, the Bamako Initiatives (BI) defined spatial accessibility based on distance rather than time. Where spatial accessibility is achieved when health facilities are within 5 km of the population (Knippenberg et al. 1997). Figure 4.1

indicates that 54% of the population in Cameroon reside within 5 km of a health center. Hence, according to the Bamako definition, 46% of the population experience spatial inequality in accessibility.



Data source: (De Caluwé and Lecharlier 1999)

Figure 4.1: Percentage of population within 5 km of a health centre in Cameroon, 1999

However, these percentages and figures need to be interpreted with care as these facilities are often skeletal buildings without medication, personnel and/or equipment (World Bank 1995a). It is also possible that some of these facilities are created on paper without any infrastructure on the ground. In many parts of Cameroon, including Fungom, Ako, Nwa and Furu Awa in

the Northwest province there are no basic health care facilities and patients tend to travel for hundreds of kilometres to the nearest health facility.

In order to expand the geographic scope of primary health care in Cameroon, networks of community or village health workers (VHW or CHW) were established in 1982 (World Bank 1994b). These involve workers conducting primary health care activities including immunization and antenatal, care in rural areas mainly through the use of motorbikes and in most instances on foot (Essomba et al. 1993). The benefits in the use of CHW are that these personnel are closer to the population culturally, have similar socio-economic characteristics, and are often from the region in which they serve (Perry and Gesler 2000). However, the introduction of CHWs resulted in some problems including inadequate training (for two weeks only) and heavy workloads. For instance, in Cameroon, on the average, a CHW cared for approximately 1323 people (Essomba et al. 1993).

The 1992 Cameroon Sectorial Health Policy on the reorientation of primary health care, has as one of its major objectives to make primary health care accessible to population through the decentralization and the creation of health centers (MOPH 1992). Within the framework of the Bamako Initiative, health policy was designed to improve accessibility via the creation of health centers. A health center, known also as a health post or dispensary, is a physical entity at the hub of community life and is the first level of contact with the formal health care system (Hanson 2000, MOPH, 1992, World Bank, 1994). At the end of 1999, Cameroon had 1689 health centers, which are unevenly distributed among the population (De Caluwé and Lecharlier 1999)

4.3: Equity and accessibility in Cameroon

According to the WHO (1999a: 210) equity in accessibility implies that everyone should have a fair opportunity to attain their full health potential and no one should be disadvantaged from achieving this potential if it can be avoided. Equity is distributive justice, and factors such as where you live, what you can afford to pay, or a person's state of health, should not be barriers to the use of health services (Macklin 1990 p 228). Money (1983) viewed equity as simply a situation in which patients with equal needs for health care receive equal treatment, in terms of both the volume and quality of care (Rune et al. 1997). Equity in accessibility fits within the scope of the Cameroon policy of balanced social development.

The need for equity in accessibility originates mainly because of the existing imbalance in the distribution of health care services. In principle, all Cameroonians are entitled to equitable health care, irrespective of their location, tribal, social-economic, religious and educational background. The policy of balanced social development promotes equity through public financing and subsidies to private health care providers. As such, new health centers and hospitals were constructed and beds acquired, aimed at providing some minimum package of essential health services to all Cameroonians. In practically terms, the inadequate public financing of health services in Cameroon and the non-payment of subsidies to private health care providers increased the inequity gap between "the haves" and "the have nots".

Cameroon has adopted an official health care policy of free of charge medication and treatment since the 1960s (Tembon 1996, Sauerborn, 1995). This was intended to combat inequity in accessibility and act as away of restoring some social justice. Thus, the demand for and/or the utilization of health care services are indicators through which equity in

accessibility can be measured. As such, heavily attended health facilities are indications of equity in accessibility, whilst less attended facilities are a reflection of inequity in accessibility.

A variety of geographic as well as non-geographic factors, including income and socio-cultural factors, influence access of the population to health care services (Hay et al. 1990). However, these non-geographic factors also have a spatial dimension. Thus, the spatial variation of both geographic and non-geographic factors account for the spatial inequality in the accessibility of health care services. In this regard, the concept of spatial equality of accessibility of health care services can be measured through various methods, including distance or time traveled to the nearest health care facility and the number of health care facilities in a given area. Various studies have used these indicators as measures of accessibility. For instance, in the late 1970s the then government policy in Tanzania was locating health services within one hour walking distance or 5 km of population settlements (Benson 2001). In Perth, Australia, Hyndman and Holman (2001) used distance to services, waiting time, out-of-hours service, doctors-hours, as well as the number of consultations to measure accessibility of health care services. These measures of accessibility underscore the difficulty in the definition of equality in accessibility in this context to health services. However, measures of accessibility such as these are arguably flawed because of the assumption of homogeneity in population distribution and the failure to include geographic factors such as topography, climatic variation and isolated populations.

4.4: Determinants of accessibility to preventive and care services in Cameroon

As indicated earlier, there is a pattern of low accessibility to health services in Cameroon. A household expenditure survey conducted in 1996 showed approximately 60% of people who reported a need for health services (formal) had access to these services (ECAM & DSTAT 1996). This implied that more than 40% of Cameroonians who needed health services had poor access or no means to, access health services. Since accessibility is the interplay of demand and supply of health care services, it would be misleading to believe that accessibility is uniform across Cameroon. This figure however, tends to mask accessibility inequalities by location and socio-economic status. The 1996 household and expenditure survey showed remarkable accessibility differences between the low, average and high-income groups in Cameroon.

As economic factors, in particular income, affects household expenditure, such as money spent on health services, accessibility of formal services is low among the low-income group compared to the high-income earners. Among the low-income groups who needed health care services in 1996, 36.1% accessed formal, 33.1% informal (street vendors) and 24.2% traditional (sorcerers, witch doctors) health care services. It is worth indicating that 6.6% of low-income earners did not access any form of health care. In contrast, accessibility of formal health care services increased substantially to 63.2% and 77.6% respectively, among medium and high-income earners who needed health care services. By comparison, there was a significant decrease to 7% among high-income earners in the accessibility of traditional healers. This is because high-income earners with the means of affording health services largely reside in the urban centers including Douala and Yaounde. It is also due to other factors, such as education.

An examination of regional accessibility to health services in Cameroon indicates remarkable inequalities between urban and rural areas. In 1996, accessibility to health services was very high in the major towns. Although incomplete, recently published data of the 2001 household survey indicate that the rate of medical visits to formal health facilities ranged from 80.7% in Douala and 80.1% in Yaounde compared to 67.5% in the Far North and 68.6% in the North Provinces. In Cameroon accessibility to preventive and care services is higher in the urban areas than in the rural areas. For instance, in the 2001 household survey, 72% of households in the rural areas compared to 75.5% in the urban areas accessed formal preventive and care services (MEF 2002:57). This is because poverty is essentially a rural phenomenon in Cameroon. Available data indicate that 86.5% of the rural population is poor compared to 13.5% for the urban population (ECAM & DSTAT 1996). The existing income inequalities between urban and rural areas, is one of the major factors in accounting for the spatial variation in accessibility to preventive and care services in Cameroon. In addition, health facilities are inadequate in the rural areas (see section 4:10).

Traditional healers are also common in Cameroon, particularly in the rural areas. There is no data on the exact number of traditional healers in Cameroon because they are not registered and their activities are not controlled. However, Professor Daniel Lantum National Coordinator for the census on traditional practitioners, estimates that there are more than 3000 traditional healers in the Northwest province alone (Yika 2000). Similar numbers exist in the other nine provinces. Two main factors facilitate access to traditional healers: the high prevalence of traditional doctors in the rural areas; and the fact that they are part of the community and understand the culture and language. In 1996, 15%-20% of the population in rural areas, compared to 3% to 13% in urban areas, accessed traditional healers (ECAM &

DSTAT 1996). However, results from the 2001 household survey indicate an increase in access to informal health services. This ranged from 18.3% in urban areas to 27.8% in rural area (MEF 2002:57). It is important to note that access to informal health services includes, self-medication and visits to traditional healers. As the available data from the 2001 household survey are not disaggregated, it is difficult to make a comparison of access to traditional healers in the household surveys of 1996 and 2001. Understanding the pattern of accessibility necessitates the examination of the provision, financing and utilization of health services in Cameroon. This is vital in understanding the central role of prevailing socio-economic and cultural factors in influencing these indicators of accessibility.

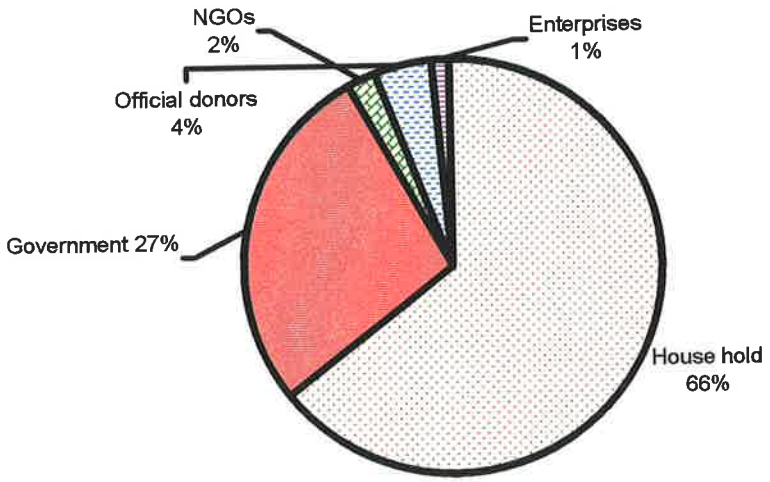
4.5: Expenditures on health services

Examining the allocation of financial resources to health services is useful in determining accessibility variations. Funds to sustain and enhance the accessibility of health services in Cameroon come from the state budget, household expenditure and external funding.

4.6: Household expenditure on health services

Figure 4.2 indicates household expenditure as the major source of health care financing in Cameroon. This represents approximately CFAF 125 744 million or US $ 212 380 (at 2004 exchange rate) in 1995/96 (Ntangsi 1999). It is difficult to compare Cameroon's household expenditure on health services to those of other developing countries, due to the absence of consistent health accounting systems. However, recently published data indicate that private health expenditure as a percentage of GDP for which household expenditure is a major component, is 4% in Cameroon compared to 2% in Nigeria and 5.6% in Kenya (The World

Bank 2001). It is important to note that in Cameroon, as in other Sub Saharan Africa countries, household and/or community expenditure have historically been a major source of financing health care services. This is because health facilities and specifically private for-profit and not-for-profit health facilities have to recover their costs to enable them to survive and continue to provide health services to the population. A study in Tanzania found that nine of the eighteen non-governmental dispensaries recover 100% of their operating costs from user fees (Shaw and Ainsworth 1996). In Cameroon, the intended subsidies of 1% to 2% of health expenditures to non-profit private health services are often not paid and as a consequence non-profit health facilities recover all their costs via user charges.



Data source: (World Bank 2001, MSP, 2001)

Figure 4.2: Sources of financing health services in Cameroon, 1999

The enormous contribution of households to financing health services in Cameroon is set against a background of mass poverty caused by the severe economic recession that started in 1986. Consequently, in 1996, 53.3% of the population, particularly in the rural areas, lived in

absolute poverty (The World Bank 2003). The economic recession led to a sharp decline in per capita income and per capita consumption. Available data indicate that per capita consumption declined from US $1196 to US $608 in the period 1986-1993 (World Bank 1995b). This represented was an approximately 50% decline in per capita consumption, which had an adverse effect on the accessibility to health services. Despite the decline in household expenditure, there was a major reallocation of expenditure towards health (Ntangsi 1999). Table 4.1 shows an increase in health care expenditure from 4.6% to 6.9% between the period 1983/84 and 1995/96. The economic recession triggered financial insecurity and in order to cope households prioritized their expenditures more on health care. However, the impact of the decline in per capita consumption was uneven across income groups. The household budget-consumption survey of 1996 indicated expenditures on health services ranged from CFAF 5600 (approximately US $7.5) per individuals per year in poor households to CFAF 37 000 (approximately US $50) per individuals per year in rich households.

Table 4.1: The comparative structure of mean annual expenditures per capita 1983/84 and 1995/96

Expenditures Items	**198/84 Per capita Expenditures in CFAF**		**1995/96 Per Capita Expenditures in CFAF**	
	Value	%	Value	%
Food-drinks and tobacco	86 348	56.8	76 474	45.7
Clothing	11 623	7.6	11 651	6.7
Housing	16 871	11.1	39 301	22.6
Other expenses	10 272	6.6	6 260	3.6
Health	**6 983**	**4.6**	**12 500**	**6.9**
Transport	13 068	8.6	12 521	7.2
Education	4012	2.6	6 596	4.0
Leisure	2 817	1.9	1 043	0.6
Make-up	1 207	0.8	4 400	2.9
Total	151 989	100	173 900	100

(ECAM & DSTAT 1996:74)

In spite of substantial differences in health care expenditure by income group, poor households pay more in real terms for medication and health care services than the middle and high-income earners (De Ferranti 1985). In Cameroon, the share of household expenditure on health rose from 4% in 1993 to 9.6% in 1995/96. This represented an increase in household expenditure in from US $4 to US $20.6 per capita (Ntangsi 1999). It is worth indicating that the cost of a basic health package was estimated at US $13 per capita per year for low-income African countries, including Cameroon (World Bank 1994b). The implication of this is that individuals in poor households could not afford a minimum package of health care services. Consequently, these persons tend to seek alternative sources of treatment including self-medication and traditional healers.

4.7: Government expenditures on health services in Cameroon

According to Figure 4.2, the government contributes only 27% of total expenditure on health services. Because of the low level of funding, the maintenance of existing health facilities has halted and the provision of free medication to health facilities has ceased. The funding crisis on health services has its origin in the economic recession in 1986. Cameroon's abundant natural resources, including oil and timber, facilitated a remarkable economic growth that averaged 10.1% per year up to 1985. This enabled the government to build and maintain a good network of health facilities. However, between 1986 and 1993, the prices of primary products collapsed and as such Cameroon was hard hit by an economic recession. The impact of the recession on government expenditures on basic services, including health, was phenomenal. Expenditures on health services fell from approximately US $12 per capita in 1985-86 to US $2.69 per capita in 1995-96 (World Bank 1995a; Ntangsi 1999). However,

health expenditures per capita have since increased to US $31 in 1998 and to US $42 in 2001 (WHO 2001e, UNDP 2003).

Nevertheless, the inability of the government to recruit and/or train health personnel and provide medication to government health facilities made them very ineffective and unattractive. In Cameroon, for example, in the late 1970s, the total government expenditure on drugs was estimated at 22% of the total recurrent expenditure on drugs (Ogbu and Gallagher 1992). It is critical to indicate that presently, the previously low expenditure on drugs has been removed.

Table 4.2 compares Cameroon expenditures with other countries of Sub Saharan Africa in 1990. These data indicate that Cameroon's total expenditures on health services as a percentage of GDP (5%) were the highest among these countries. However, Cameroon's expenditure on health services is much less than 10% of the national budget recommended by the WHO (World Bank 1995a). Table 4.2 shows that the level of public expenditure in health as a percentage of GDP is low in Cameroon, compared to Benin, Burkina Faso, Ghana and Chad. By contrast, private expenditure in health among this group of countries is highest in Cameroon. The decline in government expenditure on health services as a result of the economic recession severely affected accessibility to preventive and care health services. The inadequate provision of health facilities, including in-patient equipment such as beds made health facilities unattractive. As a result, data published in 1999 indicate a fall in bed occupation rate for public health facilities compared to large increases in private health facilities. For instance, government district hospitals of Batibo and Ndop in the Northwest province had a bed occupation rate of 42% and 16% respectively, while the bed occupation

rate in private district hospitals of Mbingo and Shisong were 30% and 46% respectively (De Caluwé and Lecharlier 1999).

Table 4.2: Expenditures on health services compared with other Sub Saharan African countries 1990-1998

Country	*Health expenditures per capita US $*	*Health expenditures as a % of GDP 1990-98*		
		Public	**Private**	**Total**
Cameroon	31	1.0	4.0	5.0
Benin	12	1.6	1.6	3.2
Burkina Faso	10	1.2	2.7	3.9
Ghana	19	1.8	2.9	4.7
Chad	7	2.3	0.6	2.9

Source: (The World Bank 2003)

4.8: Foreign aid

Foreign aid is an important source of financing health care services in Sub Saharan Africa and Cameroon. Aid is of critical importance in enhancing accessibility to health services, especially given the low level of the government expenditures on health. In Cameroon, foreign aid comes principally from multilateral donors (UNDP, WHO and UNCEF), bilateral donors (USA, France and Germany) and NGOs. International assistance presently accounts for about 7% (1999; see Figure 4.2) of the total health sector expenditure in Cameroon. Foreign aid commitments in Cameroon increased significantly from US $1 to US $2.75 per capita in the period 1990 to 1995 (World Bank 1995a). Foreign aid is generally used to build health centers, carry out family planning programs, and provide primary health care,

particularly in the prevention of diseases including HIV/AIDS. For example, aid from the German Technical Cooperation (GTZ) to public and private non-profit health facilities has reduced the cost of screening HIV/AIDS from approximately US $10 to US $1.5 in the Northwest, Southwest and Littoral provinces of Cameroon (GTZ 2001). Between 1994 and 1999 the overall external assistance on health services in Cameroon stood at CFAF 30 billion. This amount exceeded the annual health budget for 1997-98 of CFAF 26.3 billion (MSP 2001). Foreign aid is therefore a major determinant in the reduction of accessibility inequalities in Sub Saharan Africa, including Cameroon.

4.9: Availability of preventive and care service personnel

Health care systems need properly trained and motivated personnel. The availability of health personnel is an important indicator of accessibility. In Sub Saharan Africa and Cameroon there is a chronic shortage of health personnel. Currently there are an estimated 10 831 people per doctor and 2 249 people per nurse in Cameroon (NIS 2001). The shortage of health personnel cause severe difficulties of the provision of health services. As a consequence, the quality and quantity of health services are immensely affected. Although there is a lack of specific data on waiting consultation times, the undersupply of health care personnel exacerbate waiting times in Cameroon. The problem of inadequate health personnel is compounded by a high rate of attrition among health personnel (World Bank 1994b). In spite of the lack of data, in Sub Saharan Africa and Cameroon, skilled health professionals often (medical doctors and nurses) migrate to the UK, France and USA. This attrition is driven by the hope of finding better salaries and working conditions in the West. In attempting to combat the recession, the government, among other measures, devalued the currency by 50% and drastically cut the salaries of civil servants, including health care personnel and teachers.

These measures aggravated the expenditures decline on medical and dietary needs and also contributed to difficulty in retaining trained medical personnel.

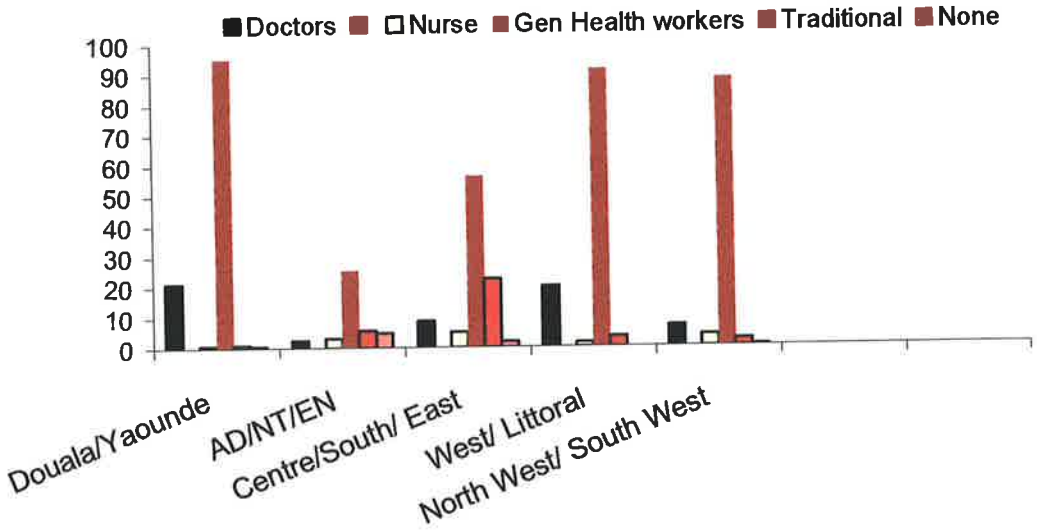
Table 4.3 shows the low wages of health workers in Cameroon at the end of 1993. These data indicate that health workers in Cameroon lost up to 67% of their wages. It is important to note that wages have not been increased since 1993. In addition, salaries were not paid for the period October to November 1993. These low and/or unpaid wages demotivated health care workers and this adversely affected the quantity and quality of output.

Table 4.3: Evolution in salaries of government workers 1992-1993 (US $)

Types of Health Staffs	1992 (pre cut)	January1993 1st cut	November 1993 2nd cut	% Decrease to 1992
Doctors	661	576.2	285.3	-57
Senior nurse & Lab. technicians	347.4	310	175.1	-50
Pharmacist	398.3	319	178	-55

Exchange rate 1993: CFAF 354 per $1
Data source: (DSTAT 2000, Syed, 2000, World Bank, 1995a)

The magnitude and the impacts of the lack of health personnel are reflected in health service delivery. Available data show that trained health personnel in 1998 assisted only 58.2% of all births in Cameroon (DSTAT 1999). Figure 4.3 shows that general health workers and/or nursing assistants assisted most of the deliveries.



Data Source: (MSP 2001, DHS 2000)

Figure 4.3: Assistance during births by geographic location

The quality of the training received by the nurse assistants is poor and the undersupply of skilled health personnel is exacerbated by the lack and/or closure of existing training centers. Due to the economic recession and the need to reduce public spending, the 48 nursing training centers in Cameroon were closed for most of the 1990s. Hence, health professionals who emigrated, retired and/or died were not replaced. The Faculty of Biomedical Sciences is the only school in Cameroon, training about 65 physicians per year, including pediatricians, gynecologists and public health specialists (MINPAT and PNUD 2000, MSP 2001). The shortage of personnel is compounded by inequality in geographic distribution. A World Bank study showed that the Center province of Cameroon had 15 physicians and 70 nurses per every 100 000 inhabitants, compared with 2 physicians and 17 nurses per every 100 000 inhabitants in the Far North. However, within the Center province, 230 of the 293 physicians

are found in Yaounde. As a result, there were 23 physicians for every 100 000 inhabitants in Yaounde in the mid 1990s (World Bank 1995a) and the present situation is much the same.

The impact of undersupply, inadequate training and the low wages of personnel is reflected in a sharp productivity decline. A study in Cameroon found that nurses spent 70% of their time at work on non-productive activities (Isely 1980, World Bank, 1995a). Health workers are forced to look for additional paid work of some kind to increase their income in order to afford basic necessities of medication, food and shelter. These alternative methods of raising income include, private practice in public facilities, use of public resources (car, petrol and money) and clandestine abortions. Health personnel also carry out subsistence and commercial activities, including the sale of drugs in hospitals (Syed et al. 2000, Roenen, 1997).

4.10: Availability of infrastructure and equipment

Figure 4.4 presents the provincial distribution of health infrastructure and equipment in Cameroon. The availability of infrastructure and equipment, including buildings, vehicles and refrigerators, are vital in the delivery of services. Their presence or absence are also indicators of the level of accessibility to preventive and care services. Cameroon's health infrastructure includes 339 hospitals and 1689 health centers. These are unevenly distributed in the country, with hospitals being concentrated in the cities and health centers in the rural areas. To facilitate the allocation of health resources Cameroon is divided into 1388 health areas. In principle each health area is supposed to have a health center. However, 19% of these health areas do not have a health center, whilst 23% have more than one health center (De Caluwé and Lecharlier 1999, DSTAT, 2000). There are also 143 health districts in Cameroon and

each is supposed to have a district hospital, however 9% (13) of the health districts do not have a hospital (MINPAT and PNUD 2000).

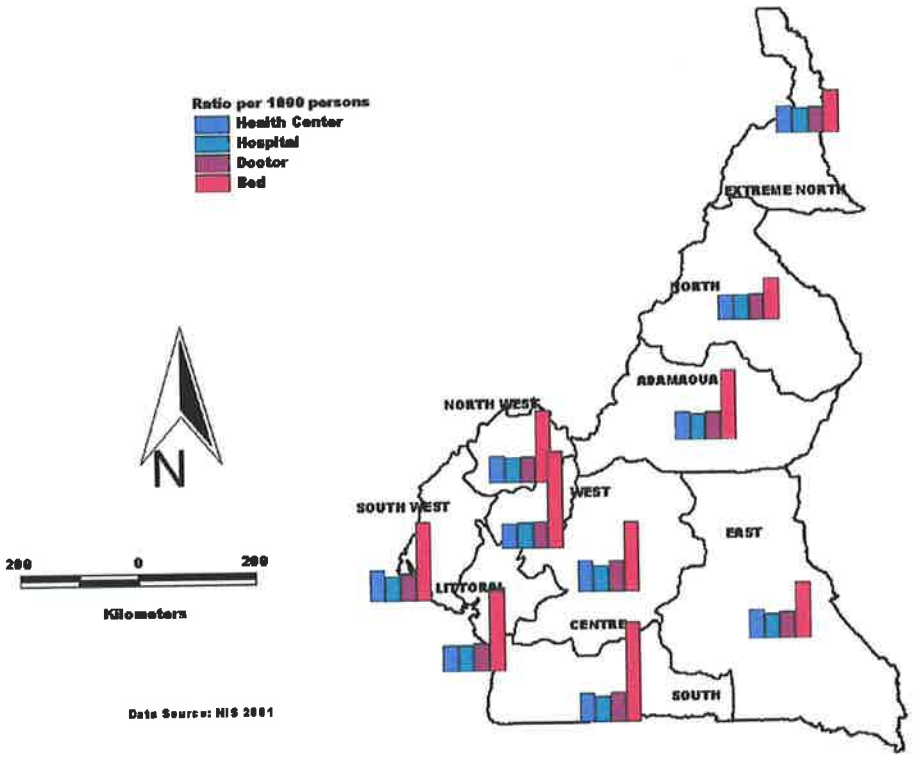


Figure 4.4: The indicators of health service availability in Cameroon at the end of 1999

The health infrastructure in Cameroon is organized in three distinct levels namely, peripheral, intermediary and central health care services (Tembon 1996, MSP 2001). Peripheral facilities are a network of health facilities in a health district that are either public or private, with one designated district (departmental) hospital as a referral center. A referral center in principle has an upgraded facility to handle medical problems that cannot be treated in the health centers. Intermediary facilities are district hospitals with one to one hundred and fifty beds.

In principle, intermediary (departmental) facilities are staffed by a physician and provide first referral levels for health centers. At the highest are provincial and central level hospitals with two hundred or more beds, which provide specialized medical services not available at the peripheral level (MSP 2001, World Bank, 1995a).

A health center in Cameroon provides peripheral health care to an average of 8 555 people. On the average there is one hospital per 42 623 people (MSP 2001). While these ratios clearly demonstrate poor accessibility to health services, they also mask the large disparities between geographic regions and between rural areas. Health coverage ratios per geographic region are approximately 5000 per health center and 35 000 per hospital in the South province, and 14 000 people per health center and 90 000 per hospital in the Far North province (MSP 2001, De Caluwé, 1999). Sharp disparities are noticeable between villages. Health centers in Nkambe (Northwest province), Manguirda and Koza (Extreme North province), serve 19 000, 20 000 and 41 000 people respectively (De Caluwé and Lecharlier 1999). In Cameroon, a number of factors, including the poor location of services, cause these imbalances in availability of facilities, particularly between urban and rural areas. The population-facility ratio, lack of facilities and inadequate financing also inhibit the delivery of health services.

Despite the above figures, Cameroon has an extensive network of health facilities and as a consequence the population-facility ratio is much lower than 20 000 people per health center recommended by WHO (World Bank 1995a). However, the facilities are of limited utility because of the chronic shortage of in-patient equipment including beds, microscopes, refrigerators, generators, vehicles and/or ambulances. On average there is one bed for every 768 people in Cameroon. This ratio is, however not homogenous across the country, with

ratios are as high as one bed for every 1 948 and 2 094 people in the Far North and North provinces respectively. By comparison in the South the ratios are one bed for every 462 inhabitants (MINPAT and PNUD 2000, MSP 2001). However, a study carried out by the Ministry of Public Health found that only two of the nine provincial hospitals have anesthetic and respiratory equipment. Two of these central level hospitals also had no x-ray equipment and three (Ngaoundere, Bertoua and Maroua) provincial hospitals lack delivery tables (MSP 2001).

In addition, there is the problem of infrastructure and equipment deterioration. Existing health facilities and equipment are obsolete and in an advanced stage of disrepair. Beds, refrigerators and vehicles are broken down and in desperate need of repairs, and/or disfunctional. Health facilities' buildings are in grave need of maintenance. Many factors account for the deterioration of the infrastructure and equipment. First, the economic recession halted investment in new infrastructure and the maintenance of existing equipment, as most of the health budget is spent on personnel salaries. For instance, by 1992 approximately 99% of the expenditure on health was on salaries (World Bank 1995a, Sauerborn 1995). Currently, less than 2.5% of the expenditure on health is on maintenance (MSP 2001). Second, Cameroon and Sub Saharan Africa generally lack expensive spare parts as well as trained personnel to maintain imported equipment. Finally, the maintenance of health infrastructure and equipment is problematic because it is divided between the Directorate of Hospital Medicine (responsible for biomedical equipment and its maintenance) and the Directorate of General Affairs (responsible for the maintenance of health facilities and transport) (World Bank 1995a). Available data from Cameroon indicate that 23% of health centers need major repairs

of between 34% and 100% in the maternity, laboratory, consultation and admission wards (De Caluwé and Lecharlier 1999)

4.11: Cultural influences and accessibility

The explanations of causality and definition of a disease is culturally specific (Mayer 1983). A disease such as HIV/AIDS has specific epidemiological features like wasting and colouration (Wilton 1996). Ailments that manifest these features are perceived and defined within the specific cultural context of Cameroon, and in this case the disease aetiology is witchcraft (Van Der Geest 1991). Experiencing, treating and reporting of such diseases (HIV/AIDS) in Cameroon is influenced by their cultural aetiology. The perceived cultural causality demands that the diseases: tuberculosis, diarrhoea and wasting be treated or can only be treated traditionally. Thus the treatment of an ailment cannot solely rely on the scientific explanation of aetiology (Azevedo et al. 1991; Ndubani et al. 1998).

In Cameroon and Sub Saharan Africa the cultural perception and treatment of ailments is a major impediment to accessibility to preventive and care services. This is because the perception, aetiology and treatment of a disease determines the type of health care services patients seek. Cultural aetiologies of diseases transcend religion and education, because cultural beliefs are unique identities of a people. The heterogeneity of Cameroon, with more than 250 ethic groups, implies diseases and therapies vary with cultural beliefs. For instance, the aetiology of illnesses in the Bulu culture in the South of Cameroon is defined by *nson* (worms). According to Van Der Geest (1991) Nson-is the causality of all diseases, including pain, liver and genital diseases.

The belief that wasting, tuberculosis and diarrhoea can respond only to traditional treatments seriously affects accessibility to preventive and care services. Presently in Cameroon, TB and diarrhea are very prevalent among people infected with HIV/AIDS. Patients with symptoms of these diseases tend to seek traditional treatment and do not access formal health services. This is problematic in the early diagnosis and treatment of HIV/AIDS.

Culturally, the decision to access health services is primarily the responsibility of the men. Cameroon is largely a patriarchal society and consequently men control most of the resources (Hampshire 2002). These resources including money and livestock (goats), are needed for transport to facilities, user fees and/or medication charges. It is important to note that livestock are used as a form of payment, particularly with traditional healers. In addition, the linguistic barrier is a major deterrent in accessibility. Information about health care services is provided to patients orally and at times supplemented by written information. The provision of these services with the use of foreign languages (French and English) implies that those patients who do not understand these languages have an additional problem of a linguistic barrier. Visual aids, including those denoting the sun and the moon, are used especially in rural areas to overcome this particular problem and facilitate accessibility (Ngoh and Sherpherd 1997).

Accessibility to health care services entails monetary and time costs and as a consequence, patients often self-administer their own treatments by procuring drugs mostly from the informal market. Street vendors and traditional healers in Cameroon are able to make diagnostic and therapeutic decisions regarding diseases (Welsch 1991 cited in Cocks and Dold 2000). To facilitate this, informal health service providers generate all sorts of medical

knowledge to present their treatment as the panacea of all medical problems. For instance, 'Pénexilline' was described as an anti biotic that cures all the ailments including rheumatism (Van Der Geest 1991).

Cultural identities of people are unique but these unique identities are also barriers to accessibility. However, culture can also facilitate accessibility and in doing so promote equity. The social solidarity networks in Cameroon are organized around family, kinship, lineage and neighbourhood (Valente et al. 1997). Social solidarity networks provide self-help to members in situations of births, illness and deaths. These networks are vital in the urban areas because the concepts of solidarity and mutual help common in the villages are foreign. Examples of such networks include the Northwest Solidarity Fund and "Mutuelle Famille Babouantou". Because these networks are mutual insurance of reciprocity, accessibility among the members of "Mutuelle Famille Babouantou" was 100% in 1993-95. Each member of the network who was hospitalized received an estimated US $40 (Atim 1999).

However, members are expected to pay a subscription of about US $21 per year to receive assistance when in need of health care. Such subscription fees, described as coverage charges (prepayments) are for future access by members of the network (De Ferranti 1985). Subscription fees are problematic in accessibility because those who are unable to subscribe are excluded from the network and in essence denied access to health services. Furthermore, the reciprocal nature of the networks makes it mandatory for recipients of assistance to assist other members. Hence, members of the network who are unable to reciprocate, including the poor, disable and old, encounter accessibility barriers, especially during periods of disasters (Fafchamps 1992).

4.12: Physical determinants of accessibility

Definitions of accessibility have two central features namely, distance and location. In this context physical factors including rugged topography, climatic variables and remoteness, that affect the distance and geographic location of health facilities, intricately influence accessibility of health services (Perry and Gesler 2000). In Cameroon, particularly in rural areas, geography is an impediment to accessibility. As indicated earlier, approximately 51% of the populations live in the rural areas (NIS 2001). The earlier parts of this chapter discuss the undersupply of health infrastructure and personnel in rural areas of Cameroon (Azevedo, 1991,World Bank 1995a; 1995b, 1994b). Consequently, there is a mismatch between the distribution of population and the provision of health services. For instance, in Cameroon, the ratio of health care workers per acre is 1:400 in the urban areas compared to 1:4000 in the rural areas (WHO 2002b: 44). This is exacerbated by spatial mobility problems due to a lack of personal and public transport. In Cameroon only an estimated 5% of the population has access to personal transport (DSTAT 2000). Thus accessibility even to peripheral health services involves substantial traveling distances and time in many areas of Cameroon (Furu Awa-Northwest province, Nguti, Ndian, Lebialem and Akwaya in the Southwest province). The partial results of the 2001 household survey shows that in the rural areas, accessibility to distance and time to health facilities are two to three times longer than the national averages of 3.9 km and 31 minutes (MEF 2002: 63).

In many parts of Cameroon including the Western Highlands that encompass the Northwest, East and Southwest provinces, the terrain is rugged and varies between highlands and lowlands. In the Northwest province, in places such as Ndop, Katsina and Gayamo, the altitude varies between 200m and 1000m, compared to 1500m to 3000m above sea level in

Banso, Nkambe and Oku (MINIFE 2001). Climatically, rainfall is heavy and varies between 4000mm to 12000mm per annum. The high altitudes and the heavy rainfall are a cause of poor transport infrastructure, which is consequently a major impediment on accessibility. In Cameroon, most of the roads are unpaved. In the rainy season the roads are impassable because they are muddy and slippery. Long distance travel is limited in many isolated parts of Cameroon. Due to frequent floods, many places, including Akwaya, Ndian, Esimbi and Furu Awa are often completely cut off from the rest of the country. In these areas mobility is restricted to trekking, and riding of donkeys, horses, bicycles and motorbikes. Thus village to village and/or village to urban activities including access to health services, are severely impacted upon. In addition, these modes of transport pose problems, particularly to the elderly and female populations. The non-existent or limited road infrastructure cut off many villages, or make some inaccessible for up to four-five months of the year. During this rainy season, it is common for people to spend several days on the roads such as the Kumba to Mamfe road, due to mud.

In a study carried out in the Southwest province of Cameroon in 1994, 86% of the population viewed poor transport infrastructure as a major cause of poverty (The World Bank, 1996). This is due to substantial increases in transport costs (as much as 60%) in the rainy season, and loss of income due to the inability to transport food produce to the markets in urban areas. The combined effects of increases in transport costs and the loss of income aggravate geographic barriers of accessibility.

Cameroon lacks data on seasonal variation in accessibility of health services already indicated in the earlier parts of this chapter. Stock (1983) noted that pressures of farm work (planting,

weeding and harvesting) during the rainy season inhibited spatial mobility. In Cameroon cattle rearing is very common particularly in the Northwest, Adamawa, North and Far North provinces and transhumance and nomadic lifestyles are the main features of cattle rearing in Cameroon (MINPAT and PNUD 2000). Thus, spatially mobile populations (Fulani-Peul and Bororo) have problems of accessibility at certain times of the year. This is because transhumance and nomadism entails the spatial displacement of herders and/or their families in search of pasture and water for the animals. The implication for accessibility is that when herders are very remote from towns and villages, it is difficult to access health services.

The great distances, time, and the associated traveling problems with increased distances from health facilities provide evidence of limited accessibility (Stock 1983; Gesler 1986; Ogbu and Gallagher 1992, Yantzi 2001; Haynes et al. 1999; Hyndman and Holman 2001). The uneven spatial distribution of services worsened the inaccessibility of the populations that reside in rural areas and are in serious need of health services. This is a phenomenon described as the "inverse care law" (Hart 1971), as private for-profit and higher order public health care services are concentrated in the major urban areas.

The standard location theory that emphasizes the influence of unlimited demand in the location of services is an explanatory factor as to the urban concentration of health services (Newhouse 1990). Thus, health facilities and personnel are largely concentrated in the major urban areas of Douala and Yaounde. The delivery of health services in rural areas is significantly more expensive on a per capita basis because of the high cost of capital equipment needed to supply health care services. Specialized health services examples,

central and provincial level hospitals, that depend on large populations are located in urban centers.

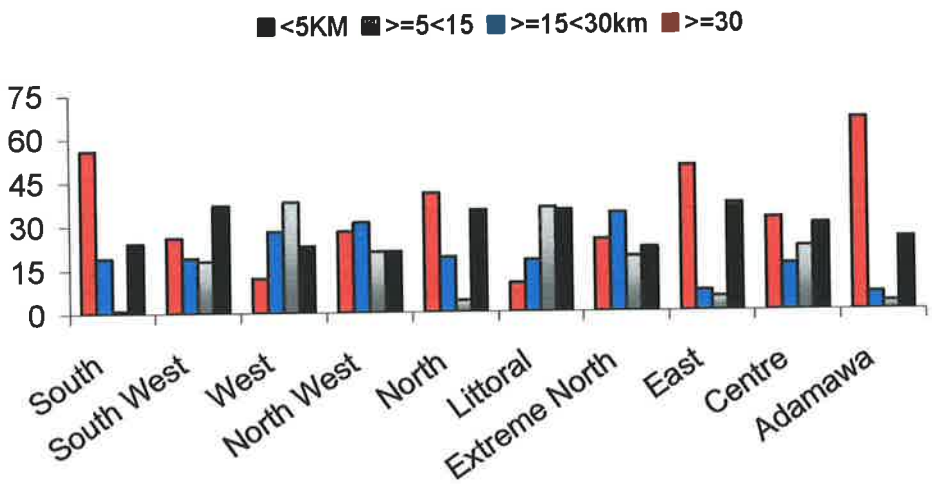
Patients from isolated geographical locations might well have equal financial access to the same level of care as those patients in urban areas but the cost in terms of travel, relocation, time and associated psychological issues involved in making the journey to health facilities, produce substantial inequalities (Blank 1997 p 135, Haynes, 1999). Time and distance are inseparable in spatial accessibility and are limited resources yet of critical importance, needed by individuals (Hagerstrand 1975) to accomplish tasks, including health care treatment.

Figure 4.5 indicates significant inequalities of accessibility in populations of provinces in Cameroon, within 5 km of the most basic health facility. These inequalities in accessibility increase substantially the more specialized and sophisticated the facilities are. High-order health facilities that include eight central and nine provincial hospitals are located in the urban centers. These high-order facilities are unevenly distributed, for example, six of the eight central level hospitals are in Yaounde, compared to two Douala. Thus, the inhabitants of rural areas tend to travel large distances, sometimes spending days on the road, to access central and provincial hospitals in the urban areas. In essence, the lack of health facilities, personnel and in-patient equipment, undermines the claim by Litvack (1993) that 70% of the populations reside within an hour of travel time.

In addition to the location of high-order facilities, large inequalities exist in the allocation of health care financial resources between urban and rural areas. A recent study conducted by the Ministry of Public Health indicates that 50% of expenditure on health services is spent on

central level hospitals (MSP 2001). Furthermore, per capita health expenditure varies considerably between urban and rural areas. Ntangsi (1999) noted health expenditure per capita were respectively US $51.9 and US $46.1 in Douala and Yaounde compared with approximately US $18.7 in rural areas. Factors examined in the earlier parts of the chapter, including high household expenditure on health, low government expenditure and the concentration of public and privately owned facilities in urban areas, account for geographic differences in per capita health expenditures. Thus, peripheral health services in rural areas (with the bulk of the population) are disadvantaged. Because of this, the majority of the population tends to have poor or no access to specialized and sophisticated health facilities.

Figure 4.5 shows the pattern of physical access to departmental (district) referral hospital in provinces of Cameroon.



Data source: (De Caluwé and Lecharlier 1999)

Figure 4.5: Physical accessibility (%) of district hospital in the ten provinces of Cameroon

On average, 27% of the provincial populations are within 5 km of a district referral center compared to 54% of the population for a health center. Thus the concentration of higher-order health facilities in urban areas limits the physical accessibility for the more than 51% of Cameroonians who reside in rural areas (DSTAT 2000). The most disadvantaged regions are in the Adamawa and South provinces, where 66% and 56% of the population respectively have to travel for more than 30 km to access a referral district hospital.

4.13: Conclusion

In this chapter, the extensive examination of several sources of data show that in Cameroon, access to health infrastructure, critical in combating HIV/AIDS, is inadequate. In Cameroon, there is a significant spatial variation in accessibility to preventive and care services, particularly between urban and rural areas. Many factors, including geography, poverty, undersupply of facilities and culture, account for the limited access of the population to preventive and HIV care services in Cameroon, and particularly in rural areas. For instance, the ratio of health care workers per acre is ten fold higher in the rural areas than in the urban areas. As a result of these, and not withstanding the efforts made by public and private sectors, accessibility even to most basic health services involves substantial travelling distances and time in many areas of Cameroon.

CHAPTER 5

Current HIV/AIDS Intervention Strategies in Cameroon

5.1: Introduction

HIV/AIDS impacts including increases in the number of orphans, lost of productive labour force and depletion of households' resources have profound implications for health care provision and overall development (FAO and UNAIDS 2001). HIV/AIDS affects patients and their families as well as the community at large. This chapter seeks to analyse the efforts so far made in scaling down the epidemic in Cameroon. These include the creation of the National Committee to Fight AIDS, information campaigns and the development and adoption of a National HIV/AIDS Strategic Plan. It is not a exhaustive analysis but a snapshot of HIV/AIDS intervention efforts being carried out in Cameroon. It is aimed at setting the scene and/or arguing the case for spatial data integration into the management and surveillance of HIV/AIDS.

5.2: Political leadership

HIV/AIDS is a preventable disease. In Sub Saharan Africa, Senegal and Uganda provide models on how the spread of HIV/AIDS can be slowed and its impacts reduced.
Uganda, the worst affected country in the early 1990s, successfully reduced prevalence rates from 14% in the early 1990s to 5% in 2002 (UNAIDS 2000b). The political will and leadership of President Museveni has been a major contributing factor to this significantly reduced rate. Museveni liberalised the use of condoms, created centres to treat sexually transmitted diseases (chlamydia, gonorrhoea and syphilis) and broke the stigma attached to

HIV/AIDS by talking about it vigorously in all his speeches (BBC News, 12/7/00). In Senegal, prevalence rates are 0.5% among 14-49 years old (UNAIDS 2002b). These are the lowest for Sub Saharan Africa.

Political leadership is important because it is a measure of national commitment in terms of financial and human resources needed to fight disease. Hence, the political leadership of then President Diouf of Senegal and Museveni of Uganda provided the much-needed resources for screening blood products, patients and of utmost importance, creating an enabling environment that de-stigmatised the disease. Senegal and Uganda demonstrate that leadership and resources are critical in helping reverse infection rates in Africa and lessening the disease's already devastating impacts. On the contrary, Cameroon and many Sub Saharan African countries have lacked this political leadership. Combating HIV/AIDS has not been a high priority in Cameroon until recently. Unlike the Presidents of Senegal and Uganda, the President of Cameroon referred to HIV/AIDS for the first time ever in public in his 2001 New Year message (WHO, WFP et al. 2001cp11) . The silence at the national level that continued for 16 years after the first HIV/AIDS case was identified in Cameroon, perpetuated the culture of shame, denial and fear in individuals whose behaviour is considered high-risk. It is in this environment that HIV/AIDS has triumphed in Cameroon and Sub Saharan Africa. The inadequate intervention policies and the increase in prevalence rates from 0.5% in 1987 to the current 12% are reflective of inadequate political will and leadership (HIV/AIDS Committee 2000, UNAIDS, 2002a)

5.3: HIV/AIDS programs in Cameroon

Cameroon did not have an HIV/AIDS prevention program until 1987 (Baer and Heng 1994), when the Short Term Plan was established. This was followed by a Ministerial Decision in May 1988 (No. 88/772) that resulted in the creation of the National AIDS Committee (NAC). The NAC, that subsequently became the National AIDS Control Service (NACS), was given the task of developing a strategy for the prevention of HIV/AIDS in Cameroon (AIDSCAPS 1996; GTC 2000). Hence, from 1988-2000 HIV/AIDS plans, these included the Medium Term Plan I (1988-92), the Medium Term Plan II (1993-95) and the Framework for the Fight against AIDS (1999-2000) were established with donor support from organizations such as the World Bank, GTZ and UNAIDS (HIV/AIDS Committee 2000, World Bank, 2000a).

The Medium Term Plans aimed at assessing and monitoring the epidemic; decreasing transmission through blood transfusion, sexual intercourse, MCT and training health personnel in HIV/AIDS identification and care. Communication for behaviour change, sentinel surveillance and counselling of HIV-positives has since been a central component of HIV/AIDS intervention strategies in Cameroon (AIDSCAPS 1996), with Information, Education and Communication (IEC) being prevention strategies in Cameroon and Sub Saharan Africa. This is consistent with the tenet 'prevention is better than cure'. The focus is on prevention because HIV/AIDS remains an incurable disease. In Cameroon there is also a lack of human and financial resources to deal with HIV/AIDS and therefore access to treatment is problematic.

Compared to high prevalence rates that reached 20% in Eastern and Southern African nations in the early 1990s, prevalence rates in Cameroon remained low (less than 4%) until 1995.

This resulted in some governmental self-congratulation, as evidenced in a paper describing the 1989 Yaounde International Symposium on HIV/AIDS Information and Education as follows (Cameroon Tribune No. 4504:8; 27 October 1989):

> *"Ce n'est pas un hazard que ces assises ont eu lieu á Yaoundé. Depuis que le sida sévit dans le monde, le government Camerounaises'est toujours distingué par les moyens qu'il met en œuvre pour freiner le fléau" cited in (Eboko 2002:137).*

Roughly translated, as:

> "It is not sheer luck that this conference is held in Yaounde. Since, HIV/AIDS was discovered, the government of Cameroon has always been distinguished for its efforts in halting its spread".

Contrary to this statement, inaction, apathy and indifference had been the major features of Cameroon intervention strategies. However, the dramatic increase in prevalence rates between 1994-95 forced a rethinking of this self-congratulation platform. Indeed, the Government of Cameroon (GOC) used apocalyptic descriptions to demonstrate the magnitude of the problem, such as representing HIV/AIDS as the 20th century pest. However, HIV/AIDS activities remained dormant in Cameroon between the years 1994-97. According to Handyside (1998), between 1994-97 few meetings of the NAC took place and limited available HIV/AIDS resources, notably at the central level, were poorly coordinated. The AIDS intervention strategies were also affected by the frequent changes of Ministers at the MOPH. Between 1994 and 1997 the MOPH had three different ministers. In Cameroon, new ministers chose their collaborators to lead key departments in their ministries such as the AIDS Committee. As such, the constant change of ministers created uncertainty among personnel of the MOPH and impacted upon HIV/AIDS intervention strategies in Cameroon. Ministerial changes and the resulting personnel shake up exacerbated other problems that affected the AIDS Committee: insufficient coordination among the various stakeholders;

ineffective integration and cooperation across sectors; and scarce financial and human resources (GTC 2000). In this context, the national policy on HIV/AIDS was ineffectively implemented.

This inaction within the framework of HIV/AIDS intervention strategies in Cameroon necessitated the reorganisation of the AIDS committee in 1997. A series of structural changes in the AIDS Committee were carried out in the reorganisation. First, the committee's scope of activities was expanded to include the surveillance of tuberculosis. Thus, the organization's name was changed to 'Programme Nationale de Lutte contre le Sida et Maladies Sexuallement Transmissive et Tuberculoses' in order to reflect the increase in the scope of its activities. Second, two advisory boards: the National AIDS/STDs/TB Committee and the Multi Sectorial AIDS Committee were created. The National AIDS/STDs/TB Committee coordinates HIV/AIDS intervention strategies in Cameroon with the objective to slow the transmission and amplification of HIV/AIDS, STDs and TB in Cameroon. Whilst the Multi Sectorial AIDS Committee coordinates the interventions of all the stakeholders, including international donors, the ministries of Women's Affaire, Education, Public Works, Transport and Communication that are all involved in dealing with HIV/AIDS in Cameroon. These boards are expected to meet twice a year with the minister of Public Health as their chairperson.

A major intervention strategy in dealing with HIV/AIDS in Cameroon was in September 2000, when the Prime Minister launched the National Strategic Plan for the Fight Against AIDS in Cameroon (2000-05). Major components of this plan including prevention of Mother to Child Transmission (MTC), 100% condom use and detection and treatment of STDs are discussed in the later sections of this chapter.

5.4: Conferences and meetings

Conferences, meetings and seminars have been organised in Cameroon as one of the major responses to the epidemic. Their organisation is heavily dependent upon the technical and financial support of donors: UNAIDS, WHO, World Bank, and French Cooperation. However, conference and/or meeting allowances have become a significant alternative source of income for participating health care workers (Syed, Razum et al. 2000). As a result of the financial incentives associated with participating in a conference, medical personnel do not appreciate the contributions of other disciplines in dealing with the disease. Extensive research on HIV/AIDS has been carried out in Cameroon, however, determining precisely the number of studies conducted on HIV/AIDS in Cameroon is problematic. A conservative estimate of individual research with or without the support of donors or the GOC is approximately 350 studies. In these studies various aspects of the disease including populations at risk (CSW, truckers, STD patients and students) of transmission and behaviour change, have been widely studied.

5.5: Condom use

Scaling up responses to HIV/AIDS in Cameroon also involves the use of condoms. Historically, the use of contraceptives, including condoms, has been very low in Cameroon. For example, in 1991, only 4.3% of women were using modern methods of contraception (World Bank 1995a). Against this background of low contraception use, combating HIV/AIDS in Cameroon is a daunting task. However, social marketing (SM) in Cameroon began in 1989 with the launch of Prudence condoms. Social marketing by Population Service

International (PSI), targeting adolescents and students resulted in an estimated 10.5 million condoms sold in Cameroon in 1997 (Handyside, Dennis et al. 1998). In 2002, an estimated 22 million condoms were sold in Cameroon (The Herald, 26/June/2003). According to these data, condom sales in Cameroon have more than doubled since 1997. However, in per capita terms, this is a sale of about 1.4 condoms per person per year. Recent studies conducted in Cameroon indicate 27% to 37% sexual contacts with multiple partners (AIDSCAP 1996, Mburano 2000). Given this high level of sexual activities in Cameroon, this is an insignificant number.

In addition, knowledge of condoms as an effective method of HIV/AIDS prevention is as high as 79% among adolescents in some areas of Cameroon (IRESCO 2002). The 1998 Demographic and Health Survey reported a 74% level of condom awareness among women in Cameroon (DHS 2000). Posters and demonstrations using condoms with erect penises are widely used in public hospitals and antenatal centres through out Cameroon. This information is of critical importance in increasing the knowledge of condoms and their proper use among the population.

In spite of the increased knowledge on the potent role of condoms in the prevention of HIV/AIDS transmission, the use of condoms among adolescents in Cameroon is still very low, estimated at 22.4 % in 1998 and between 28% and 51% in 2002 (IRESCO 2002 DHS 2000). A high prevalence rate of 79% to 90% condom usage is noted with CSW in Cameroon, which reinforces the view that CSW are reservoirs of the HIV/AIDS virus. Negligence, in particular by vulnerable groups explains why an increase in the knowledge of condoms as an effective tool in the prevention of HIV/AID has not corresponded to a similar increase in condom use.

There are a number of problems associated with access to, and use of, condoms in Cameroon. First, the fear of rejection and denial inhibits a married man from raising the subject of condom use with his wife (UNAIDS 1998), the complexity of the stigma attached to the use of condoms is tantamount to admitting infidelity on the part of the woman or man if she/he proposes the use of condoms. In Cameroon, the worsening economic condition has forced many women: married women whose husbands are unemployed, single mothers, and University and High school students into prostitution. However, they deny involvement in this activity. Consequently, individuals including quasi sex workers are reluctant to change their behaviour (use condoms) in case a change is seen as an admission of infection and/or infidelity. Also, in Cameroon to some men, the idea of condom use is considered to affect their virility and therefore "down sizes" a man.

Accessibility and availability are pivotal factors that explain the limited use of condoms in Cameroon. In Cameroon, a packet of four Prudence's condoms costs US $0.17 or 100 CFAF. However, other brands of condoms sold in pharmacies can be obtained for between US $2 to $4 for a packet of four. Because of the higher profit margins to be gained from other brands, pharmacies in Cameroon rarely retail the social marketing-Prudence brand. Nevertheless, Prudence condoms are widely available in small retail shops and kiosks in the major towns of Cameroon (see Plate 5.1). However, Prudence condoms sold along the streets in Cameroon are of doubtful quality because of poor storage. It is common to see condoms exposed to temperatures of 30 ° Celsius and above, thus, increasing the risks of breakage during vigorous and/or normal sexual intercourse. In of spite their apparent low price, access to Prudence is still limited due to their cost. The unavailability of condoms, notably in the rural areas,

aggravates the difficulty to access and use of condoms in Cameroon. In 1997, approximately 50% of the Prudence condoms sold were in the towns of Douala-Littoral and Yaounde-Centre provinces (Handyside, 1998). Condoms are also widely available in other towns including Bafoussam, Bamenda, Kumba and Limbe.

As HIV/AIDS is largely transmitted heterosexually in Cameroon and Sub Saharan Africa, the GOC recently (September 2000) launched a 100% Condom Strategy aimed at preventing the heterosexual transmission of the disease (GTC 2000). It is a key component of its 3 years emergency plan of action identified in the National Strategic Plan (2000-05) to combat HIV/AIDS. In 1991, Thailand pioneered the first ever 100% Condom Program in dealing with HIV/AIDS. In Thailand, this program requires all sex workers to use condoms with every customer (Thailand MOPH and UNAIDS 2000). In contrast to Thailand where there is a free of charge condom program, quality control and a successful campaign to the male population to use condoms in the fight against HIV/AIDS, in Cameroon, there is no free distribution of condoms. However, the National AIDS Committee and donor organizations including the GTZ, UNAIDS and FAC provide condoms free of charge in their offices and/or areas of activities. In Thailand, condoms are available free of charge in many places, including brothels and massage parlours. Introducing the 100% Condom Program in Cameroon is also troublesome because prostitution remains an illegal occupation in most of Sub Saharan Africa, yet the industry is thriving. Because of potential prosecution and the stigma associated with this activity, prostitutes go underground making it difficult to track and encourage them to use condoms. As indicated earlier, clients of CSW who are able to pay at least US $8.5 can buy unprotected sex in Cameroon. In addition, religious institutions, notably the Catholic Church, strongly oppose the use of condoms in Cameroon.

Plate 5.1: A roadside kiosk displays a packet of Prudence condoms in Cameroon

(photo by Forka, 2002-2003 HIV/AIDS survey)

In Cameroon information promoting the use of condoms in curbing the heterosexual transmission of STDs (HIV and gonorrhoea) is widely available. However, available data show that 54.6% of males and 27.6% of females had higher risk sex intercourse in 2001

(UNAIDS, WHO et al. 2002a). Therefore, vulnerable groups particularly students and military men continuously practice high-risk sexual behaviour (unprotected sexual intercourse and multiple sex partners). Hence, STDs and/or HIV/AIDS prevalence rates have remained very high in Cameroon. Because ulceratic STDs facilitate the transmission of HIV/AIDS (see earlier chapter), the GOC National Strategic Plan (2000-2005) has also made STDs treatment an essential component of HIV/AIDS intervention.

5.6: Treatment of sexually transmitted diseases (STDs)

Scaling down HIV/AIDS also depends on successful detection and treatment of STDs. Thus STDs have compounded the fight against HIV/AIDS. In Cameroon, the situation is worsened because of the little awareness of the link between HIV/AIDS and STDs (Handyside 1998). As a result a large number of STDs patients do not seek treatment. A study conducted in Cameroon indicates that approximately 50% of urethritis patients sought care in the informal sector and/or self-medicated themselves (Crabbé, Carsauw et al. 1996). Factors such as inadequate STD services and poverty also account for the non-treatment of STDs in Sub Saharan Africa and Cameroon in particular. Well before, the discovery of HIV/AIDS, Senegal was the only country in the region with an effective STDs control program almost four decades old (Lom 2001). Thus HIV/AIDS met an effective infrastructure to monitor its spread, and control factors like genital ulcers that facilitate infection.

In the period 1993-1995 SM introduced an STD treatment kit made up of antibiotic and condoms in the towns of Douala and Yaounde. However, because of financial constraint and the lack of support form the MOPH, about 1500 units were sold per year (Handyside 1998). Combating STDs is problematic in Cameroon. However, the GOC in the National Strategic

Plan (2000-05) committed approximately US $500 000 for the treatment of opportunistic infections and STDs together (World Bank 2000b). Notwithstanding, the lack of health personnel and STD services to carry out physical examination of vulnerable populations for STDs undermines these efforts.

5.7: HIV/AIDS detection in Cameroon

Worldwide, HIV antibody testing began in 1985. Subsequently, in many parts of the world including Sub Saharan Africa, different assays including Enzyme Immuno-Assays (EIA), Enzyme-linked Immunosorbent Assays (ELISA)) and Western blot are commonly used to detect antibodies of HIV-1 and HIV-2 presence in the blood, semen, saliva and urine of persons (UNAIDS 1997a, WHO, 1998). HIV/AIDS detection is central to the surveillance and management of the disease. In Cameroon, HIV/AIDS detection is carried out at peripheral, intermediary and central health care services. The primary role of testing is demonstrated in the National Strategic Plan 2000-05 in which HIV/AIDS detection is one of the major components of the GOC three years emergency plan. For this reason, the National Strategic Plan 2000-05 envisaged the creation of ten new testing sites in Cameroon (GTC 2000).

In Cameroon, the ELIZA testing method is commonly used and there are advantages in using this particular assay. The batch nature of the ELIZA assays (96 to 960 test kits) makes it cheaper to be used in centralised surveillance centres such as hospitals and blood transfusion centres (UNAIDS 1997a). Also, their sensitivity and specificity make it possible for HIV antibodies in blood samples to be detected within 22 days of seroconversion (Catton 2001, UNAIDS, 1997a , WHO, 1998). In the period 2000-2001 the GTZ provided crucial assistance

in the form of 40 000 ELIZA reagents to public and private not-for-profit facilities in the NW, SW and LT provinces of Cameroon (GTZ 2001).

The use of ELIZA in Cameroon is however, not without significant problems. This is because, among other things, ELIZA requires good laboratories and regularly maintained equipment, trained technicians to correctly prepare the reagents and constant electricity supply (WHO 1998). The lack of trained health personnel, equipment and health infrastructure, particularly in the rural areas (discussed in Chapter 4) makes the use of ELIZA problematic in Cameroon. As a result of these issues, simple and rapid HIV/AIDS tests are used widely in district and peripheral health facilities. The benefits in the use of simple and rapid tests are that these assays require no reagent and/or equipment, they are easy to use, and can be used by staff with no prior laboratory experience (UNAIDS 1997a). CAMSTIX, use by the CHU, Hôpital de Jour, Chantal Biya Foundation and Central Hospital in Yaounde is the only simple and rapid assay made in Cameroon. Facilities of the Cameroon Baptist Health Services use Determine assay in the screening of HIV/AIDS.

Approximately seven to eight different assays, including Determine, Camstrix, Multispot, Check, Double Check, ELIZA, and Western Blot, are used by health facilities in Cameroon. The use of different assays highlights the problem of non-standardization of assays in Cameroon. Another impediment is that simple and rapid tests cost between US $0.88 and US $1.4. This is much higher than the US $0.38 to US $0.60 required for ELIZA test (UNAIDS, 1997a, WHO 1998). The cost of HIV/AIDS detection in Cameroon currently varies between US $2.6 and US $8.7 for public and private not-for-profit facilities. In private for-profit facilities the cost of HIV/AIDS detection is as much as US $17.3.

5.8: Peer education

In Sub Saharan Africa, the age cohort 15-24 years old is disproportionately affected by HIV/AIDS. In Cameroon for example, approximately seven of every ten STD patients are between the ages 15-24 years old (IRESCO 2002). HIV/AIDS prevalence rate in this age cohort exceeds 12% compared to 8% in the age group 35 and above (GTZ 2001). As a result, Peer Education has been introduced as a major intervention strategy to combat the increase in prevalence rates among adolescents. Peer Education is a strategy where by adolescents disseminate information pertaining to STDs including HIV/AIDS and unwanted pregnancies in order to encourage adolescents to take protective actions (P S I 2000).

Two Peer Education programs have been instituted in Cameroon. The first of these (Horizon Jeunes) was run by PSI in the town of Edea (1996-97) and involved the training of 28 Peer Educators of age 12-24 years. The second (2000-2002) was carried out by the Institute of Behavioral Research and Studies (IRESCO) in the district of Mokolo-Yaounde, where 49 Peer Educators were trained. Both programs targeted a variety of educational forums, such as debates, school clubs and soccer matches, with the aim of educating adolescents about responsible sexual behaviour (STDs, HIV/AIDS, prostitution and abortion). The media especially FM radio 105 in Douala also played a critical role in the dissemination of information that included slogans such as " Pensez Avant d'Agir" (Think Before Acting), "Choisissons la Vie" (Let's Choose Life).

The benefits in the use of Peer Educators are that they are closer to their peers culturally and have similar socio-economic characteristics. In addition, Peer Educators are members of the

targeted community and as a result are more likely to be understood and trusted as a credible source of HIV/AIDS prevention information (P S I 2000). Peer Education has thus significantly impacted on the sexual behaviour of adolescents. For instance in Edea condom sales among adolescents increased threefold from 6180 per month in 1996 to 17 000 per month in 1997 (PSI 2000). In Mokolo, an estimated 200 000 youths received material including 35 000 copies of "Among Youths" magazine and 45 000 copies of three comic books. The introduction of Peer Education, has however, been limited to only two urban areas in Cameroon, and adolescents in other towns and villages have not benefited from Peer Education campaigns. AIDSCAPS (1996) noted that while the educational efforts increased the knowledge of the target audience, they may lack the ability to effectively move the target audiences beyond knowledge and into the higher levels of behavior change continuum.

In addition to Peer Education, HIV/AIDS information is widely available notably to the population in the urban areas. For example, 73% of antenatal attendees in the urban areas of Cameroon know of MTC during birth and 84% of urban women know that condoms exist. In 2000, about 74% of men in the towns of Douala and Yaounde used a condom compared to 20% in the rural areas (World Bank 2000a). As a result, Cameroon instituted a multi-sectoral response to scale down HIV/AIDS. This involved the training of about 2000 agricultural extension workers on HIV/AIDS prevention aimed at mobilizing 1 250 000 family heads in the country against the disease (GTC 2000). In Cameroon, agricultural extension workers work with the rural communities and as a result are more likely to be understood and trusted as a worthy source of HIV/AIDS prevention information. However, Cameroonian's civil servants including those of the Ministry of Agriculture do not like to work in the rural areas

and tend to spend several months away from their places of work. This has implications for the effective implementation of multi-sectoral HIV/AIDS program in Cameroon.

Donor organizations have also provided critical support in sensitising the population on HIV/AIDS prevention. The GTZ trained around 1080 women leaders and 950 traditional rulers on HIV/AIDS prevention in the North West province of Cameroon (GTZ 2001). The trainees, who later became trainers, are educating communities in the province on HIV/AIDS prevention. Overall, vulnerable groups including military men and CSW are specifically targeted through the mass media, video clubs and drama. Early HIV/AIDS intervention strategies among the military involved the organization of 2 300 meetings as 16 000 posters and flyers (AIDSCAP 1996). Current HIV/AIDS prevalence rates in Cameroon demonstrate that the availability of information on prevention has not translated into a reduction in prevalence rates.

5.9: Combating poverty

The relationship between HIV/AIDS and poverty is twofold. Not only is the dramatic spread of disease in Sub Saharan Africa caused by poverty, its impacts including reduction in productivity, increases dependency, and health expenditures and losses in household resources exacerbate poverty. Reducing HIV/AIDS prevalence rates and expanding access to treatment is inherently linked to combating poverty, social exclusion, and access to essential services especially health and education (UNDP 2002). These factors create an enabling environment for the rapid spread of the disease in Cameroon and Sub Saharan Africa. Combating poverty reduces the risk of vulnerability and makes available the much-needed financial resources for VCT, prevention campaigns, provision of contraceptives and antiretroviral treatment

To prevent the further spread of HIV/AIDS and enhance access to treatment, in 2000, the GOC accelerated efforts in combating poverty. First, on the 23 August 2000 its Interim Poverty Reduction Strategy Paper (I-PRSP) was launched. At the individual levels, I-PRSP sought to improve access to health services and income generation activities as much as 20% for individuals and their households affected by HIV/AIDS (GTC 2000). I-PRSP encouraged poor households to carry out activities including foodstuff production and processing as well as livestock farming to generate financial resources in order to enable their access of essential services including health and education (GOC 2000).

At the national level, I-PRSP underscored the central role of HIV/AIDS in exacerbating poverty and as a serious menace to overall socio-economic development of the country (GOC 2000). Poverty leads to inadequate health systems and inhibits access to HIV/AIDS prevention information and treatment. This implies that HIV/AIDS in Cameroon and Sub Saharan Africa "is largely a disease of the poor". Scaling down poverty is socially and economically empowering and greatly contributes to reducing vulnerability to HIV/AIDS (UNDP 2002). However, combating HIV/AIDS necessitate heavy financial resources and as a result, the GOC sought and in October 2000, was granted approximately US $1.2 billion in Debt Service Relief under the Enhanced Heavily Indebted Poor Countries (HIPC) Initiative. The country's foreign debt estimated at US $8 billon in 1999 was significantly reduced and because of this, Cameroon saved approximately US $100 million per year between 2000-2003 (World Bank and IMF 2000d). These financial resources are ploughed into health and education. Overall, the MOPH budget was increased by 36% between 1999/2000 and 2000/2001. Within the context HIV/AIDS, in 2000 the budgetary allocation to the MOPH was

increased by about US $3,441,689.013 (2 billion CFA F) to combat the epidemic. Approximately US $9 million is being spent on its 100% condom use program in the periods 2000-2003 (GTC 2000). Notwithstanding, only a limited number of vulnerable groups namely truckers, students, prostitutes, military, and prisoners, are to receive condoms free of charge.

Parallel to HIPC resources, in 2000, the GOC also secured a World Bank credit of US $50 million for its Multi-Sectoral HIV/AIDS project (World Bank 2000b). These financial resources are also being used in the effective implementation of the National HIV/AIDS Strategic Plan, buying test kits for HIV/AIDS, to strengthen the National Committee, target prevention information, carry out VCT, provide financial support to NGOs and communities involved in combating HIV/AID (World Bank 2000b; MSP 2001). It is important to note that, because of widespread poverty only about 0.6% of people living with HIV/AIDS (PLWHA) in Cameroon has access to ARVs (The Herald, 26/June/2003) compared to 0.1% for Sub Saharan Africa (UNDP 2002). Also, the excise tax that increased the price of medical products including HIV test kits and reagents was removed in 2000 (MSP 2001). These measures have facilitated access of the population to HIV/AIDS prevention and care services in Cameroon.

5.10: Voluntary counselling and testing (VCT)

In Cameroon and Sub Saharan Africa, rumours and misinformation about AIDS transmission are widespread among the general population (Plate 5.2). Hence, HIV-positives are stigmatised and rejected. In this context, people deny being tested. It is against this background of rejection and fear, that VCT has been introduced in Cameroon.

HIV voluntary counselling and testing is the process by which an individual undergoes counselling, enabling him or her to make an informed and independent decision about being tested for HIV (UNAIDS 2001a). HIV voluntary counselling and testing is a major component of prevention and care strategies in developed countries. However, in Sub Saharan Africa, less than 10% of the population has accessed VCT services, largely because the services are not available (FHI 2001). Other inhibiting factors include a lack of logistics and professionals, confidentiality issues, limited financial resources, lack of motivation of individuals to know their serostatus, and the non-existence of medical infrastructure (Van de Perre 2000). Finally, VCT involves pre and post-test counselling that are time consuming and thus making it unsuitable if a large number of people such as antenatal attendees are involved (UNAIDS 2001).

In order to curb the epidemic and its devastating impacts, VCT has of recent (2000) been an essential feature in the GOC three years emergency plan of action of the National Strategic Plan (2000-05) to combat HIV/AIDS (GTC 2000; World Bank 2000a). HIV VCT was introduced in the AIDS week of 1999. In this first attempt an estimated 8.4% of 1600 participants were tested positive (NACC 2001). However, as early as 1989, the GOC, in collaboration with bilateral organizations (GTZ), started to train health care personnel and members of associations of HIV-positives as counsellors. The PMTCT Program in Cameroon has trained an estimated 189 counsellors in five provinces: NW, SW, LT, W, AD and CE (CBCHB 2003). Approximately 50% of PMTCT counsellors are in the NW province. It is vital to recognize that trained personnel in Cameroon are commonly assigned to different tasks, and it is not unusual for counsellors not to practice counselling and sit idle in offices. Generally, in Cameroon, members of NGOs and associations of HIV-positives (AFSU,

MERC, SWAA, AFASO, Unique sisters and Jolly Friends) provide most of the psychological support to HIV-positives in hospitals.

Plate 5.2: AIDS information and education in Cameroon

Roughly translated as "AIDS is not gossiping, it is amongst us, let us avoid it", (photo by Forka, 2002-2003 HIV/AIDS survey)

Nevertheless, in Cameroon, VCT is limited. In the towns of Douala and Yaounde VCT is an annual event, and one of the main activities of the AIDS week, in preparation for World AIDS Day on 1st December. In November 2000, SWAA Douala and Hôpital de Jour each organised anonymous and free testing of HIV/AIDS. Approximately, 2500 and 1730 participants took part in free testing in Hôpital de Jour-Yaounde and Lanquantinie hospital-Douala respectively (Kamenga, Sawadogo et al. 2001). In 2000, the GTZ provided the much-needed financial and technical support, facilitating the organization of VCT by the Bamenda provincial hospital (GTZ 2001).

In Cameroon mandatory and/or compulsory testing is a key component of VCT. Mandatory testing is when HIV detection is a precondition for obtaining a service or benefit, including antenatal care and recruitment into the military. Jürgens (2001) noted that the element of choice rests with the person considering the "service, benefit or specified status ". Mandatory testing usually occurs with the informed consent of the client. Data available indicate that in the period 1999-2000, 1456 police recruits were screened (CPC 2000). Presently in Cameroon, antenatal attendees who access formal health care services are also screened. Organizations including the Catholic and Presbyterian churches recently made HIV testing one of the requirements for employment. According to the Synod decision of April 22-25, 2001, newly recruited staff into all the services of the Presbyterian church will undergo HIV/AIDS tests in any of the three Presbyterian Hospitals, namely, Manyemen, Acha-Tugi and Nyasoso (Umenei 2001).

Besides mandatory testing, anonymous, voluntary and free testing is also carried out in Cameroon, though is not widespread. According to Jürgens (2001), anonymous testing is

where HIV-antibody test results are linked to the person tested by a code known only to the patient. Neither the physician ordering the test nor anyone else knows the identity of the patient. Data from the Yaounde outpatient-AIDS hospital collected in the 1999 AIDS week indicated that 8.3% of 1675 anonymous tests were HIV positives (Hopital de Jour 2001). Anonymous testing is beneficial in that it encourages high-risk groups in the population to carry out testing. In spite of this, it may impede adequate post-test counselling, making it difficult to track patients for treatment and preventing partner's notification (Kassler, Meriwether et al. 1997).

HIV voluntary counselling and testing are of critical importance in providing the opportunity for HIV/AIDS education and behaviour change. In addition, knowledge of a persons' serostatus allows individuals to make important life decisions as well as to seek care and support (Coates, Grinstead et al. 2000). Furthermore, VCT is a cost effective method of detecting HIV/AIDS. A study conducted recently indicated that as a result of VCT, 1104 HIV-1 infections in Kenya and 895 in Tanzania would be averted per 10 000 clients. This represents huge financial savings of approximately US $249 for Kenya and US $346 for Tanzania per HIV-1 infection averted (Sweat, Gregorich et al. 2000).

The relevance of VCT as a strategy to combat HIV/AIDS depends completely on how the information from counselling and testing will be used. In Cameroon, VCT is not used as a way to access other care services (Kamenga 2001). This is compounded by the lack of a national system of VCT, despite the fact that the national plan defines the types of VCT services. The Lanquantinie and Hôpital de Jour are the only two facilities in Cameroon that practise a limited system of referral. This has resulted from the active involvement in these

facilities by two associations of people living with HIV/AIDS, namely SWAA in Douala and AFASO in Yaounde.

5.11: HIV/AIDS treatment in Cameroon

The identification of HIV/AIDS in the early 1980s led to the development of antiretroviral therapies (ARV), the first of which to be utilized was zidovudine (1987).
Currently, more than 40 ARVs including Didanosine, Stavudine, Delavirdine, Sustiva, Ziagen, and Agrenerase have been developed. ARV slow or disrupt the viral replication of HIV/AIDS and treat opportunistic infections such as cutaneous lesions in AIDS patients (US FDA, 2000). There are substantial benefits in the use of ARV. First, antiretroviral treatments improve the quality of life of patients and hence help to de-stigmatise the disease. Second, ARV significantly reduces AIDS related deaths. In the United States for example, ARV reduced AIDS related deaths from approximately 50 000 in 1995 to 17 000 in 1998 (Bloom 2000). It is thus likely that ARV will significantly reduce HIV/AIDS related mortality in Cameroon, estimated at 53 000 deaths in 2001 (UNAIDS 2002a). Finally, the use of ARVs prevents the hospitalisation of AIDS patients and as a result reduces the competition for hospital beds that exist between HIV/AIDS and none HIV/AIDS patients. Studies in Brazil indicate that between 1997-1999, approximately146 000 hospitalisations were averted because of the availability of ARV to all HIV-positives. This represented an estimated US $289 million in health expenditure savings (UNAIDS 2000b). Recent data on hospitalisation in Cameroon indicate that 10% of the patients in CHU-Yaounde and 15% in the Bonaberi district hospital are due to AIDS (Kamenga 2001). Reducing the number of hospitalisations has enormous benefits, including the release of critically needed financial resources into other areas of grave need, such as malaria.

The kind of healthcare infrastructure necessary for HIV treatment is grossly inadequate in most parts of Sub Saharan Africa, particularly in Cameroon. Introducing an HIV-positive person to drugs and maintaining him/her on these drugs requires a set of laboratory examinations to determine the level of immune damage (CD4 count), quantity of virus in blood (viral load), drug resistance testing and side effects-toxicity (Wilton 1996; Erwin and Peters 1999). The introduction of ARV in Cameroon has the potential for improper use of these drugs, primarily for two reasons. First, professionals knowledgeable in HIV/AIDS education including, treatment are lacking. This implies that professionals knowledgeable in HIV/AIDS education are lacking. In this context, it is difficult to effectively regulate the activities of the prescribers in the country. Even though there is no data on erroneous prescriptions, it is not unusual in Cameroon to have inappropriate ARV prescriptions, with grave consequences. Second, Antiretroviral treatment necessitates patients to be counselled by professionals. However, in Cameroon the few designated treatment centres are usually overcrowded and understaffed. As a result, many patients do not receive adequate counselling on treatment, thereby having poor drug compliance Inappropriate prescriptions and poor compliance trigger and/or exacerbate the sub optimal use of ARV, which may lead to the development of viral resistance (Susman 2002). According to Mougnutou (2001) non-compliance in Cameroon is also due to patients who tend to hide their serostatus, particularly from their sexual partners. Consequently, patients do not want to been seen taking antiretroviral treatment, thus they may either forget and/or deny taking these drugs.

In Cameroon and Sub Saharan Africa inadequate health infrastructure, combined with high prices have made ARV scarce. In the 1990s ARV costs between US $10 000-$15 000 per

patient per year (Temmerman 1997) and approximately US $700-$800 (600 000 to 500 000 CFAF) per month (Hopital de Jour 2001). It is worth noting that the cost of ARV far exceeded Cameroon's annual per capita income of about US $570 (IMF 2000, World Bank, 2001).

Consequently, in Cameroon the only treatment available to HIV/AIDS patients was that used for opportunistic infections including TB, diarrhoea and pneumonia. The Jamot hospital in Yaounde is Cameroon's anti TB centre. Cameroon also adopted the WHO recommended "Directly Observed Treatment, Short Course" (DOT) for TB treatment. However, TB drugs are often not available except in private not-for-profit facilities, where the treatments are lower compared with public facilities (approximately US $9 and US $37 in public facilities). The ministerial decision of 31/07/2002 to reduce the price of ARV was an important policy decision of the GOC within the framework of dealing with HIV/AIDS. According to DR Leopold Zekeng, Permanent Secretary of National AIDS Control Committee, the GOC presently provides ARV to 6000 HIV-positives in 18 ARV centres (The Herald, 26/June/2003).

In 2000, international actions, including protests, forced pharmaceutical companies (Boehringer-Ingelheim, Bristol- Meyers, Squibb, Glaxo Wellcome, Merch & Co and F. Hoffmann-La Roche) to substantially reduce ARV prices by up to 75% (The Australian, 12/05/2000). In spite of this reduction, ARV remained largely unaffordable in most developing countries, particularly those of Sub Saharan Africa. In addition, several firms in developing countries, including ClPLA in India and state owned pharmaceutical companies in Brazil, started to produce low cost generic versions of ARV. Thus, in these countries generics

of ARV (Zidovudine, and Nevirapine) could be purchased for US $83 per month compared to US $768 per month in the United States (Farmer, Leandere et al. 2001). These changes facilitated the introduction of ARV in Cameroon and Sub Saharan Africa.

In 1999, antiretroviral treatment was introduced in Cameroon, approximately 13 years after Zidovudine was developed. However, before 1999 individual patients who had the means imported their treatments from Europe and North America (Kamenga 2001). These isolated initiatives taken by individual patients, were beset with problems including delays in delivery, and as a result patients were often out of stock for weeks. It is of critical importance to indicate that delays in delivery of supplies and theft of drugs from health facilities to sale in the informal markets are widespread in Cameroon (Van Der Geest Sjaak 1982; Von Massow, Korte et al. 1998). These issues induced drug shortages and consequently patients were usually treated with small doses of medicines (Van Der Geest, 1982). Within the context of HIV/AIDS treatment, delays in delivery, combined with drug shortages, exacerbates the development of a multi-drug resistant form of the HIV/AIDS virus in Cameroon. According to Dr Flavien Ndonko (12-15 December, 2002), Director of GTZ Cameroon, 17% of people living with HIV/AIDS in Cameroon have this new resistant form of the HIV/AIDS virus.

Some ARV trial projects are currently taking place in Cameroon. In 2000, the Yaounde Central Hospital started the first ARV trial in a public facility in Cameroon. In the first eight months of the program around 200 prescriptions involving 60 patients were issued (Hopital de Jour, 200). Apart from the Yaounde Central Hospital project, the Cameroon Aluminium Company (ALUCAM) launched TRICAM (Cameroon Tri-Therapy) in June 2000. The TRICAM project involves antiretroviral treatment of 40 employees of the company in the

town of Edea. TRICAM is within the framework of the HIV/AIDS treatment program designed in 1998 by the Cameroon MOPH (Eboko 2002). ALUCAM pays the treatment cost sought at the plant and the company, Mutual Insurance, pays 80% of the health cost outside the facility (Pechinery Group 2001).

The PARVY-a seven year treatment project involving 150 patients was also launched in January 2000 at the Yaounde Military Hospital. PARVY is an extension of the research (PRESICA) started in 1995 on the genetic diversity of the HIV virus and the psychosocial characteristics of HIV-positives in Cameroon. PRESICA involves 368 patients and is an ongoing project between the MOPH, IRD and IMEA. Médicine Sans Frontière (MSF) provide the critically needed financial and technical support to PARVY, estimated at US $3.5 million or 4.7 million Swiss Francs (MSF-Suisse and Presica 2000; Kamenga, Sawadogo et al. 2001). It is important to indicate that a similar seven years program, DARVIR (Douala antiretroviral), was launched in January 2000 at the Laquintinie Hospital for the town of Douala and its environs. The NGOs of PLWH, the HIV/AIDS Committee and UNAIDS as well as Rotschild Hospital in Paris-France provide the crucially needed financial and technical support to DARVIR. In spite of these trials, antiretroviral treatment remains very limited in Cameroon, as the trials involve only a small fraction of HIV-positives in Cameroon. In addition, the rigid selection criteria make access to ARV very limited. For instance, the PARVY project required patients to be of the PRESICA cohort, have a fixed residential address within a 30 km radius of Yaounde and pay a solidarity levy of approximately US $88 (MSF-Suisse and Presica 2000).

The lack of financial resources makes access to antiretroviral treatment in Cameroon and Sub Saharan Africa problematic. A recent study indicates that the annual costs of HIV/AIDS interventions in Sub Saharan Africa are between US $29 to US $45 million (World Bank and UNAIDS 2000c). A similar study in Cameroon found that the costs of antiretroviral treatment for all AIDS patients were three to four times the overall health budget of the year 2000 (World Bank 2000b). HIV/AIDS treatments also require good nutrition and in Cameroon, there are patients who have refused treatment because they are unable to meet their dietary needs (Mougnutou 2001).

An important element of treatment in Cameroon concerns affordable prices. In Cameroon prices have plummeted dramatically since 2000, and HIV/AIDS treatment can be accessed for US $38.5-$122.4 per patient per month. The fall in treatment cost is related to two major factors: first, the GOC signed an agreement with CIPLA-India on the 27 July 2001, to supply AIDS triple therapy at US $350 per patient per year; second, in August 2002, the GOC reduced the prices of ARV from US $38.5-$122.4 (22 000 to 70 000 CFAF) to US $26.2-$ 49 (15 000 and 28 000 CFAF) per patient per month. To enhance access to treatment, the cost of viral load examination was also reduced from US $98 to US $66.4 (CRTV, 1/August/2002). Although, the prices appear relatively low, ARV remains unaffordable to most people in Cameroon as the treatment represents more than three times the gross per capita income (US $570). It is obvious that if antiretroviral drugs are not available, patients cannot use them. Thus, since 2001, ARV procurement and distribution has been through the Central Nationale d'Achat de Medicaments Essentiels-CENAME (Hopital de Jour, 2001) making treatment more accessible.

Monitoring HIV/AIDS treatment in Cameroon is problematic because the equipment for CD4 count and viral load quantification are found in very few centres in Cameroon. Until recently, the National Reference Laboratory (CPC) in Yaounde was the only laboratory with the capacity to biologically monitor patients (viral load quantification; HIV characterization and CD4 count) and ARV side effects on patients in Cameroon (CPC 2000). It was also the only HIV confirmatory centre that guaranteed the quality of tests carried out in facilities around the country. Hence, patients on AVR treatments in Cameroon travelled to Yaounde to carry out CD4 count and viral load examinations. In addition to the cost of transport, these examinations cost approximately US $104 (60 000CFAF) and US $66 (38 000CFAF) respectively (SunAIDS 2000). Like many African countries, Cameroon has no laboratory infrastructure to monitor ARV response. ARV resistance monitoring for Cameroon is carried out either in the virology laboratories in Abidjan-Ivory Coast or Dakar-Senegal (WHO 2001d). The lack of a system to monitor drug adherence, effective distribution and use of ARV in Cameroon and most of Sub Saharan Africa could lead to an emergence of resistant viral strains and the subsequent transmission of resistant viruses to the population (Harries, et al. 2001). The role of the CPC is central in the surveillance and management of HIV/AIDS in Cameroon.

One of the major priorities of the GOC 2000-2005 HIV/AIDS Strategic Plan is to prevent Mother to Child Transmission. In 1999, 90% of an estimated 570 000 children infected with HIV were in Sub Saharan Africa (UNAIDS 1999). As at 2001, 69 000 children were infected with the HIV/AIDS virus in Cameroon (CPC 2000, (UNAIDS 2000b). In order to deal with MCT, the GOC has expanded activities to the national level and made the prevention of MCT a central priority its 3 year emergency plan of action (GTC 2000). In North America and

Europe, MTC is eliminated with the use of less expensive antiretroviral drug: Niverapine and Zidovudine (Wiktor, Ekpini et al. 1999; Mofenson and Mclntyre 2000). All HIV-positive antenatal women and their babies are currently given Niverapine free of charge in Cameroon (CRTV, 01/08/2003). In practically however, only few antenatal attendees have access to Niverapine. For example, in 2000, at the Chantal Biya Children's Hospital only 50 of the 121 antenatal attendees who tested positive were treated with Niverapine. Similarly, between January and March 2003, the PMTCT program of the Cameroon Baptist Convention treated 121 women and 120 babies of the 346 antenatal women who tested positive to HIV (CBCHB 2003).

5.12: Barriers to current intervention strategies in Cameroon

Currently in Cameroon there are substantial efforts to combat HIV/AIDS. However, challenges including inadequate coordination and inadequate resources as well as the uneven distribution of intervention strategies severely undermine these efforts.

In Cameroon like in most of Sub Saharan Africa, there are several localized and isolated HIV/AIDS intervention efforts. According to the World Bank, (2000a) only a small fraction of the needs with regards to supporting the fight against HIV/AIDS are covered. This is partly because in Cameroon and Sub Saharan Africa many stakeholders are involved in the fight against the epidemic. The 1990 Law No. 90/053 on Freedom of Associations and the 1997 Circular letter No. 136 stating the modalities for registering NGOs in the health sector facilitated the involvement of these actors-NGOs. Registering an NGO in Cameroon is complex and problematic because of bureaucratic delays and approval may take even years. This hinders the ability of both local and international NGOs in combating HIV/AIDS.

Donors are less likely to provide funding unless approval has been given to the NGO (Handyside, Dennis et al. 1998). Also, because organizations particularly local hospitals and NGOs vie for funding, they do not share information such as prevalence rates with other actors involved in the fight against the disease. The result is a chaotic and confused situation where most intervention efforts are concentrated in major towns. Similarly, HIV/AIDS has been tackled as a purely health issue that is best understood by health care professionals. However, it has impacted negatively most sectors and exacerbated poverty. This necessitates the expansion of intervention strategies beyond health to incorporate a multi-dimensional approach. Spatial data has a central role in this multi-sectoral approach in data update and analysis over space and time. The 2000-05 National Strategic Plan has as one of its central components to institute risk, prevalence and response mapping (GTC 2000).

Scaling up HIV/AIDS interventions are very uneven in Cameroon. Geo-strategic reason of different bilateral and multilateral organizations is a major determinant of where resources from these organizations are allocated. According to Eboko (1996), HIV/AIDS data do not necessarily justify the intervention efforts of multilateral and donor organizations. The GTZ for instance, concentrates its intervention efforts in the North West, South West and Littoral provinces. In parallel, the Canadian Government concentrates resources in the East and Douala-Littoral Provinces. The French Cooperation and Belgian are in the North Extreme North Provinces.

Sub Saharan Africa and Cameroon have limited human and financial resources to deal with the HIV/AIDS epidemic. Approximately between US $ 29 and US $ 49 million is needed annually to scale-down the HIV/AIDS epidemic in Cameroon. This represents about US $ 2 – 3 per capita (Africa Development Forum 2000). Because of this, it is important to indicate that,

expenditures on health services fell from approximately US $12 per capita in 1985-86 to US $2.69 per capita in 1995-96 (World Bank 1995a; Ntangsi 1999). The inadequate financial resources make it troublesome to carry out HIV/AIDS surveillance in Cameroon and Sub Saharan Africa. In this context, limited financial resources for prevention and treatment programs are best utilized in areas of greatest need. In Sub Saharan Africa and Cameroon in particular, the distribution of HIV/AIDS resources is at best haphazard. Both local and international organizations (World Bank, GTZ and Medicine sans Frontiers) concentrate their activities in the major towns of Douala and Yaounde. Spatial representation facilitates a coordinated and targeted response in combating the epidemic. The ability to locate HIV-positives makes it possible to decentralize intervention programs that are over represented in the major towns of Douala and Yaounde and as a consequence improves HIV/AIDS surveillance and reporting in Cameroon. This is beneficial because, the close proximity in the number of seropsotives identified and the number of seropositives who have full-blown AIDS indicate that detection is not well developed. The implication being the underreporting of prevalence rates that may be due to organizational deficiencies and the politic of the situation (Handyside, Dennis et al. 1998).

PART TWO

CHAPTER 6

Dealing with HIV/AIDS in Sub Saharan Africa: Benefits and Challenges of a Spatial Approach in Cameroon

6.1: Introduction

Accurate and timely spatial data describing HIV/AIDS are useful to governments, donor organizations, communities, and the private sector in countries such as Cameroon to combat the epidemic. Spatial data can be used to mobilize political will in order to increase the scale of both prevention and treatment intervention and to identify priorities for the allocation of scarce resources and target interventions (Scholten and Lepper 1991, Hugo, 2002). These data are also useful in monitoring the prevalence, morbidity and mortality rates of HIV/AIDS, and they facilitate the prediction of the incidence of HIV infection as well as identifying the population at risk. The role of spatial data is therefore central in the management of HIV/AIDS, one of the single most critical health issues in Sub Saharan Africa.

6.2: Potential benefits of spatial data in the management of HIV/AIDS in Cameroon

HIV/AIDS surveillance is the on-going and systematic collection, analysis, interpretation, dissemination, and evaluation of population-based information about persons infected with HIV or diagnosed with AIDS (CDC 1999). HIV/AIDS is a disease with location characteristics. It is transmitted through intimate human contact, and the transmission of the virus is strongly related to the movement of people and their interactions (Kristine, Davis et al. 1992; Cohn, Klein et al. 1994; Decosas, Kane et al. 1995; Akopkpari 1998; International Migration 1998 vol. 36 no. 4). The aetiology and location of the disease are related to the existing social,

economic and cultural factors in Cameroon. The illness exerts significant limits on the geographic extent of an individual's daily world. Opportunistic infections such as tuberculosis, sores and wasting confines infected persons to a home environment with limited mobility. These location constraints are imposed by the psychological, epidemiological and social changes associated with the illness (Wilton 1996). In view of these considerations, spatial data are critical in the surveillance and management of the disease.

Spatial data provide information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. These data may be derived using, mapping and surveying technologies (FGDC 1998). In the context of HIV/AIDS spatial data contain explicit location references, such as coordinates of longitude and latitude, or implicit references such as an address, postal code, census tract name, or road name of a person infected with the virus. HIV/AIDS spatial data are of two types: the physical that represents places where HIV/AIDS infected people live (cities, local government areas and villages); and the attribute data that describes the characteristics of the disease, including infected population, income, age, gender and marital status.

In Sub Saharan Africa national spatial data have enabled the mapping of HIV/AIDS incidence and trends since 1987. The Digital Chart of the World and the USAID /FEWS datasets both at the scales of 1:1 000000 have been used with the corresponding attribute data of Sub Saharan Africa countries for HIV/AIDS epidemiological surveillance at the regional, country and city levels. Spatial data at this scale have facilitated the surveillance of the epidemic at the regional and sub regional levels. Some of the attribute data collected and linked to spatial data at this scale include virus types, prevalence rates of STD patients, antenatal women, blood donors,

truckers, tuberculosis patients and commercial sex workers for countries and some cities of the region (Figures 6.1 and 3.11).

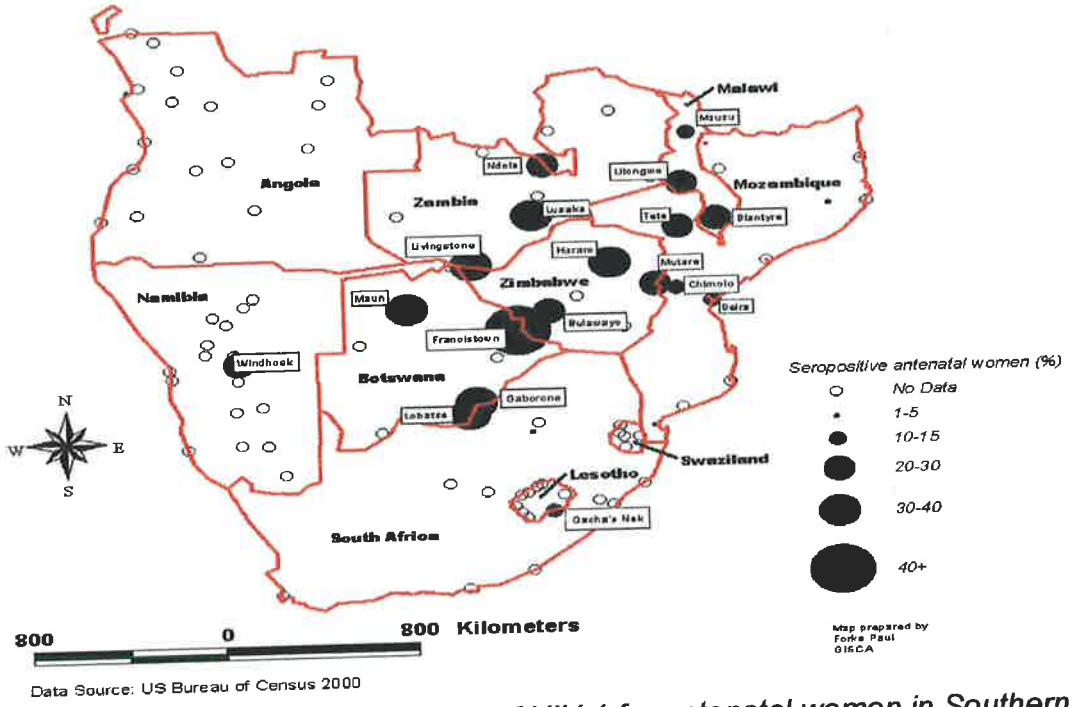


Figure 6.1: Seroprevalence of HIV-1 for antenatal women in Southern Africa at the end of 1999

The role of spatial data is not new in epidemiologic surveillance. Historically, the work of John Snow in 1854 to map the outbreak of cholera in London is one of the earliest examples of spatial data being used in the surveillance and management of disease causality (Moore and Carpenter 1999). Snow underscored the vital role of location in the disease's aetiology. Contemporary disease surveillance necessitates the use of new location techniques such as Geographic Information Systems (GIS).

GIS technologies facilitate the analysis, availability and presentation of spatial data in a way that has enabled the timely monitoring and management of diseases (Scholten and Lepper 1991). GIS is used to analyse location information in order to examine areas of high disease

prevalence and has enabled the establishment of the relationship between pathogens and space. Rushton (1998:64) indicated that GIS has provided the opportunity to carry out two types of spatial analyses that could have been difficult or impossible without it:

- Tracking areas of high disease incidence that could be labelled as statistically significant and worthy of further investigations
- Examining the spatial relationships between disease incidence and other information that is georeferenced differently from the disease data.

The availability of spatial data are vital to the application of these techniques in generating information tools such as maps that in turn can be used in health education, planning and monitoring HIV/AIDS trends and health services. Maps are useful for their ability to: record and store geographic information; analyze spatial relationships and identify spatial patterns; and communicate findings (Foote 2000). GIS have revolutionized our ability to visualize spatial data. Spatial data are central in the surveillance of diseases, changing health needs, service rationalization and accessibility to services (Higgs and Gould 2001).

According to Löytönen (1998:97) the characteristics of diseases, including prevalence and incidence are always based on information on individual cases recorded at the time of diagnosis. As a result, spatial data combined with GIS can be used to examine location trends of HIV/AIDS over space and time so that areas of consistently high rates and the differences in rates among communities, population groups and tribes, as well as transmission modes can be seen within the surrounding social, economic and cultural environment in the different regions of Cameroon. A GIS approach provides the opportunity to link health information from various data sources for efficiency and centralization in order to recognize geographic point patterns

that may suggest where cost-effective public health interventions can be applied. In spite of the benefits of spatial data, these data are not used in the surveillance and management of HIV/AIDS in Cameroon. Current HIV/AIDS surveillance and management follows the traditional epidemiologic approach that focuses on person and time, ignoring location information (Moore and Carpenter 1999).

Higgs and Gould (2001) and Löytönen (1998) describe patient's place of residence, as where a patient is living when the disease is diagnosed, however the patient may have just moved to that area. As such, this may result in significant variations in prevalence rates between the place of diagnosis and that of contracting the disease. In addition, the latency period of diseases (see chapter 3), including HIV/AIDS, also lead to inaccurate estimations of the disease prevalence and incidence, as most HIV/AIDS diagnoses in the world occur in the final phase (AIDS) of the disease development. Further, the movements of patients are considerately shorter than the latency and incubation period of infectious diseases, including HIV/AIDS (Haggett 1994). In spite of the problems in having accurate disease estimates, HIV/AIDS spatial data, including mobility patterns, can facilitate the prediction of the direction of the next wave of the HIV/AIDS epidemic. Löytönen (1998) provides an illustrative example of spatio-temporal analysis, using individual migration histories to depict potential high and low risk areas of radio active contamination from the 1986 Chernobyl disaster and the geographic distribution of natural radon (cancer causative agents) in Finland. Mobility data of seropositives are important in Cameroon because families living in towns often take infected members back to the villages to avoid the extra cost of transporting a corpse. HIV/AIDS spatial data allow trends such as this to be mapped, facilitating the siting of prevention and testing sites geared towards HIV/AIDS surveillance in specific communities. These data also provide the opportunity for

the analysis of geographic aspects that are not captured by variables when observed directly for individuals. They can also be used to recognise specific geographic processes that interact to produce the resulting HIV/AIDS patterns. Analysing spatial data for seropositive individuals, including movements, is more useful than aggregating data to gain stability and it avoids the loss of information (Gesler 1986).

In addition, spatial data offer an opportunity in HIV/AIDS surveillance of finding active cases of seropositives and high-risk groups (prostitutes, military and truckers). These data make it possible for patients and vulnerable groups to be traced and ensure infected persons begin and complete their treatment against opportunistic infections such as that of tuberculosis or are vaccinated against opportunistic infections immediately after seroconversion. Spatial data are of fundamental importance for HIV/AIDS workers to understand where vulnerable people can best access HIV/AIDS prevention and treatment information. As demonstrated in Swaziland, the preferred source of information is from clinical settings and health care workers rather than from family members, schools and religious organizations (Buseh et al. 2002).

HIV/AIDS spatial data ensures that the limited financial resources for prevention and treatment programs are best utilized in areas of greatest need. The analyses of infected people can be used to determine the allocation of limited resources. Wilkinson et al. (1998) argued that there are problems of accurate enumeration of a population served by a hospital because the population is geographically dispersed. However, the geocoding of patients' address locations using geospatial techniques are useful in defining a hospital's service area. As such, mapping the location of expected and current HIV prevention programs in relation to the population indicates if testing sites are too far away from their target population and whether they can be

placed in close proximity and in doing so, help combat the most serious health and development issue in Sub Saharan Africa. In spite of the benefits of a spatial approach to HIV/AIDS management, for the most part it remains to be introduced in Sub Saharan Africa.

What is apparent at one scale may not be apparent at another scale (Moore and Carpenter 1999). Location HIV/AIDS data represented at small scale of say 1:1000 000 can conceal the concentration of high prevalence rates and the behavioural characteristics of groups in the communities, all of which interact and influence HIV/AIDS transmission. Spatial data represented at such a scale are flawed because in sero-surveys, small, non-representative and geographically biased sample sizes are used (US Bureau of Census 2000). When these data are generalised in the analyses to extrapolate beyond the sample population and geographic area, they may generate misleading information. For instance, estimates of sero-prevalence rates for commercial sex workers in Yaounde in Cameroon, Lagos in Nigeria and Harare in Zimbabwe are often generalised to represent high-risk urban populations of these countries (UNAIDS and WHO 2002c). However, Yaounde, Lagos and Harare do not represent the entire urban areas of Cameroon, Nigeria and Zimbabwe respectively. In addition, commercial sex workers do not represent all high-risk groups, such as the military and truckers in these countries.

Spatial data presented at larger scales of 1:20 000 and 1:15 000 will show more detailed features in the population. Large scaled spatial data give a more precise demographic and morbidity situation of HIV/AIDS in the population and communities at quarter and village levels, in contrast to smaller scale maps showing generic situations of cities and sub groups in the population. Micro level spatial data can facilitate the siting of HIV/AIDS treatment and prevention services in areas and communities that have the greatest needs. A spatial approach

of HIV/AIDS surveillance and management at a more micro level is vital in combating the most serious health problem in Sub Saharan Africa. However, adopting this approach has its own challenges including the lack of location and attribute data, lack of hardware and software, stigmatisation and confidentiality.

6.3: Geographic information system development in Sub Saharan Africa: The case of Cameroon

In the developing countries, such as Cameroon, there is little development of spatial data (Bishop et al. 2000). The GEF-Global Environment Land Watch Program in Limbe has just commenced training in the use of GPS and GIS software. While it is difficult to say precisely how many trained personnel can use spatial data, it is the case that there are very few in the country. Biodiversity is the only area where spatial data has been used and this is in a few yet unfinished projects, and most of the personnel involved had no formal training in spatial data collection and analysis. Also, Cameroon lacks the hardware and software infrastructure for the analysis of spatial data. Generally, the Ministry of Environment and Forests (MINEF), HEVETAS a (Swiss organization) and the GEF Program in Limbe use ArcView 3.0 and ArcInfo software installed in one or two computers. These organizations each have a digitising table, scanner, and GPS.

In Cameroon, non-digital spatial data exist in the form of hard copy maps, aerial photographs and satellite images. Hard copy maps are at various scales: 1:100 000, 1: 200 000 and 1:1 000 000. Hard copy maps of medium and large scales also exist for the towns of Bamenda, Yaounde and Douala at the scale of 1:10 000, 1:15 000 and 1: 25 000 respectively. Apart from the maps of Douala and Yaounde produced as recently as 2000, most of the maps are relatively

old and do not represent the current geographic internal administrative boundaries. Bamenda, (1:10 000) and Buea-Douala regional (1:50 000) maps were produced in 1991 and 1976 respectively. Unscaled sketches, obsolete maps and aerial photographs prepared during the colonial era are also used. Recent aerial photographs are available but expensive. Although hard copy spatial data are available, digital spatial data are rare. This poses a problem in the use of new GIS techniques to analyse spatial data. The Canadian Agency for International Development and MINEF in 2000 produced the only available digital dataset for Cameroon at the scale of 1:200 000 for the surveillance and management of forestry activities. The dataset is divided into mapsheets of ESRI ArcInfo's coverages which when converted into shape files can be read as ESRI vector shape files in ArcView 3.2. Rectified and geo-referenced scanned topographic map sheets of Cameroon at a scale of 1:200 000 supplement the digital dataset. There are problems associated with the data quality. First, the map sheets of Yaounde and Akwaya folders do not contain location and attribute data. Second, there are no metadata for the dataset and polygon boundaries are not classified or coded. Finally, the dataset was produced from the 1976 Cameroon 1:200 000 map which does not including post 1976 internal boundaries.

Digital spatial data on Cameroon is also contained in the USAID/FEWS dataset at the scale of 1:1 000 000. It contains both provincial and divisional levels of the administrative boundaries of Cameroon. This dataset also contains point data for approximately 40 towns in Cameroon. Spatial data are useful in epidemiologic surveillance only if linked to the corresponding attribute data. HIV/AIDS attribute data, prevalence and incidence have been available in statistical format since 1989 in Cameroon, but these data have not been linked to location information (Figure 3.5)

The 1981 Civil Status Registration Ordinance No.81-02-29 governs the collection of data, particularly of vital events: births, deaths and marriages. The Ordinance requires parents or family members to register the event within 30 days of occurrence in the local registry-council at a cost of 600 Frs CFA (US $ 0.82) for fiscal stamps, after which a certificate is issued. Birth certificates are required for enrolment in educational institutions and for employment purposes, while death certificates are required for inheritance and to transport a corpse. It is important to indicate that death certificates are not a requirement to bury a corpse in Cameroon. Deaths including those related to HIV/AIDS that occur elsewhere other than in hospital environments are frequently not registered. Notwithstanding the law, data collection is problematic in Cameroon, particularly that of vital events due to the costs of fiscal stamps, transportation fares and long waiting periods at the registration centres (Ndong et al. 1994). Hospitals and health centres have collected epidemiological data. However, Cameroon lacked a national approach until 1997 when the HMIS–Health Management Information System was created. HMIS developed a uniform standard for data collection in Cameroon. Statistical data collected via the HMIS system is used to monitor epidemiological trends, morbidity and mortality trends, service delivery and resourcing (staffing, revenues, drugs and infrastructures) in Cameroon (World Bank 1995). These data are not geographically referenced and therefore do not indicate the nexus between the underlining socio-economic and cultural factors of Cameroon and epidemiologic surveillance.

Attribute data are also of fundamental importance in a spatial approach of HIV/AIDS surveillance and management. Underreporting or misreporting of HIV/AIDS related information limits the potential contribution of spatial data in combating the epidemic in

Cameroon. Misinformation can generate perceptions of low disease rates in an area and incorrect inference of high a disease rate in another area, leading to the poor allocation of preventive and curative resources. The benefit of a spatial approach is that, it makes it possible to control epidemiological data quality by comparing maps where deficiencies exist from underreporting or misreporting (Forand et al. 2001). The implication is the need for the generation of quality data, which are of critical importance in the surveillance and management of this major health issue.

6.4: Overcoming spatial data deficiencies in Sub Saharan Africa and Cameroon

Overcoming spatial data problems in Sub Saharan Africa and Cameroon is very important. In order to achieve this, two issues of fundamental importance need to be addressed: improving through training the capacities of the workers; and providing institutions and equipment for the trained workers to embark on quality research, including spatial data collection.

In developing countries generally and particularly Sub Saharan Africa and Cameroon there is a shortage of skilled personnel in most disciplines. To be able to carry out research, the training of personnel in all disciplines is vital. In this way spatial data, including that of HIV/AIDS, can be collected. Training makes it possible for roads, quarters, and boundaries of villages and towns to be digitised from the existing hard copy maps at 1:10 000 and 1:15 000. Training in the use of equipment such as Global Positioning Systems (GPS) facilitates the gathering of spatial data for hospitals, villages and trucking stops. Training also facilitates the collection of spatial data with a GPS as well as down loading these data with the use of software such as OziExplorer. The use of GIS software such as ESRI ArcView and ArcInfo requires specific skills to analyse spatial data. It is through training that these skills can be obtained. Generally,

health care workers in clinical settings collect epidemiological data in Cameroon. The lack of motivation and shortage of health personnel hinder the collection of epidemiological data including that of HIV/AIDS. For instance, in 1999 the doctor to population ratio was approximately 1:10 000. The inadequate number of personnel limits the abilities of health services to care for patients and hinders the collection of epidemiological data. The training of staff in the field, such as those oriented to epidemiology and social sciences, will resolve problems in the gathering of epidemiologic data. In this way, quality epidemiological and socio-economic statistical data can be collected and stored in a relational database like Microsoft Excel dBase Files. These data can be georeferenced by importing dBase files into GIS to link with the corresponding spatial data (coordinates of longitudes and latitudes).

Training of personnel is a useful tool only if the trained personnel are provided with the necessary spatial data infrastructure and equipment. In Sub Saharan Africa and Cameroon, universities and research centers, such as the National Geographic Centre in Yaounde, have collected and used non-digital spatial data, including hard copy maps and cadastral data. However, these organizations are underresourced and understaffed. Private and public sector investment will build their capacities to collect spatial data. The National Geographic Centre in Yaounde lacks the expertise and equipment to produce digital spatial data. In November 2001 the centre acquired one computer with ESRI ArcInfo software, but this centre lacks staff with formal training in GIS. In December 2001, a network of 132 computers, scanners and printers were obtained for only two Yaounde-base high schools in the country. The underresourced universities lack basic infrastructure such as libraries, electronic communication and computing facilities for training. The provision of infrastructure and equipment is of fundamental importance in the collection of data and analysis of data especially location data for HIV/AIDS.

6.5: Conclusion

Dealing with the HIV/AIDS epidemic in Sub Saharan Africa and Cameroon necessitates the accurate and timely use of HIV/AIDS and health service data. Data in Cameroon, including epidemiological data, are incomplete, inadequate and lack spatial specificity and as such need to be treated with care. This research is therefore a typology of HIV/AIDS surveillance and management in Cameroon. The identification and collection of demographic and spatial data of seropositives are of fundamental importance in targeting HIV/AIDS prevention and care. The research makes it possible for partners and/or sexual networks of people infected with the HIV/AIDS virus to be notified of the risk of infection. The study also makes it possible for patients to be traced and treated and/or vaccinated against opportunistic infections, as well as counselled on safe sexual behaviour.

Geographically specific information at large scales are important to identify "hot spots", an important factor in decision-making in the allocation of scarce preventive and curative resources. Accurate maps that show the precise location of seropositives, testing, counselling and treatment sites, identify areas of needs. The identification of health service location enhances accessibility, a crucial factor in the surveillance and management of the disease. This also contributes to the better planning and location of new health facilities, such as mobile clinic services, (outreach medical services). As HIV/AIDS occurs in time and space, the research underscores the contribution of spatial data at a large scale in the surveillance and management of the single most important health and development issue in Cameroon and Sub Saharan Africa.

CHAPTER 7

A Spatial Analysis Of HIV-1 Prevalence Among Pregnant Women In The Northwest Province of Cameroon

7.1: Introduction

A spatial approach to the analysis of HIV/AIDS infection at a micro level within Cameroon will allow for the clear identification of villages and towns with population at high-risk of infection and it will allow for the representation of trends over time. The purpose of this Chapter is to integrate spatial data in the management and surveillance of HIV/AIDS in Cameroon. This implies demonstrating the use of spatial data in the surveillance and management of HIV/AIDS in Cameroon. This includes geocoding and mapping of the PMTCT HIV/AIDS data in the Northwest Province of Cameroon. The ultimate aim is to use GIS analytical techniques to investigate geographic patterns of HIV/AIDS infections in the Northwest Province of Cameroon.

7.2: The PMTCT Data in the Northwest Province

Section 2.13 describes the PMTCT program and its methods of collecting HIV/AIDS data among antenatal women in Cameroon. Figure 7.1 shows PMTCT sites in the Northwest Province of Cameroon. While Figure 7.2 shows the spatial distribution of antenatal women tested for HIV/AIDS in the Northwest Province of Cameroon. The number of antenatal women tested ranged from 20 in the subdivisions of Nwa and Santa to 1 500 in Kumbo Central. At least 9.7% of the 9 500 antenatal women tested by June 2002 in the Northwest province were HIV/AIDS positive. This represents about 900 antenatal women. Since the acceptance rates of antenatal HIV testing at facilities supported by CBCHB are among the

highest anywhere in the world (90 to 95%) (CBCHB 2000), the seroprevalence rates reported here approximate closely the rates in all women who receive antenatal care at those facilities.

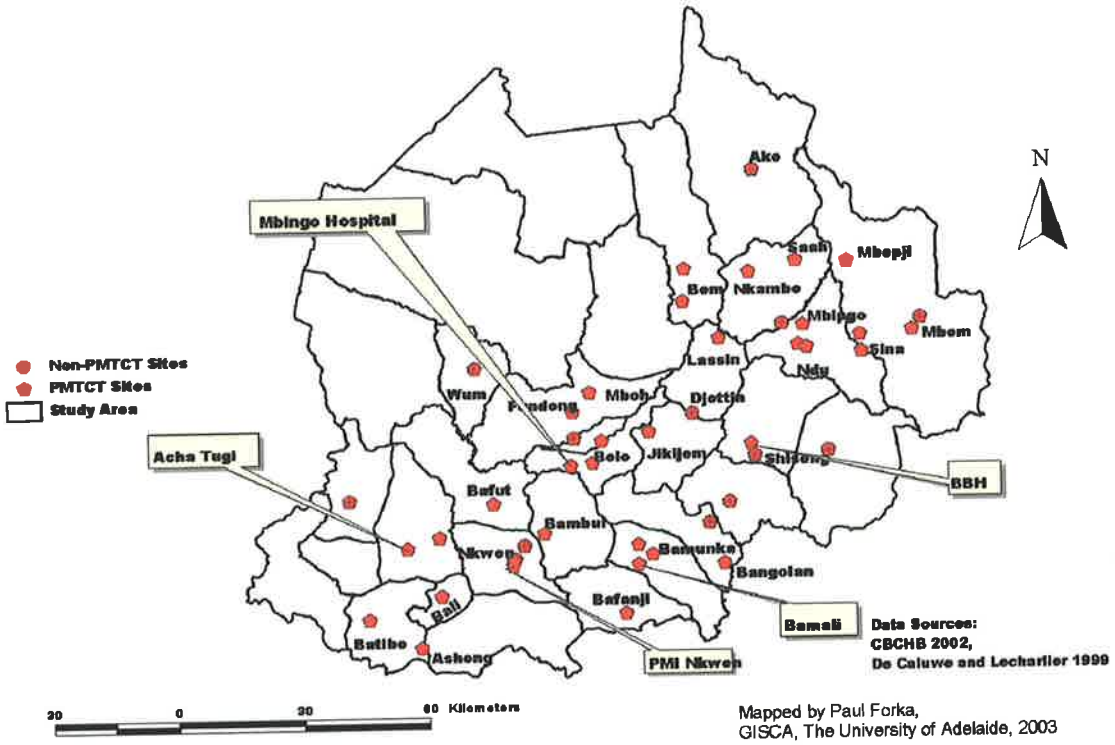


Figure 7.1: PMTCT health facilities in the Northwest Province of Cameroon at the end of 2002

The PMTCT data are in Excel and Epi Info formats. These data are of two types: 1) Antenatal Screening and Maternal Data and 2) HIV Positive Mothers and their Infants Data. Antenatal Screening and Maternal Data are collected on all pregnant women who receive voluntary counselling and testing as part of the PMTCT program, and HIV Positive Mothers and their Infants'. Data are collected on all HIV-positive antenatal women and/or babies who are treated with nevirapine prophylaxis to prevent mother to child transmission. Boehringer

Ingelheim Pharmaceutical Company provides the treatment at no cost (CBCHB 2000). Approximately 38% of the infants born to HIV-positive mothers were treated in CBCHB facilities between 2000 and 2001 (CBCHB 2000). The Antenatal Screening and Maternal Data of the PMTCT dataset contain demographic, social and epidemiologic information including age, marital status, tribe, maternal address, and occupation. Also included are partner's occupation, number counseled, number of sexual partners and number of partner's wives.

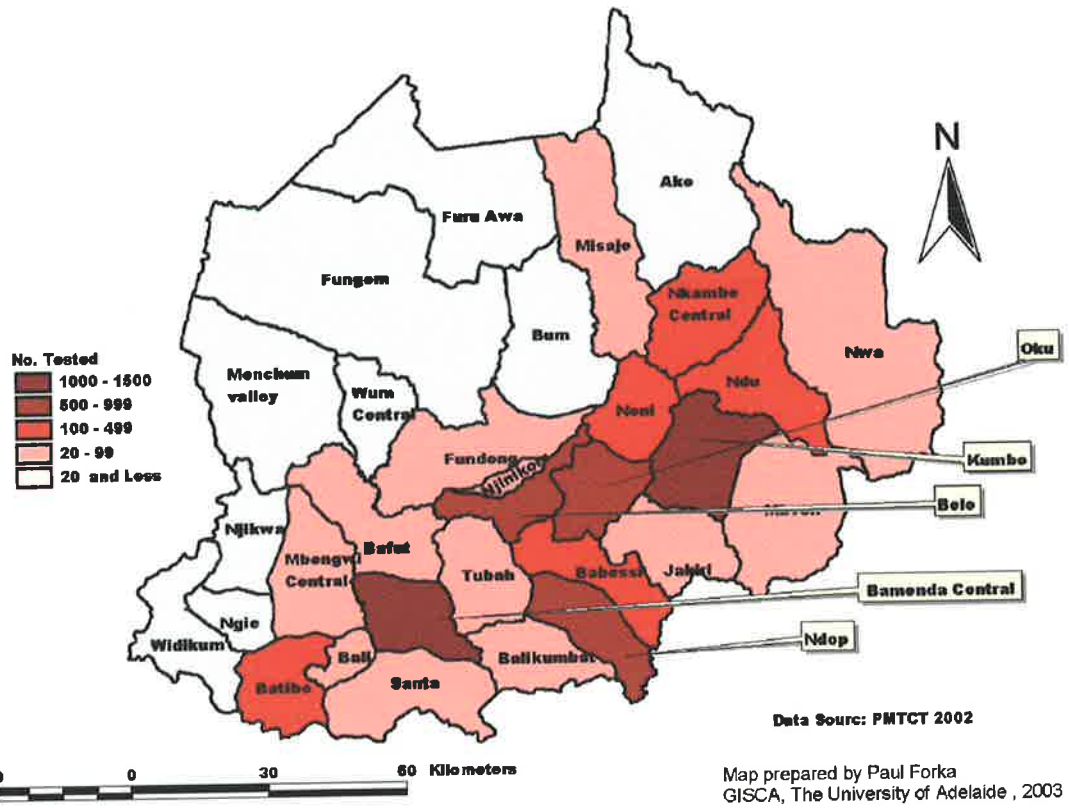


Figure 7.2: The spatial distribution of antenatal attendees tested in the Northwest Province of Cameroon, 2000-2002

Patients' data are vital in designing preventive and care measures. In Cameroon and Sub Saharan Africa, the risk of acquiring HIV infection is, higher in high-risk occupations, such as the military and trucking. The risk of HIV/AIDS infection is highest in the age cohort 15-24; PMTCT data indicate a prevalence rate of 12% in this age cohort. With regard to marital status, HIV prevalence rates are about 9% among married women, 17% among single women and 16% among separated, divorced and/or widowed women. Data such as these are useful in designing and targeting prevention and care strategies. This includes counselling for patients and their partners. In Cameroon, there are at least 250 tribes including Nso, Metta, Bali, and the Bayangi. Prevalence data by tribe are vital in identifying the underlying socio-cultural factors that explain the differences in the spread of HIV/AIDS between tribes. Although tribal analyses of HIV/AIDS might cause tribal conflict in some African countries, such as Rwanda, in Cameroon tribal conflicts are rare.

A vital attribute in the dataset is the maternal address field. Because of confidentiality issues, maternal addresses recorded in the database are general rather than specific. For example only the names of villages are recorded. Nonetheless, specific details of the patients' residences in the villages are retained in hard copy forms that are securely stored in the hospitals. Access to specific residential address data is limited only to medical personnel to plan home visits. Maternal addresses at the villages are of critical importance in the study, in spite of the fact these were not geocoded in the PMTCT dataset. This particular field makes these data unique in Cameroon. Approximately 500 village addresses in the dataset were aggregated, geocoded, and represented as spatial point data in a GIS analysis.

7.3: Methodology

To carry out this analysis, spatial data, including roads, Subdivisional boundaries, and points representing the location of villages were digitised from existing hard copy maps at the scale of 1:200 000. Unscaled sketches and obsolete maps were also used in generating these data. In addition, a Global Positioning Systems (GPS) was used to gather spatial point data describing the location of health facilities and villages, and the software OziExplorer was used to download these GPS data into a GIS database. ESRI ArcView 3.2 and ArcGIS, and TerraSeer's SpaceStat software were used in the spatial analyses.

Epidemiologic and demographic data were transferred electronically and stored in relational databases (Microsoft Excel and Access dBase files). These data were georeferenced by importing dBase files into a GIS to link with the corresponding spatial data (coordinates of longitude and latitude). In Microsoft Excel and Access dbases the address field was cleaned, and each address given a unique identification code. This enabled the dataset to be queried spatially. The unique identification code was also used to join and/or link the aggregated outcome of the PMTCT database to a Northwest Province GIS database. Between March-September 2003, a series of GIS techniques were used to analyze geospatially these epidemiological data. First, point and areal-based crude prevalence rates for the Province were mapped in ArcView 3.2. Also, areal-based crude prevalence rates were smoothed in SpaceStat, and ArcView 3.2 was used to map the results.

SpaceStat Extension was loaded into ArcView, and, as a result, two menus, Data and SpaceStat, were added into ArcView's view menu. In ArcView the function 'Table to SpaceStat Data Set' of the SpaceStat Extension's Data Menu was used to create two binary

format files that SpaceStat recognizes in the dataset. The variables: unique ID, number tested, number positive, and X and Y coordinates were used to create a SpaceStat data set of raw prevalence rates. The use of centroid data resulted in the X and Y coordinates of 32 Subdivisions in the Northwest Province being calculated in ArcView 3.2's Query Builder, using the formulae:

X coordinate = [shape]. Return Center. Get X

Y coordinate = [Shape]. Return. Get Y

Thereafter, smoothing or shrinkage, a spatial statistical method, was used to adjust HIV prevalence rates for 32 Subdivisions of the Northwest Province. Specifically, the Empirical Bayes Smoothing Procedure (EB) in SpaceStat's Rate Transform menu was used to adjust the raw HIV prevalence rates. The multiplier of 1 000 was used in computing these rates. The output created the file, SPTRAN.TXT, which was joined to the corresponding attribute of the Northwest Province data set. In ArcView 3.2, the function Join SpaceStat Report Files, of the SpaceStat Extension's Data Menu was used to link these data sets. The unique ID variable in both SpaceStat and ArcView data sets made it possible for the two data sets to be joined. The SpaceStat data linked to ArcView had the raw and smoothed rates of HIV/AIDS for Subdivisions in the Northwest Province. This made it possible for the two new attribute tables to be compared. In ArcView, the function 'Spatial Smoother' in SpaceStat Extension's SpaceStat menu was used to map the smoothed prevalence rates. This map displayed the geographic variations of the disease in the Northwest Province of Cameroon.

The EB smoothing is a function of mean, variance and the population at risk; it is calculated using the equation (Anselin 2002):

$$\hat{r} = w_i * \left(\frac{E_i}{P_i} \right) * (1 - w_i) * \theta$$

$$w_i = \frac{\phi}{\phi \left(\frac{\theta}{P_i} \right)}$$

where: W_i=Weight, E_i = Events, P_i = Population at risk, θ=Mean

Disease mapping may be defined as the estimation and presentation of areal summary measures of health outcomes (Wakefield, Best et al. 2000). Digital and hard copy maps are the principal ways of visualizing data. Thus complex information summarized on maps can be interpreted easily. Effective visualization of spatially referenced data can lead to new insights into data association and HIV/AIDS patterns. Maps are useful for their ability to record and store geographic information, analyze spatial relationships and identify spatial patterns, and communicate findings (Foote and Crum 2000). Mapping disease rates is troublesome because of variation in sample sizes and in some cases the small number of cases of a particular disease relating to the whole population. Recording and reporting errors also affect disease rates. These make the interpretation of maps and, in particular, maps of small areas difficult (Mollié 2000). Map smoothing using EB is an appropriate methodology to stabilise small area estimates while maintaining geographic precision (Briggs 1997). These methods smooth crude rates by taking into account rates in nearby areas. Specifically, the crude rate is moved towards an overall mean, as an inverse function of the inherent variance (Anselin 2002).

7.4: Results

Figure 7.3 shows a point-based disease map of HIV/AIDS prevalence rates for villages in the Northwest Province. Points of villages are centroids of 91 of the 461 geocoded village areas and their surroundings.

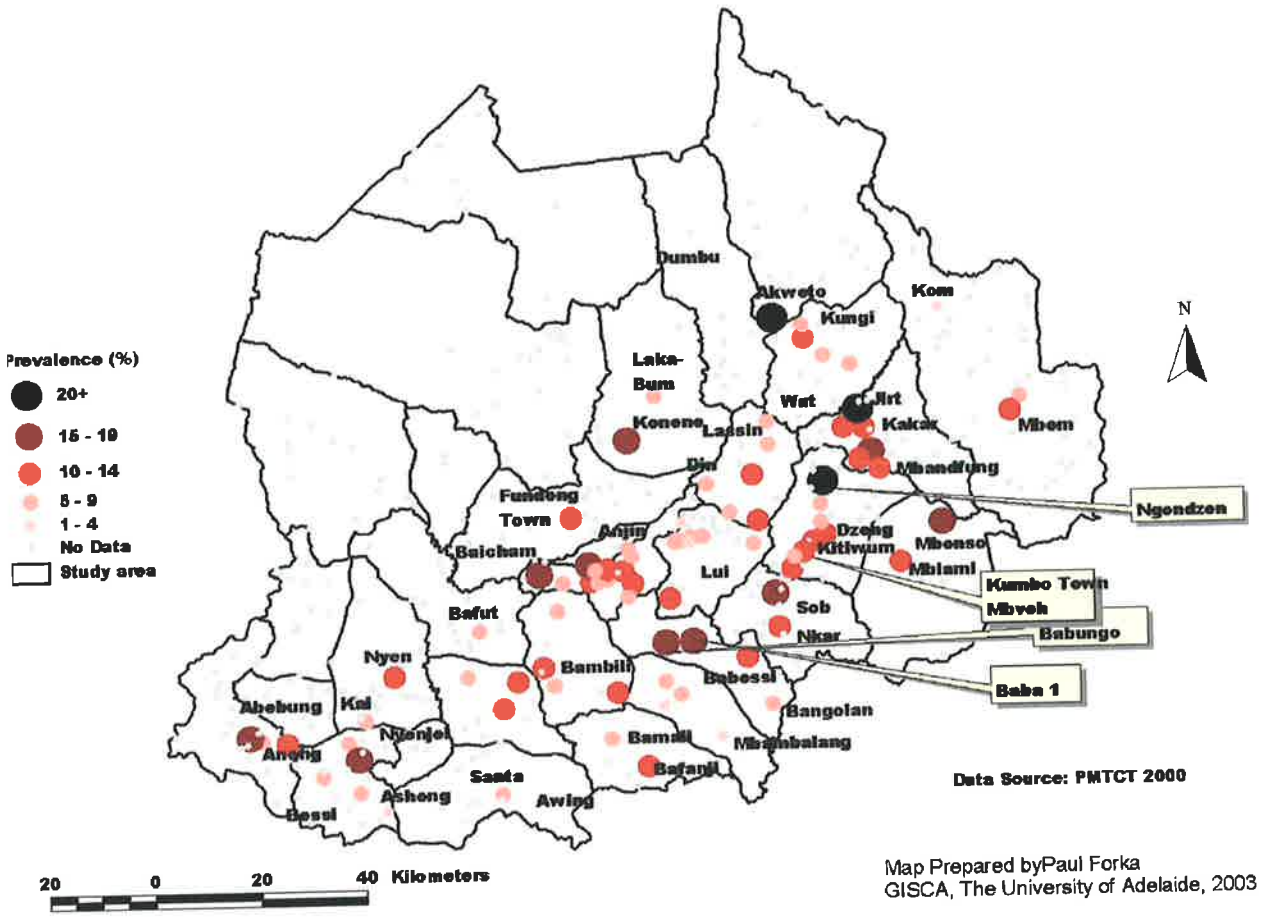


Figure 7.3: Seroprevalence rates (%) for villages in the Northwest Province of Cameroon

Village prevalence rates vary from 1 to 20%, with the mean prevalence rate of 10.1% (variance 20 and standard deviation 4). The highest prevalence rates of (>15%) occurred in the villages of Akweto, Konene, Baba 1 and Babungo. This represents approximately 16.5%

of the mapped villages. However, the vast majority (75%) of mapped villages had prevalence rates between 5 to 14%, while relatively few villages had prevalence rates of <5%. There are marked differences in prevalence rates within individual Subdivisions.

Since analyses by Subdivision present a homogenous pattern of prevalence rates across large geographic areas, this has masked variations noticed in prevalence rates by points of villages. There are vast differences within a Subdivision and between different villages within a Subdivision. As a result, individual villages had higher prevalence rates (20%) than the upper limit (16.8%) of the Subdivisions (see Figure 7.4). Notwithstanding the geographic precision, which indicates the magnitude of the HIV/AIDS in the Province, point-based analyses are problematic. The first issue relates to concerns about confidentiality discussed in Section 2.10. Second, point-based analyses result in multiple representations and a high symbol density (Atkinson and Molesworth 2000). Consequently, areal-based analysis is designed to ensure the confidentiality of individuals as well as indicate the pattern of infection. However, area-based analysis also mask intra-subdivision variation of HIV/AIDS prevalence in the Northwest Province of Cameroon.

Mapping disease rates by area is one of the most widely used methods in spatial epidemiology. In this research, area case data are used to represent the rate of cases among antenatal attendees who underwent HIV testing from specific villages. As a result, choropleth maps of HIV/AIDS prevalence rates are used to describe the spatial pattern of the disease in the study area. Table 7.1 shows crude and EB prevalence rates mapped in Figures 7.4 and 7.5. According to Table 7.1, there was a large range in prevalence rates across the region (varying from approximately 4 to 16.8%). This suggests significant real differences in HIV prevalence rates between different Subdivisions.

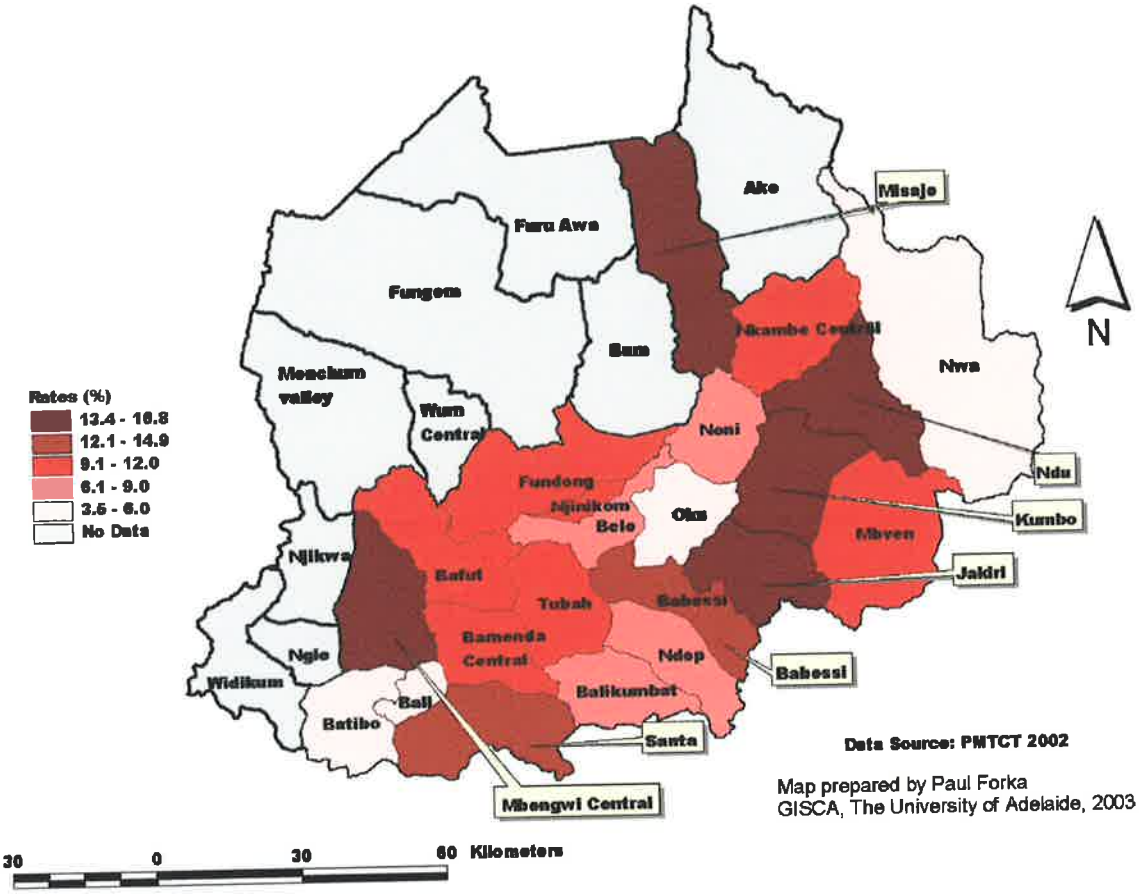


Figure 7.4: Crude seroprevalence rates (%) among antenatal attendees in the Northwest Province of Cameroon

However, it is likely that this large range in prevalence rates is not entirely representative, but is also reflective of variations in sample sizes among Subdivisions. For example, in the Subdivision of Nwa, a small sample size of 85 people were tested for HIV (the mean sample size across the region was 226 people tested per Subdivision), of which there were 3 seropositive cases, producing a low prevalence rate of approximately 4%. By comparison, in the Subdivision of Kumbo, 1490 people were tested for HIV, of which 250 returned positive (approximately 17% prevalence rate).

Table 7.1: Antenatal attendees tested, number positive, crude and Bayesian estimates of Subdivisions in the Northwest of Cameroon, 2000-2002

Subdivisions		Antenatal Attendees		Prevalence (%)	
Number	Name	Tested	Positive	Crude	Smoothed
2	Babessi	427	57	13.3	12.9
3	Bafut	56	6	10.7	10.7
4	Bali	24	1	4.1	9.2
5	Balikumbat	96	8	8.3	9.3
6	Bamenda Central	1110	115	10.3	10.3
7	Batibo	331	19	5.7	6.7
8	Belo	956	71	7.4	7.7
10	Fundong	50	5	10.0	10.4
13	Jakiri	82	13	15.9	13.3
14	Kumbo	1490	250	16.8	16.5
15	Mbengwi	28	4	14.3	11.7
16	Mbven	74	8	10.8	10.8
18	Misaje	22	3	13.6	11.4
19	Ndop	544	38	7.0	7.4
20	Ndu	307	47	15.3	14.3
23	Njinikom	51	5	9.8	10.4
24	Nkambe Central	393	39	9.9	10.1
25	Noni	128	8	6.3	7.0
26	Nwa	85	3	3.5	7.0
27	Oku	598	34	5.7	6.3
28	Santa	23	3	13.0	11.3
29	Tubah	84	10	11.9	11.3

Figure 7.5 shows mapped prevalence rates from the crude data. The Subdivisions of Bali and Nwa were represented as having the lowest prevalence rates within the region (3.5 to 4.2%). Only a small number of people in these two Subdivisions were tested for HIV (24 in Bali and 85 in Nwa) with corresponding low numbers of positive tests (1 in Bali and 3 in Nwa). In these cases it is likely that the small sample sizes influenced the prevalence rates, and influenced their large deviation from the mean prevalence rate across the region (10.1%)

The highest prevalence rates (14 to 17%) occurred in the Subdivisions of Ndu, Jakiri, Mbengwi Central, Babessi and Kumbo. With the exception of Jakiri and Mbengwi Central, with only 82 and 28 antenatal attendees tested respectively, these areas all had large sample sizes that vary from 307 in Ndu to 1 490 in Kumbo. Prevalence rates in approximately 64% of Subdivisions fell within 2% of the mean for the region. This indicates that there is a large variation in crude prevalence rates with 36% percent of the region deviating significantly from the mean (variance 14.8; standard deviation 3.8 for the entire dataset).

To overcome the problem of small sample sizes relative to the mean in some Subdivisions, and their influence on prevalence rates, the spatial statistical technique of smoothing was applied to the dataset. Smoothing borrows strength from the information provided by other spatial units (Anselin 2002). The EB smoothing technique adjusted rates through out Subdivisions of the Province producing some differences in the pattern of prevalence rates. Figure 7.5 shows mapped prevalence rates from the smoothed data. Using this analytical technique, the Subdivisions of Nwa, Oku, Belo, Ndop and Batibo had the lowest prevalence rates (6.3 to 7.7%) across the region.

As with the crude prevalence rates, this analysis using smoothed data has a similar number of Subdivisions in the lowest prevalence rate class. The same Subdivisions as in the crude prevalence rates were also identified in this class. Smoothing the data also increased the lowest prevalence rates from 3.5% in the crude analysis to 6.7%. It is worth noting that while Nwa remained in the lowest category, the prevalence rate for this Subdivision increased from 3.5 to 7.0%. However, the largest increase in prevalence (from 4.1 to 9.2%) occurred in Bali Subdivision.

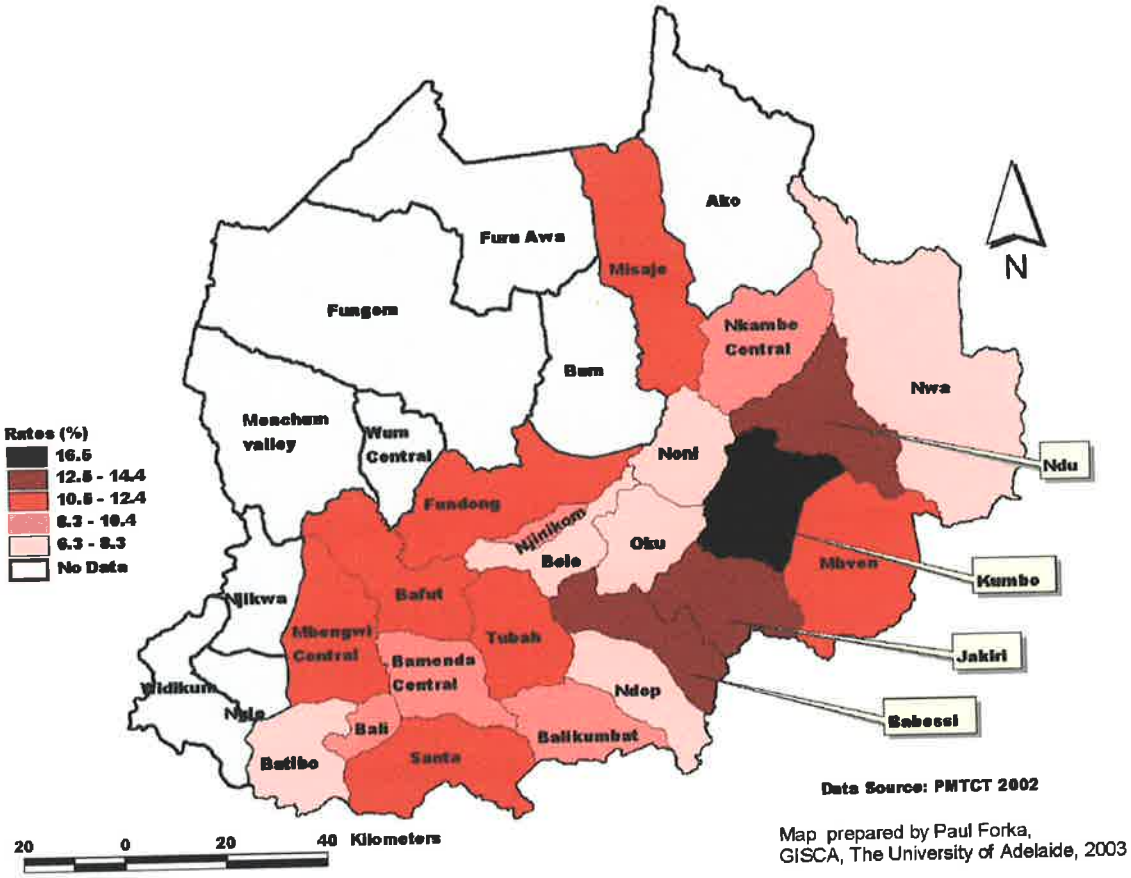


Figure 7.5: Empirical Bayesian HIV/AIDS prevalence rates (%) among antenatal attendees in the Northwest Region Of Cameroon

The highest prevalence rates (11.4 to 16.5%) occurred in the Subdivisions of Ndu, Kumbo, Jakiri, Babessi and Mbengwi Central. All of the areas identified with the highest prevalence rates using the smoothed data are the same as those high rate Subdivisions identified by mapping crude prevalence rates. In addition, the actual prevalence rates in the highest class have been reduced slightly through the smoothing process, from 16.8 to 16.4%, at their upper limits.

Approximately 55% of the Subdivisions fell within 2% of the smoothed mean (10.3%). This indicates that the smoothing process has reduced the large variation in prevalence rates across the region, from 13.2% in the analysis of the crude data to 10.2% (variance 6.6; standard deviation 2.6). On the whole, the Subdivisions most affected by the EB smoothing technique are those Subdivisions at the highest and lowest extremes of the crude prevalence scale, which are also those Subdivisions with the smallest sample sizes, including Bali, Jakiri, Misaje and Mbengwi Central. It is important to indicate that the smoothing process has not affected the crude prevalence rates in the Subdivisions of Bamenda Central, Bafut and Mbven.

7.5: Discussion

This spatial analysis of the PMTCT data demonstrated significant geographic differences in Northwest Province seroprevalence rates. In spite of the exclusion of Subdivisions with low sample sizes (<20) in the northwest and southwest of the Province, the disease is highly manifested in the Province. Mapping seroprevalence rates provided vital information on those Subdivisions where HIV/AIDS cases lived or are living. However, it is difficult to use information on place of residence to identify where the HIV virus was acquired. Data on the source of primary HIV infection are vital in preventing the dissemination of the disease. However, capturing these data, particularly in this study is problematic. HIV/AIDS has a long incubation period and HIV-positives in Cameroon and Sub Saharan Africa are highly mobile (UNAIDS 1997b; Cohen 2001). Stigmatisation associated with HIV/AIDS also makes it difficult for HIV-positives to disclose their source of infection. In spite of these difficulties the spatial variation of HIV-positives in the Northwest Province is central in deducing the causality of the disease. Spatial analysis of the PMTCT data facilitates the tracking of HIV-

positives in the Province for prevention and clinical care. Since HIV-positives are potential transmitters of HIV/AIDS, their targeting is essential in preventing the further spread of the disease in the Northwest Province. According to Atkinson (2000) such information is vital in preventing the allocation of limited public health resources in tracking what is often a hypothetical source of infection. In this context information on which prevention and clinical care strategies can be based is the spatial variation of HIV/AIDS in the Northwest Province of Cameroon.

The incorporation of geospatial analysis into the PMTCT dataset facilitated a better understanding of the epidemiology of HIV/AIDS among antenatal attendees in the Northwest Province of Cameroon. Although the disease is widespread in the Province, this small areal analysis identified the Subdivisions of Kumbo, Ndu, Jakiri and Babessi as 'hot-spots' of contracting the HIV virus in the Province. However, point-based prevalence rates for villages identified localised 'hot-spots' at a higher resolution. The extremely high prevalence rates in Ndu, Kumbo, Jakiri and Babessi Subdivisions depict a geographic corridor of HIV/AIDS in the Northwest Province. Similarly, prevalence rates for point locations of villages identified a broad geographic pattern, which corresponds with prevalence rates identified on the Subdivision map. It can be described as an arc-shaped distribution running from the northeast to south west of the Province. It is worth noting that this arc-shape showed the geographic distribution of villages for which there are data. In general, this study described the distribution of seroprevalence patterns that might otherwise have been difficult to detect in the Northwest Province.

Seroprevalence rates for Bamenda Central is significant since the crude estimates for Bamenda Central (10.4%) were close to the overall Bayesian mean; the smoothing process did not affect them. Bamenda Central, the most urbanised Subdivision in the Province, had a large sample size of 1 110 antenatal women who were tested for HIV/AIDS. However, this relatively low prevalence rate for Bamenda Central must be interpreted with care. This is because HIV/AIDS patients, particularly in the AIDS phase of the disease, move from the cities including Bamenda town to their families in the rural areas. Also, the main hospital, General Hospital Bamenda in this Subdivision is not involved in PMTCT activities; hence, it was excluded from this study.

Some 10.3% of the population in the Northwest Province was found to be HIV positive compared to 11.8% for all Cameroon. Results of another study conducted by the NACC in 2000-2001 indicated that 11.5% of 400 people tested in the Northwest Province were HIV positive (NACC 2001). It is unlikely that the 1.5% reduction in prevalence rates reported in this study is related to intervention efforts instituted between 2000 and 2002. It is more likely due to the methodology and large sample size used as well as the extensive geographic coverage of PMTCT program. Comparing the results of this study and those of NACC is problematic for two reasons. First, the NACC study used a relatively small and urban-based sample size of 400 antenatal women for a Province with almost 1.7 million people in 1998 (MINIFE 2001, DSTAT, 2000). Second, the NACC methodology did not make provision for rate smoothing and/or adjustment. Thus, their prevalence rates reported are of crude rates and smoothing will quite likely produce lower rates.

On the whole HIV/AIDS prevalence rates in the Northwest Province are high. Dynamic factors in the population including poverty, mobility and multiple sex partners are largely responsible for the dramatic increases in prevalence rates. Broadly, the high rural population density together with the need to seek work in plantations (CDC and HEVECAM) and towns (Yaounde, Douala and Limbe) in the south of Cameroon make people in the Province mobile. Persons who are mobile in general, and those in Northwest Cameroon, in particular, who are involved in high-risk behaviours including unprotected sex are at risk of contracting the HIV-virus. The AIDS corridor (see Figure 7.5) corresponds to Subdivisions closest to the most important ring road in the Province. Although, the ring road is largely unpaved, portions of the road and, in particular, between Babessi, Jakiri, Kumbo and Ndu are paved. Irrespective of its dusty and muddy nature in the dry and rainy season respectively, the ring road is passable throughout the year. This has made mobility within, as well as in and out of the Province relatively easy. The ring road is a key accessibility factor in the development of Kumbo, Ndu, Jakiri and Babessi as trading centres. These towns, which are administrative centres, are also trucking stops. Truckers bring in manufactured goods from the industrial towns of Douala, Bafoussam and Yaounde. Trucking from the Province is in primary products: coffee, rice and tea as well as potatoes, beans and corn. The interaction of truckers, traders and the local population particularly in the AIDS corridor creates 'hot-spot' areas for potential demanders and suppliers of commercial sex.

It is also important to argue that because North Westerners are dynamic and highly mobile (Neba 1999:105), many HIV/AIDS patients currently living in the Province might have contracted the virus elsewhere. The best available data (1987) on population migration indicate a negative net migration of 41 940 for the Northwest Province (MINPAT and PNUD

2000). Hence, returning seropostives exacerbate the problems of tracking sources of infection. This has also impacted severely upon the Province's seroprevalence rates.

Widespread poverty partly explains these extremely high seroprevalence rates. As indicated earlier, poverty is essentially a rural phenomenon in Cameroon. In the Northwest Province, approximately 78% of the population lives in the rural areas (MINPAT and PNUD 2000), where agriculture is mostly carried out. In the Northwest Province, about 90% of the population rely on farming for their livelihood (MINIFE 2001). As a result, the impact of the collapse in the prices of primary products (Arabica and Robusta coffee) between 1986-93 was substantial. For example, in this period the percentage change in price paid to producers (small-scale farmers) of Arabica coffee fell from 10.3% to negative 35.5% (MEF 2002). In the same way, employees of agro-industrial companies, Ndu Tea Estate and Upper Noun Valley Development Authority producing tea and rice respectively, were also impacted severely. In this context, it was difficult for companies to pay their employees. Hence, retrenchment of staff and/or closure of companies contributed to the problem of unemployment in the Province. The Wum Area Development Authority (WADA)-Agro-Industrial complex in the Northwest Province was liquidated. Since unemployment is a major cause of poverty, this explains why the Western Highlands that include the Northwest Province contributes 36.4% of Cameroon's poverty (ECAM & DSTAT 1996) with only about 10.7% of the country's population.

In Cameroon, the Northwest Province has the most pronounced urban-rural poverty gap. On the average, poverty incidence for urban Northwest is 17.5% compared to 61.5% for the rural areas (MEF 2002). As a result, people seek to break away from poverty by migrating from the

rural to the urban areas (Bamenda and Kumbo). Also, people migrate to towns like Douala, Yaounde and Limbe in other Provinces. Even rural areas in other Provinces provide opportunities for employment that are not available in the Northwest Province (MINPAT and PNUD 2000). Hence, mobility has led to an increase in urban population without a corresponding increase in urban employment. Hence, in urban areas, transients and, in particular, young persons are unemployed. Because women are less well educated, their difficulty of finding a job is two-fold and, consequently, female poverty is significant in the urban areas. In the Northwest Province, approximately 19.5% of females compared to 17.1% for males are unemployed (MINPAT and PNUD 2000).

Unemployment and poverty provide an ideal setting for the transmission and spread of HIV/AIDS. Hence, the enabling environment for transmission and spread in the Northwest Province is reflected in its extremely high prevalence rates. Unemployment and poverty trigger high-risk behaviour that includes commercial sex, multiple sex partners and non-use of condoms. It is not unusual for young girls in Bamenda, Limbe, Doula and Yaounde to have several sex partners ('sugar daddies'). 'Sugar daddies' are older, rich men who provide the basic needs of young women in exchange for regular sexual intercourse. In this context, poverty has contributed to the transmission and spread of HIV/AIDS in the Province. Polygyny is widely and culturally accepted in Sub Saharan Africa, and frequently, men marry and/or have more than one sexual partner (Caldwell, Orubuloye et al. 1989), this is common in the Northwest Province. For example, traditional rulers including those of Nso, Bafut and Bali have more than twenty wives each. Wife inheritance is also a common practice. Although not widely practiced, the switching of partners is particularly common in the villages of Wum and Babungo in the Northwest Province (Prof Tih Pius, pers. comm, 25/9/03).

The spatial variation in prevalence rates for the Northwest Province strongly correlates with available health care facilities. In Cameroon, approximately 53% of PMTCT tracking facilities are found in the Northwest Province. There are non-PMTCT facilities such as the hospitals of Shisong and General Hospital Bamenda that are also involved in the surveillance and management of HIV/AIDS in the Province. The good HIV/AIDS surveillance and reporting infrastructure in the Northwest Province has provided the reliable data used in this study and this type of data is not available for the other Provinces. For instance, between 2000-2002, the PMTCT program serosurveyed approximately 7 015 antenatal attendees in the Northwest Province (CBCHB 2000). By comparison, in Cameroon between 2000-2001, the NACC tested only an estimated 3 655 antenatal women for HIV/AIDS virus (NACC 2001). Therefore, the availability of high quality data is a key explanatory factor for the high seroprevalence rate in the Northwest Province.

However, HIV/AIDS tracking facilities in the Northwest Province are unevenly distributed. This uneven distribution, results in large disparities in HIV/AIDS surveillance and reporting between geographic areas of the Province. For instance, the largest numbers of antenatal attendees tested were in Kumbo. This Subdivision is the hardest hit by the epidemic. The Banso Baptist hospital (BBH) located in Kumbo, played and continues to play a key role in the surveillance and reporting of HIV/AIDS cases in Kumbo and adjacent Subdivisions. In the Cameroon context, BBH is an intermediary health facility that provides more advanced and referral health services for nearby health centers. Consequently, its upgraded and relatively good infrastructure attracts people not only from Kumbo and nearby Subdivisions but from other Provinces as well. High prevalence rates for Ndu, Jakiri and Babessi

Subdivisions are explained in part by their proximity to the BBH. In addition to their proximity, relatively good HIV/AIDS surveillance is also carried out in PMTCT facilities that are located in Ndu town and Bangolan in Babessi Subdivision.

Regardless of the good quality of the data within the context of Cameroon, there are still problems associated with the data. First, in the address field, there are 67 cases without any information, and some addresses also have spelling errors. This makes it difficult to summarize HIV/AIDS and/or patients per address. Instituting a unique identity code per village address eliminates this problem. Second, in the dataset, 6 178 patients do not have tribal information, because it was not collected initially. This compromises the understanding of the existing socio-cultural factors within a specific tribal environment that facilitates the spread of HIV/AIDS. Third, because of confidentiality, micro level data are missing. This information would be useful for GIS data analyses and would not compromise patients' confidentiality. Briggs (1997) has indicated that, "map smoothing" using EB methods, is an appropriate methodology to stabilise small area estimates while maintaining geographic precision. Notwithstanding the problems, the PMTCT dataset is fundamental to this study.

A deficiency common with hospital records is that patients' birthplace and/or place of origin are identified at the macro levels (town and province) rather than at the micro levels (villages, council areas, and quarters in towns). Also not recorded is the duration of stay of the patient in the current place of residence. It is problematic in Cameroon to define persons' birthplaces, because pregnant women, particularly those living in towns, often return to their husbands' villages to deliver. This practice complicates birthplace data. Besides, there is misreporting

of birthplaces of persons delivered in a health facility in a town different from the place of residence.

Frequent changes in administrative boundaries also affect place of origin and birthplace data. This includes the Decree No 83-390 of 22 August 1983, which created three new Provinces in Cameroon, thus increasing the number of Provinces to ten. In 1992, a subsequent Decree created new Divisions by splitting existing ones. For instance, Ngoketunjia, and Lebialem Divisions were created out of the Mezam and Mamfe Divisions respectively. Thus, residents of Mezam and Mamfe prior to the splitting who currently reside in new Divisions may continue to report their previously named birthplaces, because they have birth certificates issued in their previous place of residence.

7.6: Conclusion

The integration of spatial and HIV/AIDS data used in this study is a new approach in the surveillance and management of the disease in Sub Saharan Africa. The enormous benefits in integrating these data have been demonstrated for the Northwest Province. The locations of high-risk areas of HIV/AIDS transmission have been identified. Spatial information such as this makes it possible to allocate scarce prevention and care resources. It also provides an opportunity to track seropositives and their network for prevention and care. This is timely and 'state of the art' research with far reaching implications for the fight against HIV/AIDS in Sub Saharan Africa.

Dealing with the HIV/AIDS epidemic in Sub Saharan Africa and in particular Cameroon necessitate the accurate and timely use of HIV/AIDS and health service data. This research is therefore a significant spatial contribution within the scope of a multidisciplinary approach to scale down HIV/AIDS in Cameroon. Although the initial cost and commitment to develop geospatial capabilities in Cameroon would be substantial, the benefits in improved research, analysis and ability to combat HIV/AIDS would far outweigh the expense.

CHAPTER 8

A Study of Access to Preventive and HIV Care Services in the Northwest Province of Cameroon

8.1: Introduction

In the 1978 WHO Declaration of Alma Ata, the importance of primary health care was enunciated, which it was hoped would improve the basic health needs of every community (WHO/UNICEF 1978). In accordance with Alma Ata, primary health care activities in Cameroon have focused on the prevention of diseases caused by environmental pathogens. Hence, improving water quality and sanitation have been some of the major responses in eradicating diseases, including malaria and diarrhea. In contrast, HIV/AIDS is a complex social disease and combating it requires significantly different approaches to those used in the prevention of other diseases. Preventive and care services have a key role to play in combating the disease. Hospitals, laboratories and other clinical settings provide epidemiological and demographic data, vital in the surveillance and management of HIV/AIDS. Health services also provide HIV/AIDS related services: STDs and basic OI treatment, HIV testing, psychosocial support for PLWHA and prevention counseling. Hence, access to preventive and care services is an important component in scaling down HIV/AIDS transmission. However, in Cameroon, poor physical accessibility to preventive and care services is a major obstacle in the surveillance and management of the disease.

This chapter aims to determine geographic access to preventive and HIV care services in the Northwest Province of Cameroon, as spatial access to these services is critical in combating the high prevalence rate of HIV/AIDS in the Northwest Province discussed in chapter 7. Specifically, this study uses spatial analysis to assess the adequacy of access to preventive and

HIV care services in the Northwest Province. The analysis integrates epidemiological, geographic and socio-economic data in a way that could enable a more informed debate on resource allocation, policy and program directions in the prevention and management of HIV/AIDS.

Increasing the number of people who know their HIV serostatus is an important component of a national program to slow or halt the transmission of HIV (USHHS 2000). As a result, the PMTCT program was introduced in Cameroon, particularly in the Northwest Province. In addition to improving access to HIV/AIDS preventive and care services, the PMTCT program provides quality individual-level HIV-1 infection and community of residence data from the screening of antenatal women in the Northwest Province. HIV-1 infection data are derived from 8 452 pregnant women screened at 27 health clinics in the Northwest Province of Cameroon, between February 2000 and June 2002. Data for antenatal attendees who underwent HIV-1 antibody testing are represented in Figure 8.1 and Figure 8.2 represents seroprevalence rates for antenatal attendees who tested positive in PMTCT facilities.

In PMTCT health clinics, blood samples are collected for HIV antibody testing from antenatal attendees who agreed to an HIV test. HIV testing in these clinics involves the use of Determine, a simple and rapid assay with a sensitivity of 98.5% and specificity of 97.5% (CBCHB 2002). In addition to the advantages in using simple and rapid assays (see Section 2.13), Determine is readily available and inexpensive in Cameroon. In PMTCT facilities, the accuracy of HIV tests carried out is confirmed with Hemastrip and/or Oraquick confirmatory assays. A Pediatric AIDS Foundation grant made it possible for HIV testing and treatments (TB and nevirapine) in PMTCT facilities to be carried out at no cost (CBCHB 2002).

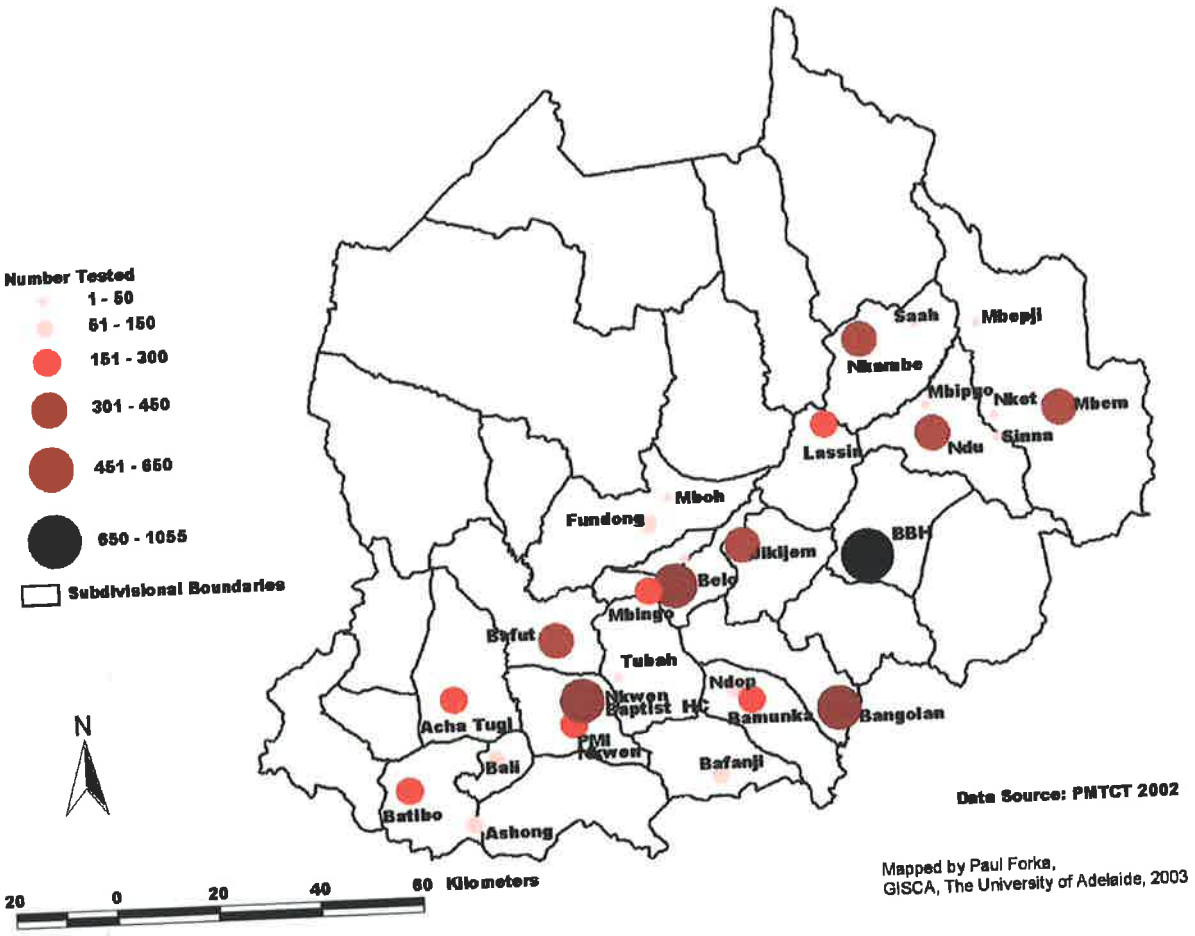


Figure 8.1: Antenatal attendees who tested for HIV virus per facility in the Northwest Province at the end of 2002

It is important to note that HIV/AIDS prevalence rates for the Northwest Province (discussed earlier) are extrapolated from this health clinic specific data. This aggregation of health clinic specific data is indicative of the critical role of accessibility in HIV/AIDS surveillance and management in the Northwest Province.

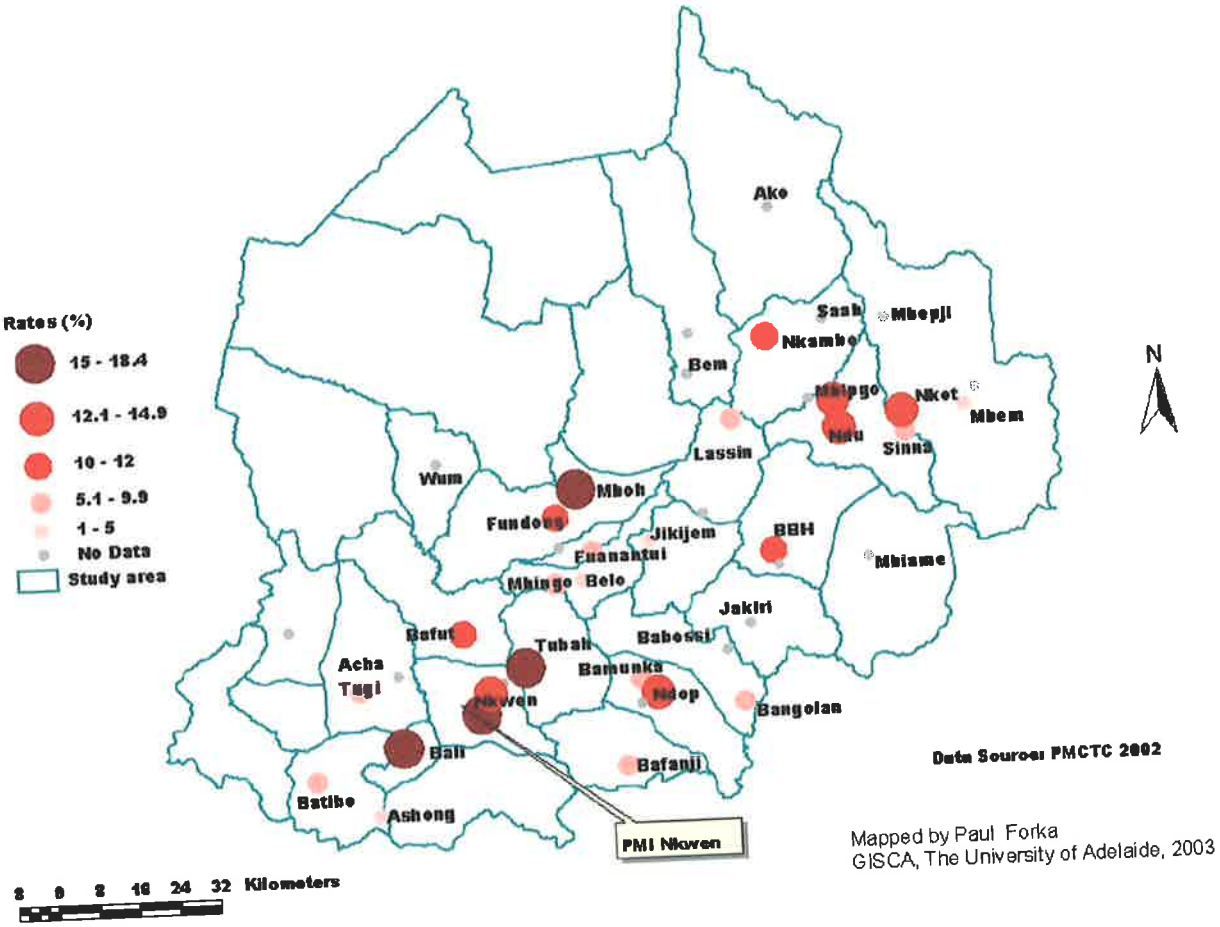


Figure 8.2: HIV/AIDS prevalence rates (%) by PMTCT facility in the Northwest Province of Cameroon at the end of 2002

8.2: The data

In addition to the PMTCT dataset described earlier, this study also uses data from self-administered questionnaires of 250 HIV-positives in the Northwest of Cameroon (see Sections 2:9, 2.10 and 2.11). The survey data are used to compliment the spatial analysis results.

Spatial data from the Northwest Province of Cameroon, including points of villages and subdivisional boundaries were obtained from HEVETAS (a Swiss organization in Cameroon).

In addition, GPS points of PMTCT sites collected between October 2002 and February 2003 are used. The road data for the region was digitised from the 1976 Cameroon 1:200 000 map series.

8.3: Methodology

This analysis involves 461 villages (small-sized population units) in the Northwest Province as demand centers. As a result, computing and mapping accessibility from villages provides information on the concordance between the locations of preventive and HIV care services, and the population, particularly seropositives in the Northwest Province. ESRI software ArcView 3.2 and ArcGIS were used in the analysis.

The methodology used in this study is the simplified version of ARIA (Department of Health and Aged Care and GISCA 2001), originally developed for use in GISCA, The University of Adelaide, to calculate and map accessibility. This was based on the idea that the farther away a person is from a particular service, the more difficult it becomes to access the service. This technique uses the raster-based method called COST-DISTANCE mapping. First, the vector shapefiles (roads, hospital locations and administrative polygons of the Northwest dataset) were converted to rasters, using the function Convert-Features to Raster in ArcMap's Spatial Analyst extension. The output cell size of each Raster was set at 200 m. The Raster for the administrative polygons was reclassified to carry the value 1 (except No Data cells). For the road Raster, the values 1 and 5 were assigned to cells on the road network and non-road cells respectively. The Raster for the administrative polygon was used as the analysis extent and that of the road became the cost (impedance) surface used to measure the cost weighted

distance. The road Raster values of 1 and 5 implied higher costs of accessibility for non-road cells than for road cells.

The Cost weighted Distance method was subsequently used to compute distances. The Cost Weighted Distance function in ArcMap's Spatial Analyst was used to compute the accumulative cost (road distance) of travelling from each cell to the nearest hospital facility. A COST-WEIGHTED distance direction grid, indicating the direction of flow was created in ArcMap by the product of COST-WEIGHTED distance function. The resultant output had the values 0-8, which were reclassified with the corresponding FLOWDIRECTION values of 1-128. The FLOWLENGTH command in the Raster calculator was used to calculate distances DOWNSTREAM along the flow part from each cell to the nearest clinic as follows:

FLOWLENGTH <direction_grid>, {DOWNSTREAM}

Finally, accessibility Index values to the clinics were calculated for 461 villages in the Province. Specifically, the Indexes were calculated with the use of the distances. For this reason, the median value of approximately 13 km was used to standardize the distances, by calculating the ratio of the measured distance for a location to the average distance for all locations. Hence, the minimum distance for each location was divided by the median value to create ratios and/or the Accessibility Index. These indices were interpolated on a 200 m raster (grid), in order to generate an overall picture of spatial accessibility for the Northwest Province. The interpolated surface created an accessibility Index of 0-8 for any location to the clinics in the Northwest Province.

8.2: Results

Figures 8.3 and 8.4 are maps of Accessibility Distances and Accessibility Indices describing spatial access to HIV/AIDS preventive and care services in the Northwest Province of Cameroon. Figure 8.3 shows accessibility distances by road, which vary from 0 to 110 km to PMTCT clinics in the Province. Figure 8.4 shows the road distance accessibility Index of 0 to 8 to PMTCT facilities in Northwest of Cameroon. The distance of 110 km, corresponding to an Index of 8, represents areas with very poor access and 0 represents areas with very good access to PMTCT clinics in the Northwest Province. The large range in accessibility distances throughout the study area suggests significant variations in geographic access (by roads) to preventive and HIV care services in the Northwest Province.

On average, antenatal women travel 18 km to the nearest PMTCT clinic. However, in this study, the mean distance is an inappropriate measure of central tendency because of the distorted nature of the frequency distribution. Also, the extensive distances between some population centers and clinics have substantially influenced the mean distance. For these reasons, the median distance of (13 km) was a more reliable representation of spatial accessibility for the Province. According to Figure 8.3, only an estimated 50% (231) of the villages, representing 64.6% of the population, fell within 13 km (Index of 1) of PMTCT preventive and HIV care services in the Northwest Province. In Cameroon, 13 km is an extremely difficult distance to travel to access health care because mobility is limited to trekking and riding on donkeys (Section 4.12). Although public transport is used, it is characterised by irregularity, overloading and inflated fares, thus compounding the problems of accessibility to health services, particularly for patients.

The technique of delineating hospital service areas in order to determine spatial access to preventive and care services is not new. For example, Bullen et al (1996) used geographic information systems (GIS) techniques to identify localities for the management of primary health care in West Sussex in England. Love and Lindquist (1995) used similar techniques to analyse the spatial accessibility of the aged to hospitals in Illinois, United States of America. In this study, service areas of health facilities are delimited using a standard 5 km radius-distance of accessibility. Although 5 km is an arbitrary value, this has been considered a reasonable distance, recommended by the Bamako Initiative (see Section 4.2); (Knippenberg, Alihonou et al. 1997) to define spatial accessibility of a population to preventive health care in Sub Saharan Africa.

Relative to this 5 km standard, this study shows that only an estimated 18% of 461 villages, representing only 37.5% of the population in the region, have relatively good access to health services. Thus, the majority (62.5%) of the population live at distances which mean that they have poor to extremely poor accessibility to preventive and care services. These analyses also demonstrate that spatial accessibility to health services is worse when examined in terms of the location of population centers. According to Figure 8.4, in approximately 72.5% of the villages in the study area, spatial access to health services involves a travel distance of more than the recommended 5 km (Accessibility Index of >0.4).

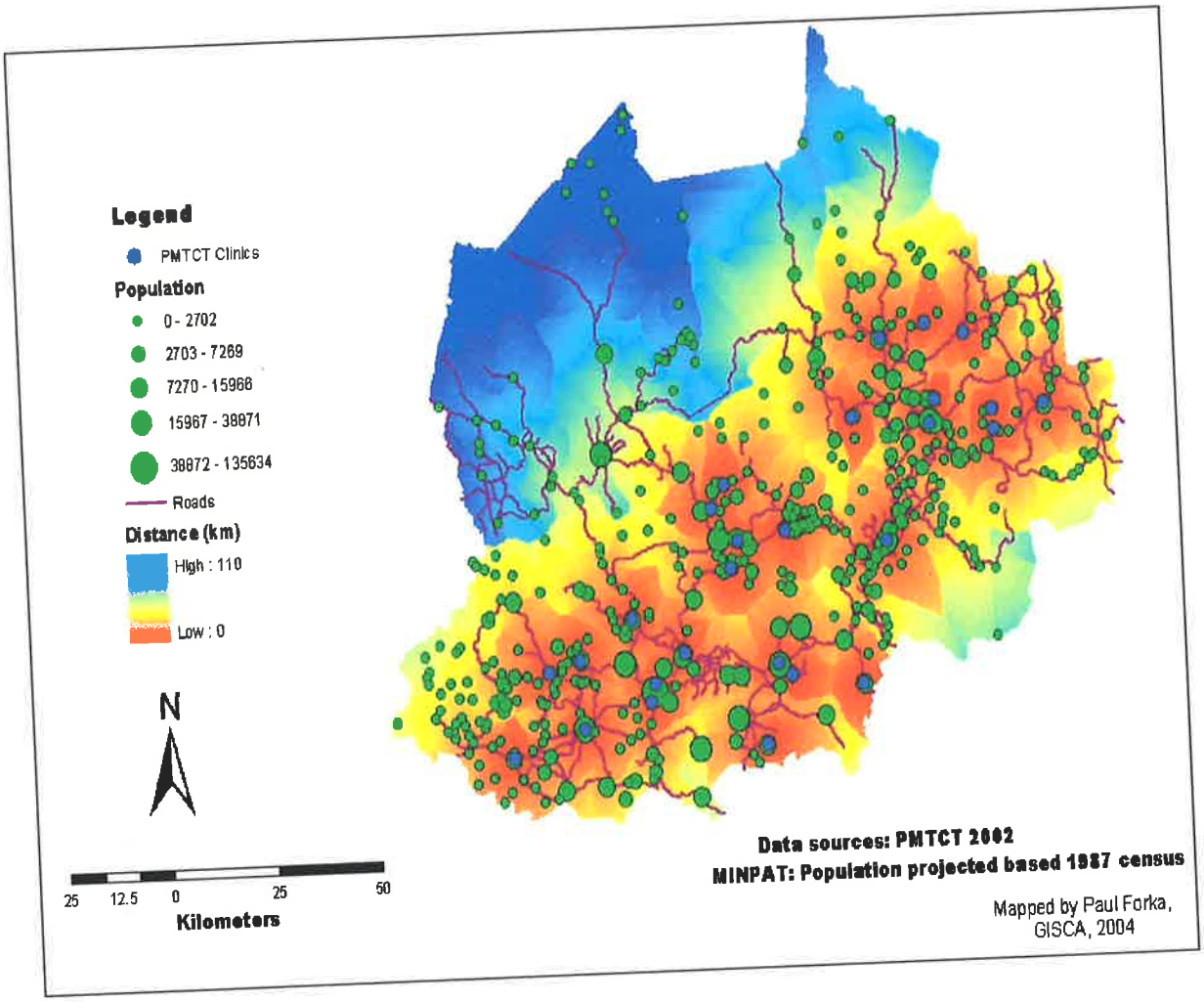


Figure 8.3: Geographic distances (kilometers) from population centers to PMTCT Facilities in the Northwest Province of Cameroon

As health service areas do not coincide to functional space-where people live, work and socialise, the implication is that there is a nexus between the locations and geographic accessibility to health services. Thus, distance categorisation provides more realistic estimates of spatial accessibility of the population to health services in the Province. In this study, only

an estimated 39% of villages, corresponding to 53% of the population, are within 10 km of traveling distance to PMTCT sites. It is important to note that 10 km is two times the recommended distance of the Bamako Initiative. Furthermore, an estimated 54% of population centers, corresponding to 71% of the population, have what can be considered poor access of (15 km) to PMTCT clinics. It important to indicate that the distance of 15 km is three times the recommended distance of the Bamako Initiative.

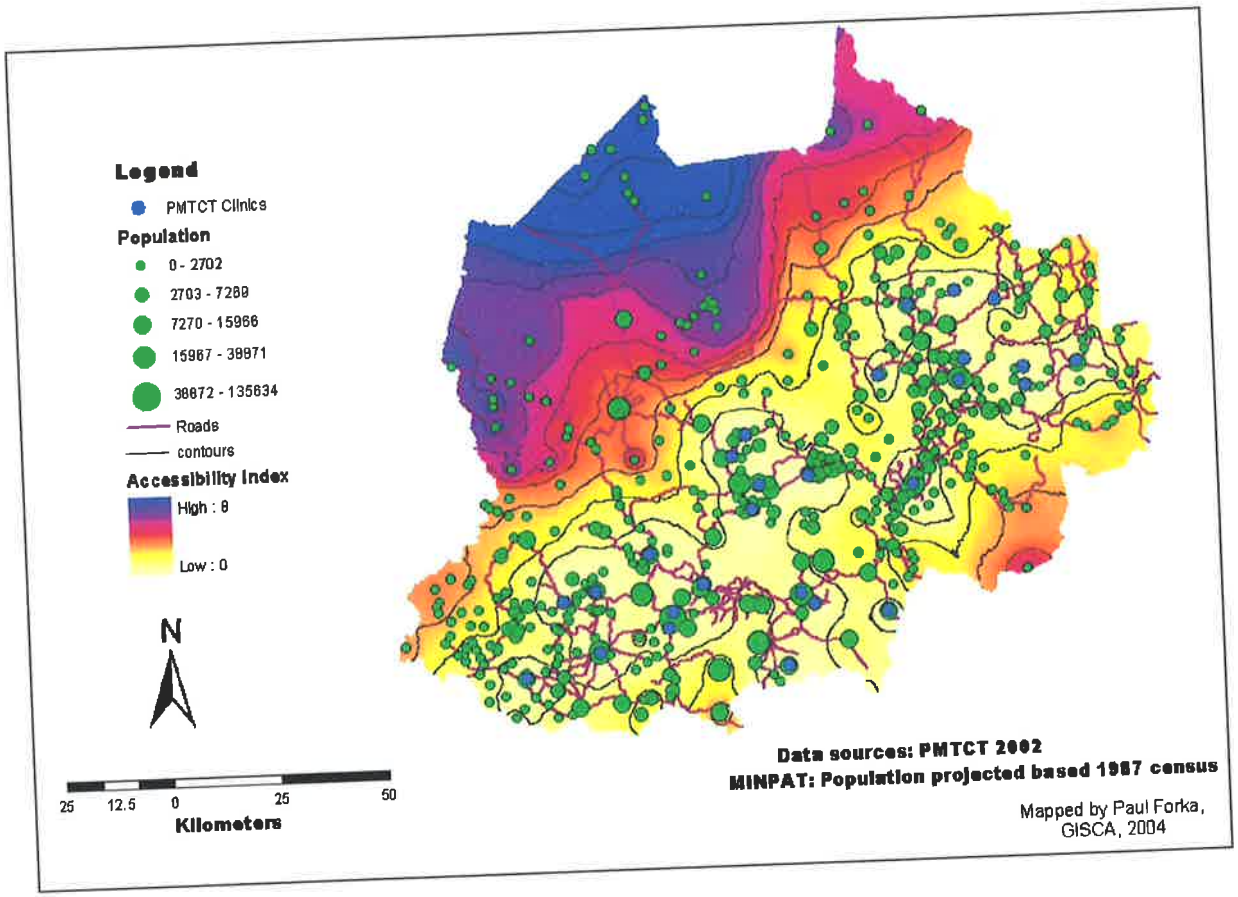


Figure 8.4: Accessibility index to PMTCT clinics in the Northwest Province of Cameroon

According to these analyses, the areas located in the northwest of the province, corresponding to the Subdivisions of Fungom, Furu Awa, Mechum Valley and Njikwa, have the poorest

access of between 25 and 110 km (Index of 8) from preventive and HIV care services in the study area. Approximately 22.3% of the population centers in the study area, representing more than 13% of the population, fall within these areas of very poor access to preventive and care services. It is of critical importance to indicate that these areas are located five to more than twenty fold the recommended distance of the Bamako Initiative. Generally, accessibility to preventive and care services of the population and/or population centers in the frontier regions of Cameroon has always been extremely poor. This makes the surveillance and management of HIV/AIDS difficult, particularly as some of the busiest trade routes between Cameroon and Nigeria are found here.

The northeast-southwest corridor of the Province, corresponding to the Subdivisions of Kumbo, Jakiri, Ndu, Boyo, Bali, Belo and Oku, have relatively good access of (0-5 km, with a corresponding Index value 0-0.4) to HIV/AIDS preventive and care services. While there is a general spatial correspondence between the location of population centers and the location of preventive and HIV care services, there is in fact a high percentage of the population within this corridor that must travel substantial distances to health services. Such distances are beyond that which could be considered reasonable, and result from the lack of spatial concordance between population centers and facilities. Thus, the Accessibility Index map needs to be viewed with care, as the visual impact and relative nature of the scale tend to mask significant variations in accessibility to preventive and HIV care services in parts of the Northwest Province, and also suggests that those areas with low relative Index values have actual short distances between villages and health facilities. For example, the area coloured bright yellow with an Index of 0-2, suggests that population centers located in this corridor have high accessibility to preventive and HIV care services. While this is true in the context

of this relative scale, areas of relatively good accessibility with an Index of 2 are in fact considerable distances (20-28 km) from preventive and care services, as shown in Figure 8.3 where real distances are presented. The average Index of 4 represents a substantial distance of about 54 km required to travel to the nearest PMTCT clinic. These areas correspond to the subdivisions including, Ngie, Wum Central and Bum. Figures 7.2, 7.4 and 7.5 show very limited HIV/AIDS surveillance and reporting in these Subdivisions. Since Subdivisions with low sample sizes (<20) of antenatal women tested for HIV/AIDS were excluded in the geospatial analysis of HIV/AIDS in the Northwest Province, there are no HIV/AIDS prevalence information for the Subdivisions of Bum, Ngie and Wum Central. Overall, in the Northwest Province, accessibility for the majority of the population to preventive and HIV care services is extremely poor.

8.5: Discussion

In Cameroon, HIV/AIDS is common and costly, yet it is a preventable disease. AIDS patients' access health care to seek treatment for a disease that could have been prevented by adequate primary health care. Even though there are no data on the exact lifetime costs of health care associated with HIV in Cameroon, the costs to society and individuals are substantial. These costs mean that HIV prevention efforts may be even more cost effective and even more cost saving to the society (USHHS 2000). Preventive health care which involves education of communities on common health problems and on the methods of preventing them from arising (Last 1995, De Ferranti 1985), is central in HIV prevention efforts. Prevention efforts include promotion of condom use, HIV counseling and testing, and STD treatment (see chapter 4). For HIV-infected people, access to preventive health service is critical for OIs prophylactics and treatments to reduce the morbidity and mortality associated

with HIV infection (USHHS 2000) Approximately 40% of TB patients are HIV-positive in Cameroon (GOC 2003).

This study has demonstrated that physical accessibility to preventive and HIV care services is problematic in Cameroon, particularly in the Northwest Province. Similarly, Stock (1983) noted a decline in accessibility of primary health care services at 3.4 km from a facility in northern Nigeria. Within the context of HIV/AIDS, limited physical accessibility perpetuates non-testing seeking behaviours among the population. Because of lack awareness of HIV status, as well as delays in accessing counseling, testing and care services by individuals who may be infected or are at risk of infection, some people do not perceive themselves to be at risk. As a result, some HIV-infected persons are not identified and provided with care until they are in the final phase (AIDS) of disease development (USHHS 2000). This explains the close relationship in the number of seropsotives identified and the number of seropositives who have full-blown AIDS in Cameroon (as earlier discussed).

In spite of their importance in monitoring and maintaining the delicate health of people infected with the HIV/AIDS virus in Cameroon, health services are in short supply and are unevenly distributed between geographic regions. This variation significantly affects the accessibility to preventive and HIV care services, as demonstrated in the Northwest Province. It also raises a number of important issues, including the location and allocation of health service resources. In 1999, in the Northwest Province, the hospital coverage ratio was approximately one hospital per 44 299 people compared to one hospital per 20 000 people in the South Province (MSP 2001, De CaluwŽ, 1999). On the whole, approximately 21% of the population in the Northwest Province resides within 5 km of a district hospital (De Caluwé

1999). The implication is that about 79% of people travel substantial distances to access higher-order health services in the Northwest Province. The impacts on HIV/AIDS prevention and care of these variations in resource location and allocation are significant.

Cameroon also lacks specific services for HIV/AIDS. For instance, an ARV treatment center provides case management services including HAART treatment, OI prophylaxis and treatment, and laboratory follow-up tests to an average of 55 555 AIDS patients (GOC 2003). Recently published data indicate that at the end of 2002 only an estimated 10% of PLWHA accessed ARV treatment centers throughout Cameroon. As a result, the bed occupation rate of AIDS patients in hospitals which are not designated as treatment centers (Banso Baptist and Shisong General Hospitals), increased by 30% (GOC 2003). Because of substantial increases in the hospitalisation of AIDS patients, in 2000-2001, AIDS related deaths were approximately 26% and 29% in Shisong, and BBH and Mbingo Baptist hospitals respectively (CBCHB 2003, Shisong Hospital 2001).

In spite of the substantial increases in the hospitalisation of AIDS patients, in Cameroon and Sub Saharan Africa, hospitals often return AIDS patients to their homes because HIV/AIDS is an incurable disease. In this study, approximately 71% of 114 HIV-positives involved in the self-administered community survey were returned home. It is critical to indicate that only 7% of HIV/AIDS patients involved in the community survey stated financial reasons to be a major factor that inhibited their access to HIV/AIDS preventive and care services in the Northwest Province of Cameroon. (HIV-positives survey October 2002-Febuary 2003). A study conducted in Choma Hospital, Zambia, indicates a shorter average stay of AIDS patients, as the hospital adopted a policy to manage tuberculosis patients on an outpatient basis

(Buve 1997). Financial and emotional costs to patients and caregivers of the hospitalisation of AIDS patients for an indefinite period also account for the early return of patients to their homes. However, in this study, 46% of 250 HIV/AIDS patients were involved in the community-based survey (HIV-positives survey October 2002-Febuary 2003). Not only because HIV/AIDS patients were returned home early but the lack of facilities also inhibited accessibility to preventive and HIV care services in the Northwest Province.

In Cameroon, specialised equipment vital in the surveillance and management of the disease are found only in the major towns of Douala and Yaounde. For instance, confirmatory HIV/AIDS tests, viral load tests and CD4 cell counts are only available in the National Reference Laboratory (CPC) in Yaounde. Consequently, seropositives are obliged to travel over large geographic areas to access the CPC facility. In Cameroon, ownership of health services also affects spatial accessibility. The Catholic, Baptist and other religious facilities are non-profit making, with courteous staff compared to public hospitals that have poor sanitation, expensive medication, and often bad-mannered personnel with bribery commonplace. "In government hospitals patients are required to provide everything from alcohol to money" (World Bank 1995a, 34). Hogg et al. (1995) also noted that the shortage of health personnel influences the degree to which HIV/AIDS infected persons can rely on health care closer to their homes. In the Northwest Province, there are 14 378 people per doctor, and one nurse per 1 881 people. These ratios are significantly above the national average of 10 831 per doctor and 2 249 per nurse (NIS 2000, MSP 2001, De CaluwŽ 1999). Thus, the shortage of health personnel exacerbates the limited geographic accessibility of preventive and HIV care services in the Northwest Province.

This study has shown that spatial interaction between health facilities and population centers in the Northwest Province involves a median distance of 13 km. This is approximately three fold the Bamako Initiatives definition of spatially accessible health care facilities (5 km). In a study conducted recently, the GOC reported an average distance of 4.05 km between health facilities and population centers in the Northwest Province (MEF 2002). Although the study conducted by the GOC did not indicate the percentage of the population involved, an earlier study stated that approximately 50% of North-westerners reside within 5 km of health facilities (De Caluwé, 1999). In contrast, this study identified a significantly lesser proportion (39.4%) of the population within 5 km of health services that deal with HIV/AIDS in the Northwest Province. As a result, a large proportion of the population in the Northwest Province has limited physical access to preventive and HIV care services, as defined by the Bamako Initiative.

In spite of the importance of physical proximity in accessibility, the introduction of cost recovery, as recommended in the Bamako Initiative, has meant that, health facilities concentrate on the provision of more profitable services such as the selling of drugs (Essomba, et al. 1993, Knippenberg 1997; Bryant and Essomba 1995; Pangu 1997). In this context, it can be argued that primary health care programs crucial in preventing diseases such as HIV/AIDS have not been a primary focus, compared to profitable curative programs. For instance, in order to receive incentives, as a major objective health care workers increase local revenue through drug sale or even through over prescribing drugs (Sanjav 1996).

Distance is a major determinant in access to health services, as users will generally travel to their closest facility (Perry 2000, Stock 1983). Hence, the distance decay principle, which

states that access to health services weakens as distance increases (Mayer 1983). The self-administered survey of 250 HIV/AIDS patients showed that, in Cameroon, other factors apart from distance to the nearest health care facility played a significant role in determining actual distances travelled by individuals seeking health care (Table 8.1).

This complementary data shows that approximately 61% of AIDS patients who sought clinical care in Shisong and Bamenda General hospitals of the Northwest Province travelled between 30 and 250 km to access health services. Several factors may explain the substantial distances travelled by AIDS patients to access health services in Cameroon. For example, Pearson (1988) explains that stigmatisation associated with certain diseases such as (HIV/AIDS) results in patients seeking health care in distant areas.

Table 8.1: Accessibility (%) of HIV-positives in Shisong and Bamenda General Hospitals, Northwest Province, Cameroon

Distance	<5km	>=5<30	>30	Total
Percentage (%)	31	8	61	100.0
				n=161

HIV-positives survey October 2002-Febuary 2003

It is not only the location and undersupply of health services that influence the substantial distances travelled by HIV-positives to access basic health services, but also the need to move closer to the family. Approximately 75% of the respondents in the hospital-based survey indicated family members paid or were paying for the cost of their treatment. In addition to financial assistance, family members are also caregivers to both in and outpatients who are

HIV-positive. According to Knodel and Saegtienchai (2002) the stigma associated with HIV/AIDS reinforces the need for caregivers to remain close family members. In the hospital-based survey in this study, 42% of the AIDS patients, who were of the Nso tribe relocated from towns including Yaounde, Limbe, Douala, and Bamenda to be closer to their family in Bui Division (Survey 2002). Zimmer and Dayton (2003) explained that throughout the developing world the family is the key institution of support. As HIV/AIDS is not a condition experienced in isolation, but is grounded in the material existence of everyday life (Takahashi 1997), HIV/AIDS infected people require support for functional tasks such as cooking and shopping, as well as material and psychological support to ensure their survival.

In Cameroon, it is characteristic that urban residents own a house and/or property in their village of origin. Currently, a village house or farming plot is a type of dependable insurance for urban HIV-infected people and their families on return to the villages. A plausible explanation from my field experience is that HIV/AIDS is fatal and as such, families living in towns and/or other parts of the country often take infected members to health services closer to their villages to avoid the extra cost of transporting a corpse. It is important to indicate that there is no data on the exact costs of transporting a corpse in Cameroon. However, substantial transport costs are involved in hiring buses to carry the corpse and the people accompany it, especially over substantial traveling distances. Base on my field experience, transporting a corpse from say the town of Yaounde to Bamenda is estimated at US $280 to US $500 for about eight hours of travel. Hence, this mobility of HIV-infected people is from the major urban areas (Yaounde, Douala and Bamenda) to the rural areas, where health clinics are scarce.

In Cameroon, the specific cultural context of HIV/AIDS causality also affects access to preventive and care services. As the perceived cultural causality of HIV/AIDS in Sub Saharan Africa is witchcraft (discussed earlier), this demands that the disease be treated traditionally (Plate 8.2).

Plate 8.1: Front view of a traditional treatment center in Bambui in the Northwest Province of Cameroon

(photo by Forka, 2002-2003 HIV/AIDS survey)

Consequently, HIV-positives tend to move from the urban to the rural areas where traditional healers are common. In many villages traditional treatment is the only source of health care, thus, traditional healers are in a unique position to first come into contact and identify cases of new and reemerging diseases (Groce and Reeve 1996). In this study, 9.3% of 161 respondents

in the hospital-based survey first sought traditional care. In Cameroon, the lack of data on the exact number of traditional healers and the uncontrolled nature of their activities make it difficult to know the number of HIV-positives who access traditional treatment. Plate number 8.1 shows an alleged traditional AIDS treatment center commonly referred to as the "AIDS-village" in the town of Bambui in the Northwest Province.

Plate 8.2: Traditional medicine used to treat illnesses in the "AIDS treatment camp" in Bambui in the Northwest Province of Cameroon

(photo by Forka, 2002-2003 HIV/AIDS survey)

During the period of this research, several unsuccessful attempts were made to interview alleged HIV/AIDS patients who sought traditional treatment in the "AIDS-village". While it is impossible to say with certainty the number and characteristics of patients treated here, the

named "AIDS-village" is indicative of the perceived type of traditional treatment rendered. Notwithstanding, the concentration of a large number of patients in such unsanitary conditions seeking treatment depicts the difficulty of access to preventive and health services in Cameroon and in the Northwest Province in particular. Within the context of HIV/AIDS, the fact that such a camp exists, further compounds the difficulty of HIV/AIDS surveillance and management in Cameroon.

8.6: Conclusion

In conclusion, this study has shown that spatial interaction between preventive and HIV care facilities and population centers in the Northwest Province involves substantial travelling distances. As a result, a large proportion of the population in the Northwest Province and Cameroon has limited physical access to preventive and HIV care services, critical in combating HIV/AIDS, as defined by the Bamako Initiative. However, in Cameroon, other factors apart from distance to the nearest health care facility, including poverty, family support and culture also played a significant role in determining actual distances travelled by individuals seeking preventive and HIV care services.

CHAPTER 9

Planning Health Service Location: The Application of Location-Allocation Models in the Northwest Province of Cameroon

9.1: Introduction

The 1992 Cameroon Sectorial Health Policy emphasizes spatial equality of access to health services. In most cases this implies the provision of additional facilities to improve physical accessibility of the population. However, location of facilities, including health services, is always problematic as they are visible symbols of local empowerment (Brabyn and Skelly 2002). In Cameroon, there is a scarcity of health care resources, (including finances and personnel), and political considerations of the ruling elites have inhibited the adequate provision and/or location of health services. As such, and in addition to the population-facility ratio being grossly inadequate, generally, the health needs of the population have not necessarily driven the provision of health care resources.

Spatial modeling with the use of GIS provides an opportunity to better inform the planning and policy development phase of the decision-making process in the provision of health services (Kwan, Murray et al. 2003, Brabyn, 2002, Smallman-Raynor, 1998, Rushton 1984, Rushton 1998). While facility re-location is very unlikely because of the financial costs involved, location optimization is essential in identifying gaps and potential locations of new health care services. Maximizing health service coverage of the population and minimizing the costs of accessibility (distance and time) to health services are primary considerations in the use of location-allocation models (Church and ReVelle 1974, Hagerstrand, 1975, Rushton 1984; Rushton 1998)).

In the context of this field of study, an optimal location is defined as that which maximizes accessibility (Smallman-Raynor, Muir et al. 1998) to preventive and HIV care services in the Northwest Province of Cameroon. In resource poor countries such as Cameroon, efficient techniques to support facility location decisions are critically needed to optimize health service coverage. The application of spatial modeling techniques in the location of services is useful in resource optimization and enhancing access to prevention and HIV care services. Location decisions are of fundamental importance in the efficient use of scarce resources.

Service location optimization is a geographic problem that is aimed at maximizing accessibility. An optimal service location problem, also known as the P-Median problem, where P is the number of facilities, uses several location-allocation models (Mindistance, Maximal Covering location problem to solve different location problems (Environmental Research Institute 2000). In developing countries, the technique of using location-allocation models to plan health service location is not new. For example, Bennett, et al (1982) used the Maximal Covering location model in Colombia to identify potential sites for additional health facilities in order to improve the population-facility ratio. Oppong and Hodgson (1994) used the P-Median model to determine spatial accessibility to health services in the Suhum District of Northern Ghana. Also in the Suhum District of Ghana, Oppong (1996) used the P-median and Coverage models to examine the impact of the rainy season in the application of location-allocation models in developing countries. These studies show that optimizing the location of existing health facilities, not necessarily establishing new facilities, could improve the physical accessibility of the population.

This chapter seeks to use 27 existing PMTCT facilities in the Northwest Province of Cameroon to demonstrate the potential use of location-allocation models in planning the location of preventive and HIV care service. The ultimate aim is to underscore the vital role of spatial techniques as decision support-tools in the location and allocation of scarce preventive and HIV care resources.

The Mindistance location-allocation model is used to optimize preventive and HIV care service locations in order to maximize population coverage in the Northwest Province of Cameroon. Furthermore, the potential location sites for new HIV/AIDS health clinics are also identified with the use of the Mindistance location-allocation model. The research findings provide an opportunity for more efficient use of scarce resources in order to better survey and manage HIV/AIDS in the Northwest Province of Cameroon.

9.2: Methods

This study uses several procedures in ArcView 3.2 and ArcInfo software to investigate the location-allocation problem in the Northwest Province of Cameroon. ArcView's Extension-Nearest Features was used to place demand and candidate centers on the road network and assign the closest road to each demand (village) point. A results table containing various user-selected fields, including distances between demand centers, was created. The distances were saved as a polyline shapefile theme, which was converted into a coverage theme. Spatial joint of demand centers and the network coverage in ArcView enabled the population of each village to be assigned to the closest arc. As a result, the population constituted the amount of

demand on each arc.

A line coverage was built in ARCEDIT from the existing road network in the Northwest Province to produce a NAT and AAT, and unique User-IDs for nodes and arcs. Consequently, an output file was produced that was later used as one of the input files for implementing the location-allocation models. It is important to indicate that the network coverage produced had a node attribute table. Following this, an info file defining the nodes used as hospital centers and their attributes was established in ARCEDIT from the existing PMTCT facilities in the Northwest Province, to create the centers file. The centers file contained a ROUTE-ID and HOSPITALS-ID of the nodes, where the centers are located.

The Mindistance model in ArcInfo was used to solve the location-allocation problem of PMTCT health facilities in the Northwest Province of Cameroon. Specifically, the LOCATECRITERIA command-MINDISTANCE was used to specify the objective with an infinite distance threshold. Using the LOCATEALLOCATE command, 27 PMTCT health clinics were modeled in their existing locations. Thereafter, the existing locations were wiped out in order for them to be optimally relocated. Finally, in the LOCATEALLOCATE command the numbers of health centers to locate were specified each time the model was run. As the existing 27 facilities provide inadequate coverage to the population, 23 new facilities were added to the existing ones to improve coverage.

The resultant output created three output files: Outallocs, Outcenters and Outglob, which are results tables created in Arcplot. These tables, which correspond to the origin-destination pairs for which the spider-lines were drawn, were imported into ArcView. Spider lines are

straight lines distances between population centers and health care facilities to display the results of the locate-allocate command. The Outallocs file contained information about the allocation of each demand feature and the Outcenter file contained the facility centers chosen by the location-allocation process. The Outallocs file was joined to the demand centers shape file and the outcenter file to the candidate shape file. The spider.ave was compiled and run in ArcView 3.2 to show health clinics and the allocated population centers.

9.3: Results

Figures 9.1 and 9.2 present the results of the current and optimized locations of 27 PMTCT facilities in the Northwest Province of Cameroon. Figure 9.1 shows the results of 27 PMTCT health clinics modeled in their existing locations, and Figure 9.2 presents the results of these facilities in optimized locations. Optimization analysis has shown a greater coverage over a larger geographic area, which includes an additional seven subdivisions, increasing coverage particularly in a northerly direction. It has also resulted in a reduction in the clustering of facilities. This implies that the existing facilities have emerged in a fashion that does not necessarily reflect an overall plan for the region, but perhaps *ad hoc* historical development.

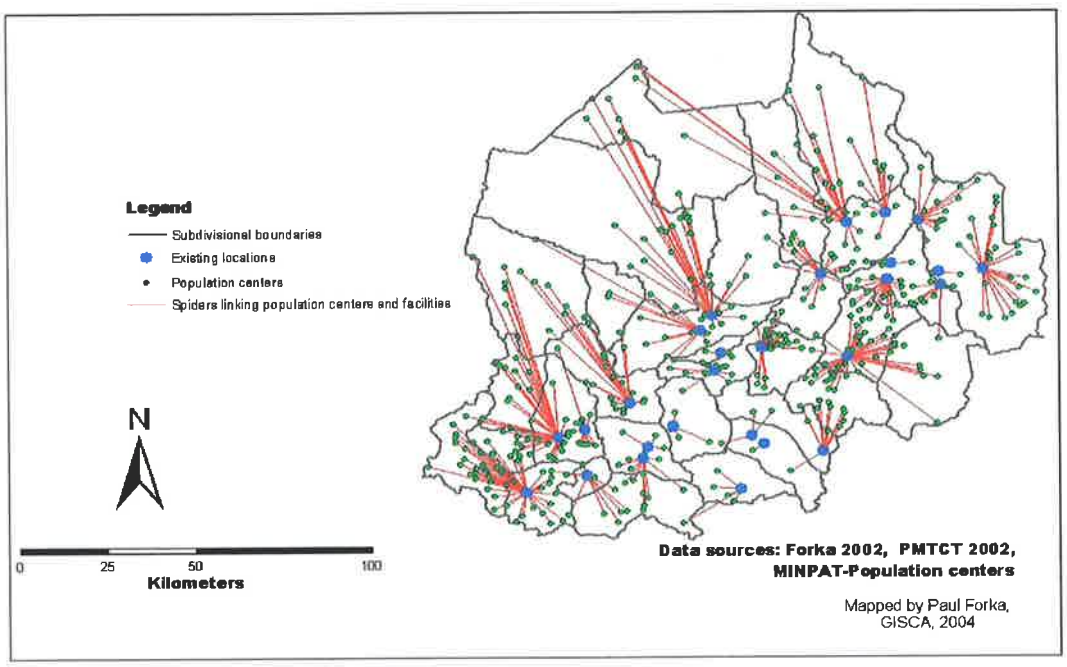


Figure 9.1: The current location of PMTCT health clinics in the Northwest Province

In this optimization analysis, subdivisions in the northwest and central north, where there are no existing facilities, including Wum Central, Bum, Misaje and Mechum Valley are allocated facilities, suggesting that these areas are in grave need of health care services. In spite of this optimal reorganization of the existing facilities, ten of the optimized locations (37%) correspond in location exactly to ten of the existing locations. This shows there is a certain level of correspondence between where existing facilities have been historically located and centers of population (as may be expected). However, this also shows that nearly two thirds (63%) of existing facilities are not optimally located to serve the population of the region.

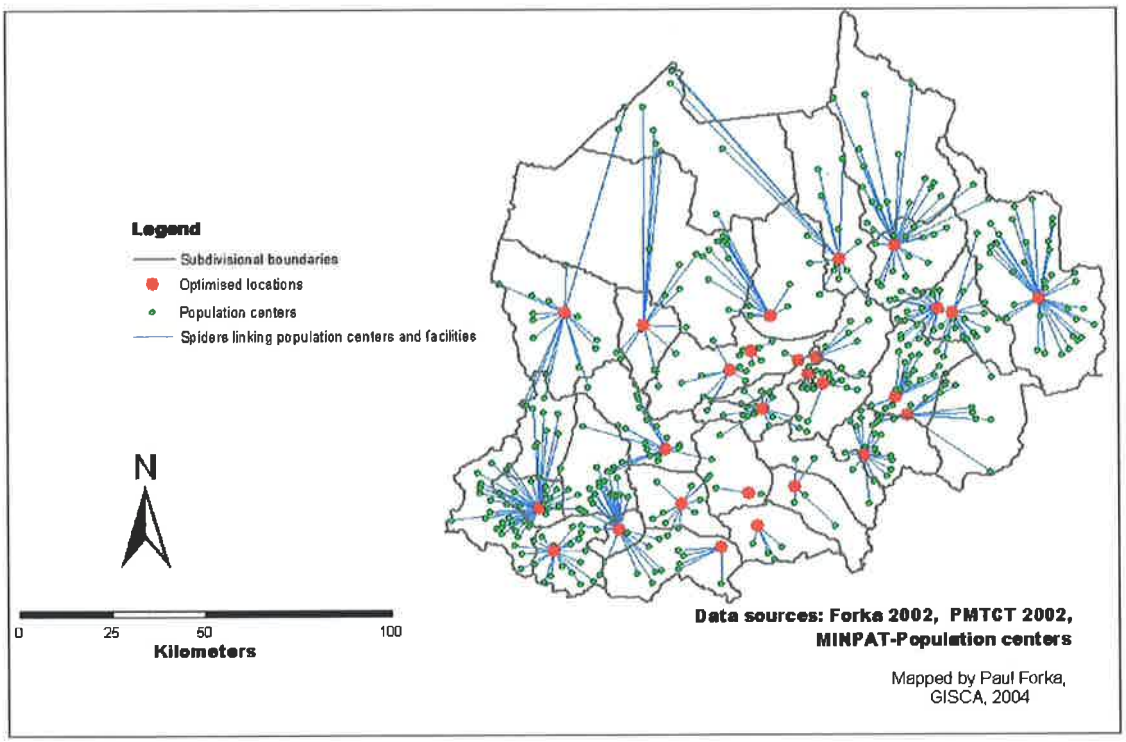


Figure 9.2: Optimised location of 27 PMTCT health clinics in the Northwest Province of Cameroon

This analysis shows a difference in population coverage between the existing and optimized facilities of 1.2% within 5 km of preventive and care services in the study area. While this may not appear to be a significant increase in coverage, in actual figures it represents around 17 000 people. An additional 32 000 people are located within 10 km of the health care facilities under the optimized location of facilities. Similarly, 32 000 additional people are also covered within 15 km of health facilities. Subsequently, a greater proportion of the population is covered under the optimized locations than with the existing locations.

In addition to substantial improvements in coverage, the optimal location of PMTCT facilities has also reduced the cost (distance) of accessibility to preventive and care services in the study area. Figure 9.3 shows a significant decline in the average weighted distance traveled, from between 0 and 38 km for the existing locations to between 0 and 21 km for optimal facility locations. Overall, the mean average weighted distance of accessibility to preventive and care services declined by approximately 3 km, under the optimal location-allocation analysis. This is approximately a 25% decline in the cost (distance) of accessibility.

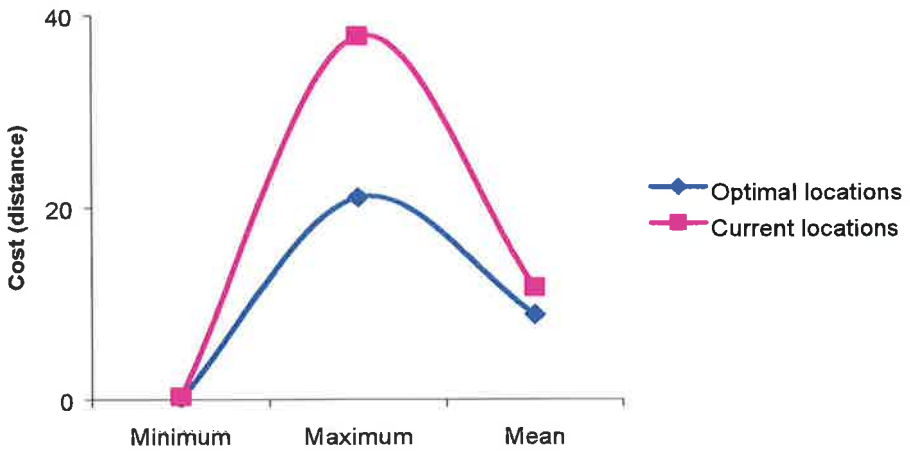


Figure 9.3: The existing and optimised average weighted distances to PMTCT facilities in the Northwest Province

While this analysis has demonstrated that many of the existing facilities are not well located in terms of population, in reality relocation of these existing facilities is not practical. Hence, improvement in coverage is likely to only be achieved through the provision of additional facilities.

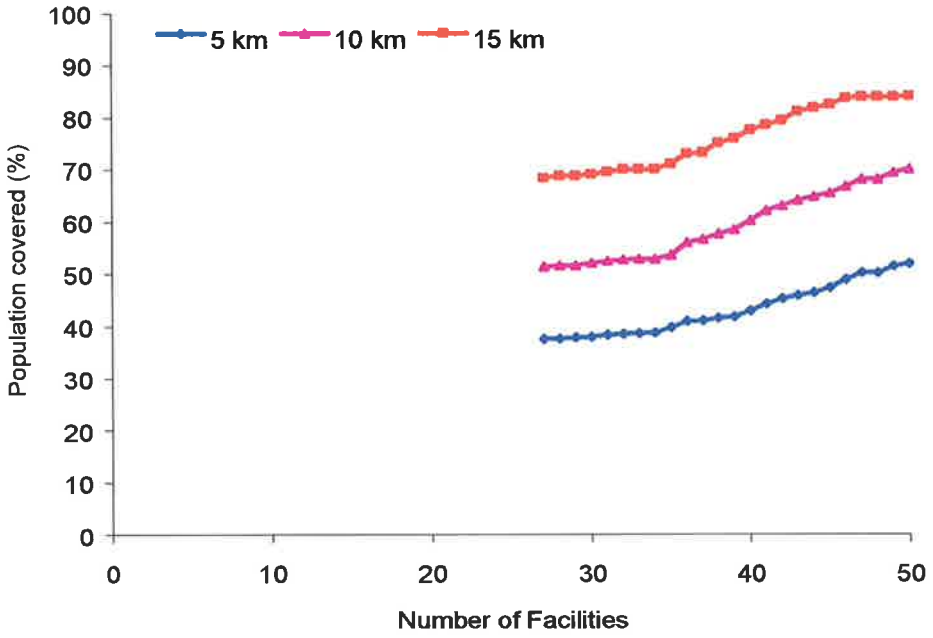


Figure 9.4: Improvements in health service coverage in the Northwest Province

Figures 9.5 shows improvements in health coverage to approximately 55% of the population within 5 km of preventive and care services, with the provision of 50 additional facilities in the Northwest Province. This level of coverage is only achieved because all the 50 facilities are optimally located. By contrast, the optimization of only the 23 additional facilities, results in only an estimated 52% of the population within 5 km of preventive and care services (Figure 9.4). Figures 9.4 shows significant improvement in coverage of approximately 70% and 84% with 23 optimal locations only at long distances of 10 km and 15 km respectively. At similar distances, health coverage is approximately 78 and 88% for the 50 optimal locations (Figure 9.5). Overall, there is a modest increase in coverage of between 0.1 to 0.3% within 5 km of health services with the provision of the first seven additional facilities.

Although this percentage increase may seem insignificant, this represents approximately 4 200 people.

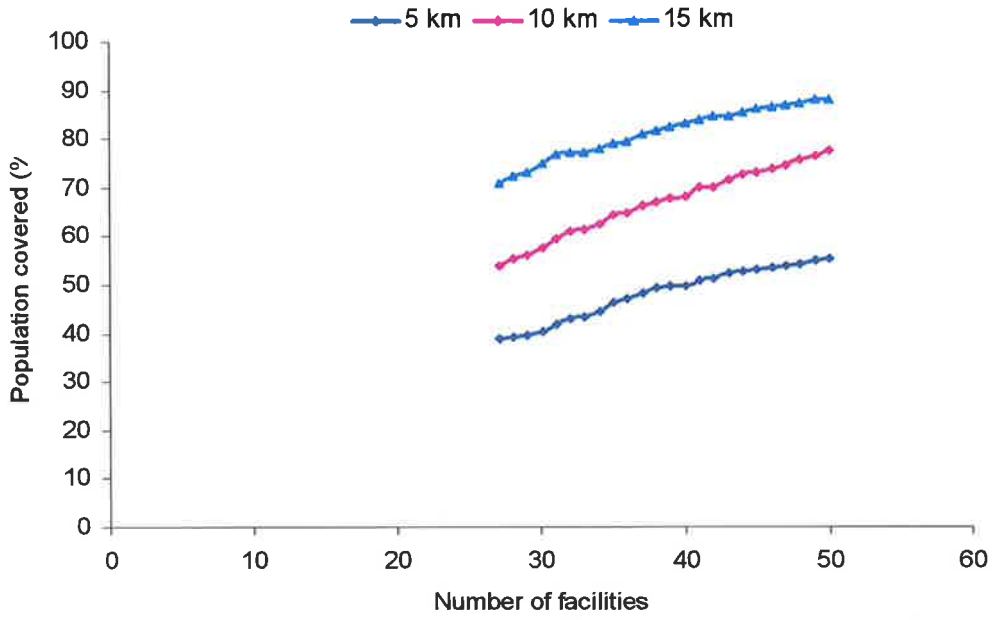


Figure 9.5: Optimal location of 50 health facilities in the Northwest Province

Figure 9.6 shows three of the first seven additional facilities in optimized locations, which appear at very close proximity to each other, located in the subdivisions of Oku, Noni, and Fundong (see Figure 7.2). The fact there is an existing facility in Oku subdivision, suggest that the first seven additional facilities have also played a key role in reducing the overload on the existing facilities.

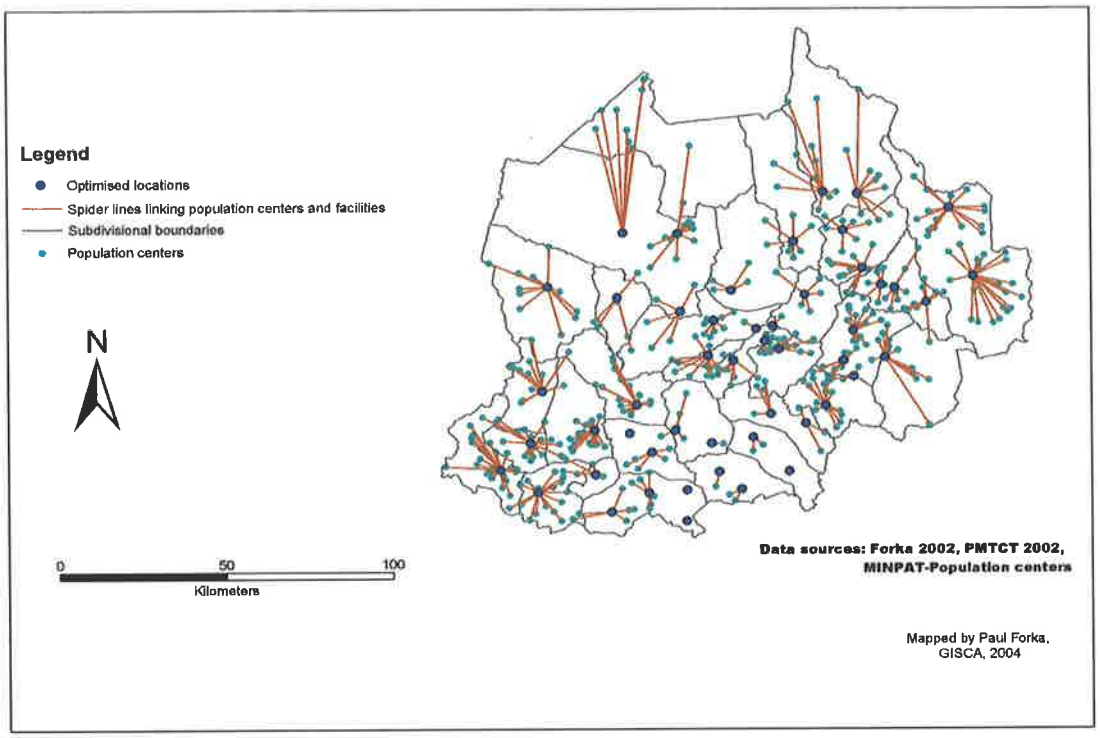


Figure 9.6: Spatial distribution of 50 optimal locations of health facilities in the Northwest Province

While this analysis (see Figure 9.6) might show the non-allocation of demand to two facilities Balikumbat, and one each in Babessi and Tubah subdivisions respectively, in reality each of these facilities is allocated demand of 9 000 and more.

This study has demonstrated that the greater the number of health facilities provided the higher the proportion of population covered, particularly when locations are optimized. Physical accessibility is, however, inevitably unequal because we all occupy different points in space (Powell 1995). As such, distance variation in accessibility to preventive and care services has made it difficult to define the optimal number of facilities for the Northwest Province.

9.4: Discussion

The health infrastructure critical in combating HIV/AIDS is generally not technically demanding, however to be effective needs a great deal of resources, hard work and careful planning. Most HIV/AIDS intervention efforts can be delivered through health centers, health posts and small facilities, which are collectively called close-to-client (CTC) systems (CMH 2001) use in preventive activities. Hence, the use of location-allocation models to find optimal locations of PMTCT clinics in the Northwest Province falls within the ambit of the CMH recommendation to make close-to-client facilities widely accessible.

The Mindistance location-allocation model used in this study has demonstrated the benefits of optimization models to find best locations for health clinics, in this case in the Northwest Province of Cameroon. Optimal locations chosen are distributed throughout the Northwest Province, based on stated criteria such as number of facilities and demand. This demonstrates the impartial role of location-allocation models in ensuring spatial equality of access to health services. The present locations of PMTCT facilities suggest that historical policies enhanced the selection of (sub optimal) sites in largely urban areas. Analysis of the existing PMTCT situation corresponds to what is referred to as a history-based location approach (Hugo 2002). This is due to the PMTCT program being carried out from locations where existing public and private non-profit health facilities (CBCHB, Presbyterian and Catholics) have been historically located.

While the original location-decisions of public and private non-profit health facilities varied, it is important to note that location of preventive and HIV care services in existing facilities

results in sub optimum coverage. Sub optimally located facilities exacerbate the problem of health service coverage in Cameroon and in the Northwest in particular. In this context, it can be argued that the decision to locate PMTCT facilities in their current locations was not necessarily need-based. However, the need-based location of facilities is problematic because patients often travel out of their community to seek health care. In this study, some of the HIV positive antenatal patients deliver at home or in other facilities, and as such data collection is difficult. According to the CBCHB 2003 report, it is exceedingly difficult to obtain accurate HIV/AIDS information on mother and baby treatment from most PMTCT facilities.

On the whole, location-decisions based on the health needs of the population are generally limited in Cameroon. Hence, modeling service location is not only an excellent planning tool, but it also makes the process of location-decision transparent. According to Smallman-Raynor et al (1998), modeling service locations also provides a convenient mechanism of checking patients' accessibility in regions where location-decisions have already been made. Furthermore, the visual presentation of spatial modeling results is a vital source of information to communities, facilitating their involvement in the decision making process. As health facilities are located where there is available land and the relief is suitable, these factors and many others also contribute to the sub optimal location of facilities.

This study indicates that a key problem in the provision of health care in Cameroon, in particular in rural areas, is the provision of enough facilities to be geographically accessible at the recommended 5 km distance. The lack of equipment and personnel for in-patients (discussed previously in chapter 4) also exacerbates the problem of health service coverage.

The shortage of equipped medical facilities is a major inhibiting factor in combating HIV/AIDS in Sub Saharan Africa.

The development of mobile HIV/AIDS clinics can provide basic health care, critical in combating the spread of HIV/AIDS in Sub Saharan Africa (Architecture for Humanity 2002). The application of location-allocation models is useful in identifying optimal sites to maximize health service coverage of the population. Although, the use of outreach primary health care services in disease prevention is not new in Cameroon, CHW are inadequately trained, and have mobility problems (discussed previously in 4.2). In comparison, mobile HIV/AIDS clinics are fully equipped to give access to primary medical services, as well as treatment and prevention advice about the virus (Architecture for Humanity 2002), including secondary infections that HIV patients frequently contract.

In 2000 the first ever mobile HIV/AIDS clinics were introduced in Hillbrow (Johannesburg, South Africa). As a result, preventive and HIV care services were brought directly to patients who avoided public facilities due to stigmatisation and discrimination. Within 15 months of their introduction an estimated 1 243 CSW accessed the facility (IRIN News, 4/March 2004). This study has demonstrated that spatial data can facilitate the deployment of such services.

Although this study has demonstrated the benefits of location-allocation models in maximizing health service coverage and minimizing the costs of accessibility, the lack of digital spatial data and the quality of the existing data (discussed previously in chapter 6.3) has made spatial modeling in Sub Saharan Africa, and in particular Cameroon difficult. Oppong (1996) noted that poor quality data undermine the application of location-allocation models to

optimally select locations. This study likewise suggests that the use of location-allocation models in enhancing policy decisions to locate health clinics also requires significant improvements in both demographic and spatial data, as well as investment in software and hardware.

9.5: Conclusion

In spite of the potent role of location-allocation models, in Cameroon many factors including finance, epidemiological data and personnel affect health service location-decisions. These are essential factors to be considered in the planning process of health service location. Overall, the provision of health services is an ongoing activity in all countries. This analysis has demonstrated that the use of location-allocation models can assist health care providers in Cameroon to maximize coverage by locating preventive and HIV care facilities in optimal locations. The optimal location of facilities does not only reduce the cost of access but also enhances access to preventive and HIV care services.

CHAPTER 10

Recommendations and Conclusions

10.1: Introduction

As discussed throughout this thesis, the integration of spatial data in the surveillance and management of HIV/AIDS in Cameroon and Sub Saharan Africa is a novel approach to assist in the fight against HIV/AIDS. The present study was carried out in order to contribute towards a greater understanding of HIV/AIDS, the single most critical health and development problem in Sub Sahara Africa and Cameroon. Combating HIV/AIDS in Cameroon and Sub Saharan Africa is severely limited by the lack of resources and data. However, the knowledge gained from the spatial analyses, fieldwork and several data sources used in this thesis makes a significant contribution to our understanding of HIV/AIDS in Cameroon and has great potential to contribute to intervention efforts. This concluding chapter summarises the major findings of the study and critically assesses the extent to which the primary objectives of the thesis have been met. It also examines the theoretical contribution of this study and discusses the implications of its major findings for policy makers and planners. Some suggestions regarding future reach priorities and approaches in light of the limitations of this study are outlined.

10.2: Major outcomes of the study

In chapter one the aims and objectives of the present study were stated. It is of critical importance to assess the extent to which these aims and objectives has been achieved. As

such, the major outcomes of the study are discussed below within the context of the original aims and objectives of the thesis.

The first objective was:

- To present a detailed and comprehensive profile of the contemporary situation of in HIV/AIDS in Cameroon.

In this study, a methodical examination of several sources of data was able to demonstrate that the HIV/AIDS situation in Cameroon is typical of most Sub Saharan African countries, where approximately 90% of the transmission is through heterosexual transmission. In Cameroon, there are an estimated 1 000 000 HIV infections and HIV/AIDS is one of the leading causes of morbidity and mortality.

Similarly, through an extensive examination of several data sources, the study has also demonstrated that in Cameroon HIV/AIDS surveillance is limited and as such the lack of reliable data about the epidemic means that prevention efforts to communities at greatest risk are problematic. In spite of the limitations of the existing data in the estimation of prevalence rates, HIV/AIDS infections are extremely high, with an increasing seroprevalence, even among subgroups considered at low-risk of infection, such as pregnant women and blood donors. Trucking, commercial sex activities and the military are occupations classified as high risk. HIV/AIDS prevalence rates are highest among commercial sex workers varying from 34% in Yaounde, 45% in Douala and 54.8% in Maimboum. Similarly, truckers in Douala, Kumba, Mamfe and Eko, truckers have a high prevalence rate of 15%, which is higher than in the general population. The high prevalence rates among these subpopulation

groups demonstrate the magnitude of the epidemic in Cameroon. As a result, the increase in the number of seropositives and increasing seroprevalence demonstrate that current intervention efforts, which are largely health based have not been able to stop the amplification of the epidemic.

The second objective was:

- To analyse the pattern of accessibility to health services in Cameroon and relate this to the accessibility of people with HIV/AIDS to appropriate services.

While there is an exponential increase in HIV/AIDS morbidity and mortality, as well as seroprevalence rate, the extensive examination of several sources of data show that in Cameroon, access to health infrastructure, critical in combating HIV/AIDS, is inadequate. Access to adequate preventive and HIV care services is essential for prevention and treatment information about the disease. In Cameroon, there is a significant spatial variation in accessibility to preventive and care services, particularly between urban and rural areas (see chapter 4). Many factors, including geography, poverty, undersupply of facilities and culture, account for the limited access of the population to preventive and HIV care services in Cameroon, and particularly in rural areas. For instance, the ratio of health care workers per acre is ten fold higher in rural areas than in urban areas. As a result of these, and not withstanding the efforts made by public and private sectors, accessibility even to most basic health services involves substantial travelling distances and time in many areas of Cameroon. In Cameroon, since inadequate accessibility to health services is against the background of an increasing seroprevalence, combating HIV/AIDS is a difficult task.

The third objective was:

- To apply GIS analytical techniques in the Northwest Province of Cameroon to demonstrate the potential benefit of integrating spatial data in the surveillance and management of HIV/AIDS.

In chapter six, the benefits of a geospatial approach in the surveillance and management of HIV/AIDS are discussed. Thus, to address the need for information to ensure effective targeting of preventive and care services, this study has integrated geospatial analyses to examine location trends, identify spatial features of the disease and related them to the socio-economic and environmental causalities in the Northwest province of Cameroon. Other spatial analyses have demonstrated the benefits of geospatial analyses, such as that of Brody (2004), which used small area analysis to estimate asthma prevalence in Chicago schools. Similarly, Marshall (1991) use geospatial techniques, including Empirical Bayes Estimator to map disease and mortality rates in New Zealand. The incorporation of geospatial analyses to visualize (through the use of maps) areas with significantly high disease and mortality rates, promote information sharing about the epidemic. According to Higgs and Gould (2001) highlighting areas of high disease rates are useful in predicting which areas might be at future risk and which may benefit from future local population screening.

In the context of a general lack of spatial data in Cameroon, several GIS techniques (digitising and GPS) were used to capture location data to link with corresponding attribute data. The study has successfully demonstrated the crucial role spatial data have in the identification of

areas of high prevalence in the Northwest Province of Cameroon. Combating HIV/AIDS is an expensive exercise and it is particularly challenging for Cameroon and Sub Saharan Africa because of limited resources. In spite of the current efforts to control the epidemic, identifying populations and geographic areas at risk is difficult with only the use of tabular data that is not locationally referenced.

The integration of geospatial data is very useful in targeting limited resources, as demonstrated in the present study. The location of high-risk areas allows for the targeted allocation of scarce prevention and care resources to communities in greatest need of enhanced intervention efforts in the Northwest Province. The concentration of intervention efforts in areas of need can significantly reduce the costs of dealing with HIV/AIDS, borne by the community, NGOs and the GOC. Greater focus in intervention efforts implies that HIV/AIDS patients in these communities can be traced, treated and/or vaccinated against opportunistic infections, as such preventing their hospitalisation and thereby reducing overall expenditures in health (see chapter 5.10). However, patients' follow up is very unlikely, with limited financial and human resources in Cameroon. Nevertheless, the integration of geospatial data have the potential to considerably assist in designing effective intervention strategies in reducing the epidemic in Cameroon and in this study, the Northwest Province in particular.

Within the framework of integrating spatial data, this study has made significant advances in planning service location and in measuring the adequacy and availability of health service provision, within the context of increasing seroprevalence in the Northwest Province of Cameroon. The integration of spatial data to assess the concordance between the location of preventive and HIV care services, and the population, shows that the majority of the

population live at distances which mean that they have poor to extremely poor accessibility to preventive and HIV care services in the Northwest Province of Cameroon. This knowledge of health service locations greatly contributes to the better placement and utilization of existing health services and the planning and location of new health facilities in order to better manage HIV/AIDS and associated ailments.

This study has also demonstrated that the integration of location data helps to direct the provision of preventive and HIV care services to communities most in need through the provision of better information in the planning and policy development phase of the decision making process. The use of location-allocation models in the Northwest Province has shown the benefits of spatial data in optimising service locations, including those of mobile health facilities.

While health based interventions are critical in combating HIV/AIDS, the success of their implementation also depends on the attitude of the local communities, which are in the frontline of the HIV/AIDS epidemic. As a result of widespread misinformation about HIV/AIDS (see chapter 5), community involvement and participation is essential in combating the epidemic. The critical nature of community involvement was recently illustrated in Northern Nigeria, where community leaders banned their members from participating in polio vaccination campaigns (BBC News, 23/03/2004). In addition, the decision to access health services is often taken in consultation with family and community members (see chapter 4). Chapter four (section 4.11) examines the concept of a community 'safety net', whereby the principle of reciprocity is a prominent feature among members of social solidarity networks in local communities. Within the specific context of HIV/AIDS, community involvement

includes contributions towards funeral costs, care for orphans and assistance in ploughing orphan's fields (AIDS Analysis Africa 2001 vol. 12 no. 1: 4).

One vital outcome of this study is that spatial data promotes community involvement and participation in the design and implementation of HIV/AIDS interventions strategies. Crucial HIV/AIDS information needed by members of a community are best obtained through a geospatial analysis. The visual presentation of spatial analyses results is valuable tool for communities to assist their understanding of the magnitude and trend of the epidemic in their areas. In addition to the visual presentation of spatial analyses results, such location specific information are important in identifying and setting priorities for community-based HIV/AIDS intervention programs, including voluntary associations, self-help groups and burial associations (AIDS Analysis Africa 2001 vol. 12 no. 1: 4).

The fourth objective was:

- Make recommendations for actions relating to the surveillance and management of HIV/AIDS in Cameroon.

In chapter two several data sources used in this study are discussed, including HIV/AIDS sentinel surveillance and AIDS case reporting. HIV/AIDS sentinel surveillance is aimed at providing local communities, organizations and governments with information on the seroprevalence situation in various geographic regions and subpopulations, in order to scale up intervention efforts. However, HIV/AIDS data in Cameroon and in many other Sub Saharan African countries are incomplete and inadequate. This study has identified data flaws, such as

the lack of information of the partners' serostatus, patience birthplace, residence, age, occupation, ethnicity and lack of information on HIV risk exposure. This makes the representation of the impacts of the epidemic and the need for prevention and treatment services tentative indicators, rather than precise estimates of prevalence rates in the population. In order for surveillance data to provide accurate estimates of prevalence rates in Cameroon, there is a grave need to improve and expand HIV/AIDS surveillance. It is essential to include a spatial element in the HIV/AIDS surveillance process. Rushton (1998) suggests that health data that are geocoded are more useful than health data that have been placed in arbitrary spatial units. The integration of spatial data, as demonstrated in this study, provides the opportunity to expand surveillance and improve the present and future quality of HIV/AIDS data through a spatial time series analyses.

For Cameroon to incorporate a geospatial analysis into the surveillance and management of HIV/AIDS, there is a grave need for data standardization and the development of a spatial infrastructure, which is vital to a geospatial analysis. Standardizing HIV/AIDS data collection and reporting provides accurate and timely data crucial in the surveillance and management of the disease, both at local and national levels. It also reduces the risks of misclassification of HIV/AIDS cases. In Cameroon, antenatal women who are CSW and are tested HIV positive are not also classified as CSW, rather just as HIV positive antenatal women. Such misclassification has the potential to significantly impact on the seroprevalence rates among antenatal attendees and consequently the misallocation of resources. It is also of critical importance to indicate that accurate population data are needed to relate the HIV/AIDS data to. The absence of baseline population data suggests that estimations regarding the number of seropositives in Cameroon are inaccurate. In addition, the present national prevalence rate in

Cameroon, based on 2000 survey data, was calculated using HIV/AIDS results from the ten provinces (see chapter 3, Figure 3.1), but these results were not weighted to take into account the different population sizes of the provinces.

An important outcome of this study was the establishment of a suitable HIV/AIDS digital spatial database on which the various spatial analyses were based. While some data was acquired from HEVETAS, other spatial data used in the research were digitised and collected with the use of a GPS. These data include locations of preventive and HIV care services, polygons of subdivisional boundaries and road data from digitising hard copy maps. Throughout the course of this research, a prototype GIS dataset containing attribute tables of HIV/AIDS for the Northwest Province has been created, which can be accessed and used by organizations and public health professionals involved in the fight against HIV/AIDS. Already, the results of this study have been used in improving the PMTCT program in Cameroon. Overall, the present study provides baseline information to carry out time series spatial analyses of HIV/AIDS and preventive and HIV care service modelling in the future.

This thesis has demonstrated the potential benefits of integrating spatial data in the surveillance and management of HIV/AIDS in Cameroon. The use of Geographic Information System (GIS) analytical techniques to investigate geographic patterns of HIV-1 infection among pregnant women has provided new insights into the magnitude of the HIV/AIDS problem in the Northwest Province of Cameroon. Small-area analysis by villages showed a number of 'hot-spots', an important factor in decision-making in the allocation of scarce finance resources. The corresponding data on ethnicity illustrate the correlation between different cultural practices and HIV/AIDS in the Northwest Province of Cameroon.

Geographic aspects of the disease were not captured by current HIV/AIDS surveillance and management techniques, which follow the traditional epidemiologic approach that focuses on person and time, ignoring location information.

10.4: Implications for the spread of the disease and HIV/AIDS policy

A noticeable outcome of the spatial analyses, which is complemented and reinforced by the survey data, is the increasing ruralisation of predominantly urban based disease-HIV/AIDS in Cameroon and in the Northwest Province in particular. The spread of the disease from urban to rural areas is probably due to the migration of HIV/AIDS patients from the major urban areas to the rural areas, as well as the bridging role of traders, truckers and commercial sex workers. Wallace et al. (1997) and Cliff et al. (1981:6) described the cascading of infectious diseases, including HIV/AIDS, from urban centres to villages as hierarchical diffusion, particularly along national and/or international highways. Consequently, there are potentials for the emergence of new forms of multi drug resistant HIV/AIDS and tuberculosis in the villages. The impacts of globalisation and international mobility have similar relevance to facilitating the spread of new forms of multi drug resistant HIV/AIDS and tuberculosis elsewhere.

Mobility combined with socio-economic and cultural factors, exacerbate vulnerability through social disruption that affects seropositive movers and their families. Mobility of asymptomatic HIV-positives enhances the probability of sexual partnerships being formed. Sexual partnerships formed between movers and local populations facilitate the relocation of the HIV/AIDS pathogen into new geographic areas and populations previously unaffected

(Wilson 1995). Decosas (1995) noted that the powerful motor for the spread of HIV/AIDS infection is the incredible burst of sharing of genital microflora. In this particular context, the sharing is between movers and local populations. Reducing vulnerability and exposure to HIV/AIDS infection, as well as the treatment of the infected are critical. GIS has a potent role to play in tracking infected movers, identifying "hot spots", and targeting preventive and care services. The health of individual patients in local communities is best ensured by maintaining or improving the health of the entire community (Satcher 1995). Not only is geospatial analysis vital for gaining detailed insights into the spatial distribution of disease determinants and health outcomes, but it has also made it possible to relate spatial incidence of the disease to its environmental and socio-economic aetiology (Higgs and Gould 2001). Hence, the identification areas of high prevalence is critical to targeting preventive and HIV care services, both in Cameroon and in other settings.

The spatial analysis of prevalence rates in the Northwest Province suggests that urban-rural migration is not the only explanatory factor triggering this shift in the reservoirs of infections. The broad arc-shaped geographic pattern of relatively high prevalence rates, adjoining the most important ring road and trading centres in the Northwest Province, suggests HIV transmission and high-risk behaviours are common in rural areas of Cameroon and in the Northwest Province in particular. Similar high-risk behaviours have resulted in the diffusion of HIV/AIDS elsewhere in the world. The social network concepts are used to describe social interactions, including sexual relationships, through which infectious diseases spread in the population (Klovahl et al. 1994; Wallace et al. 1997, Litva and Eyles 1995; Campbell 2000; Pierret 2000). Although the spatial pattern of HIV/AIDS prevalence rates in the Northwest province suggests the existence of social networks, which facilitate the spread of HIV/AIDS,

particularly in the rural areas, obtaining information to study network relationships was difficult. This is because HIV/AIDS patients were reluctant to give information, which might depict them as spreaders of the HIV/AIDS virus. In addition, the loose nature of sexual networks in rural settings also exacerbated the problem. However, the involvement of HIV-positives in conducting the survey was an important methodological technique in the HIV/AIDS survey that has relevance elsewhere.

This study proposes the need to enhance prevention and care programs of HIV/AIDS patients, particularly those with a spatial component such as the behaviour Sentinel Surveillance (BSS) in order to track the daily activity locations of patients. This is particularly important because some patients are involved in high-risk sexual behaviours, in particular after migrating to the rural areas. It is essential to target rural residents who commute to the cities to practice commercial sex activities and/or are clients of CSW in the BSS, prevention and care campaigns.

The migration of seropositives has a number of significant implications, for the spatio-temporal spread of the disease. A noticeable feature of these movements is that they originate in the cities and terminate in the villages. HIV/AIDS patients in the villages are in grave need of health services to improve their health status. As indicated earlier, basic preventive health infrastructure are largely non-existence in rural Sub Saharan Africa. The urban to rural mobility of HIV-positives leads to the movement of patients into low prevalence areas that may not be the focus of education and prevention programs (Wood et al. 2000) in Cameroon and elsewhere. In Cameroon, the available elementary health posts and/or village health workers lack diagnostic skill, infrastructure, and the experience vital in identifying and dealing

with HIV/AIDS patients and improve access to preventive and HIV care services. Access to preventive and care services is critical in the surveillance and management of HIV/AIDS. Health services are vital in HIV/AIDS education, post and pre-counselling, testing, treatment, nutrition and the general health care of the community.

Health care professionals and AIDS educators also display a central role in removing the stigma. The lack of information regarding HIV/AIDS in the rural areas perpetuates denial and reinforces the stigma. Denial is a common feature among seropositives in Cameroon. Hence, HIV/AIDS information are of critical importance to the local communities in order for them to accept, care and support seropositives. HIV/AIDS information are also relevant to carers in the local communities to protect themselves from contracting the disease. In this research for instance, an HIV-positive reported contracting the virus when the traditional doctor used a non-sterilized razor blade on the patient and the carers. O'Farrell (1987) noted the significant risk of contracting HIV/AIDS virus from treatment by witch doctors, as patients are seen with lacerated or cut bodies. In this regards, there is a significant risk of contracting the HIV/AIDS virus from treatment by witch doctors, mostly concentrated in the rural areas where there is poor or no access to prevention and HIV care information.

The aggregation of seropositives into the rural areas has important impacts, as they form the host reservoirs for maintaining infection chains of the HIV/AIDS virus. The introduction of the pathogen into villages and populations that have no previous knowledge of the disease may have severe impacts on the individuals and the community before preventive and care measures are implemented.

Various methods have been used to estimate seroprevalence based on reported AIDS cases. However, the mobility of HIV-positives has not been included in the considerations of seroprevalence for specific areas (Hugo 2001, Kristine et al. 1992). Since HIV/AIDS is a sensitive issue, the mobility of seropositives into inaccessible rural areas aggravates the difficulty in gathering HIV/AIDS information. Moreover, tracking HIV-positives in Cameroon is problematic because there are no registries that provide clinical, administrative and management reports of the patients. The mobility of HIV-positives can lead to an incorrect estimation regarding prevalence patterns (Higgs and Gould 2001). The implication is the potential exclusion of HIV/AIDS-positives in the extrapolation of prevalence rates. Although mobility is a significant factor in the spread of HIV/AIDS, the role of mobility decreases as the number of HIV/AIDS cases in the villages increase.

It is important to indicate the comprehensive nature of the present study in not only establishing the spatial epidemiology of HIV/AIDS, but also in relation to the accessibility of preventive and HIV care services, and in planning health service location. Underestimating the magnitude of the epidemic affects funding and service provision that is based on the number of reported cases. Kristine et al (1992) indicated delays in the introduction of AIDS education in rural areas of Iowa in the United States of America due to poor estimation of prevalence rates. The poor allocation of preventive and care resources makes it difficult to access AIDS education and treatment. In this context, this study contributes to improving preventive and HIV care services in Cameroon, with the potential for application elsewhere.

Due to the stigmatisation of HIV/AIDS, information concerning people living with HIV/AIDS is treated confidentially. In addition, HIV/AIDS-patients often deny their serostatus. It is of

critical importance to indicate that in Sub Saharan Africa and Cameroon in particular, confidentiality perpetuates HIV/AIDS transmission. Partners of HIV-positives are particularly exposed to infection because they do not have the right to access information pertaining to their husbands or wives. Seropositive who choose not to inform their sexual partner(s) about their serostatus, expose them to infection. It is not unusual for people living with HIV/AIDS and involved in activities requiring mobility to have sexual partners in different geographic regions. Denial of serostatus leads to unprotected sexual intercourse with their wives and/or partners. Hence, confidentiality reinforces denial and stigmatisation and in doing so aggravates the exposure of the community to HIV/AIDS infection. Consequently, seropositives who do not make behavioural changes in the areas visited and are engaged in unsafe sexual practices are spreaders of the disease.

10.5: Priorities for the future

There is clearly a grave need to implement the recommendation of the National Strategic Plan for the Fight Against AIDS in Cameroon (2000-05) to use GIS to identify high-risk areas, track the epidemic and target intervention efforts. This study is the first attempt to integrate spatial data into the surveillance and management of HIV/AIDS in Cameroon, specifically in the Northwest Province. While the present study has demonstrated the benefits of a geospatial approach in the surveillance and management of the disease, the following recommendations regarding future priorities are made in light of the specific study undertaken in this thesis and with recognition of its limitations.

HIV/AIDS trends occur over time, therefore priorities must not only be spatial in nature but also temporal. As new HIV infections are detected in an area then its priority may change, in turn affecting prioritisation of all other areas. Hence, spatial data of HIV/AIDS must undergo repeated location analyses, with priorities being updated each time new HIV/AIDS diagnoses are made. Although in the present study there is no time series analysis, the study has provided baseline data for future spatial analyses including a time series analysis. Such time series analysis carried out throughout Cameroon will provide new insights into the geographic patterns and trends of HIV/AIDS in the country.

In order to fill gaps in data, it is important that a similar study to the present one undertaken for the Northwest province, be undertaken in other provinces of Cameroon. Spatial analyses of HIV/AIDS data at finer scales (boundaries of villages and council areas) will provide new and deeper insights into the geography of the HIV/AIDS epidemic in Cameroon. Such research will not only contribute to the understanding of spatial patterns of HIV/AIDS in Cameroon, but will also facilitate the understanding of the link between the spread of the epidemic in Cameroon and the Central Africa subregion. The understanding of the epidemic within the context of Central Africa is particularly crucial for Cameroon, as Douala, the economic capital of Cameroon, is the port of entry into the subregion. Many people from neighbouring countries including Nigeria, Chad and the Central African Republic come to Cameroon to look for work and periodically return to their home countries (Handyside 1998).

There is also a need to use spatial modelling techniques to optimise service locations and measure access to preventive and HIV care services in other parts of Cameroon. In addition to improving attribute data, further research in the area of spatial analysis necessitates the

development of a standardized spatial database for Cameroon, for instance, at the level of census collection districts. Research in this area will not only benefit spatial epidemiology, individuals and communities, but is also critical for the socio-economic development of Cameroon.

A fully integrative approach to combating HIV/AIDS could also involve further research to include the role of socio-economic and cultural determinants at micro-levels that are accelerating the spread of the disease. This study has demonstrated the movement of HIV/AIDS from urban to rural areas. It is important to examine and spatially analyse the socio-economic impacts as a result of this movement, including the non-transfer of remittances from the urban to rural Cameroon.

10.6: Conclusion

In Sub-Saharan Africa, spatial HIV analysis is an innovative and useful approach to identifying high-risk areas of HIV transmission among the population and to model access to preventive and HIV care services. However, for the most part spatial analysis remains to be introduced. In the National Strategic Plan for the Fight Against AIDS in Cameroon (2000-05) there is recognition of the need to incorporate spatial data in the surveillance and management of HIV/AIDS. Generally, the integration of spatial data into the surveillance and management of HIV/AIDS, as demonstrated in this thesis, is not an attempt to provide a definitive panacea to the problem of HIV/AIDS in Sub Saharan Africa and Cameroon, but rather makes a significant spatial contribution within the scope of a multidisciplinary approach to scale down HIV/AIDS in Cameroon and Sub Saharan Africa.

APPENDIX 1

ADELAIDE UNIVERSITY AUSTRALIA

OFFICE OF THE VICE-CHANCELLOR

Applicant: PROFESSOR G HUGO

Department GEOGRAPHICAL & ENVIRONMENTAL STUDIES

Project Title ACCESSING HEALTH SERVICES IN CAMEROON: THE CASE OF HIV/AIDS INFECTED PEOPLE

ADELAIDE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE

Project No **H-42-2001** *4648*

APPROVED for the period until **30 November 2002**

Noting

- that this study will be conducted in the Cameroon and involves Mr Lukong Paul Foka, PhD candidate
- that it has two stages, the first in October 2001 to enable official clearances and preliminary fieldwork towards finalisation of the questionnaire and survey methodology, and the second larger visit in 2002 for collection of primary data
- that patients will be advised that their participation is voluntary and that they can withdraw at any stage in the course of the research with no disadvantage to them

Approval is subject to:

- approval of the relevant Cameroon Government ethics committee;
- although recognising that verbal consent will be obtained, that written information regarding the study will be given to subjects for their reference
- that the details of the final methodology including confidential storage and the questionnaire will be provided to the HREC for subsequent approval, prior to commencement of the second stage

Refer also to the accompanying letter setting out requirements applying to approval.

Professor CE Mortensen
Convenor

Date 14 AUG 2001

Enquiries: Helen Malby, Secretary, Human Research Ethics Committee

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Yaoundé, le 26 novembre 2001

CLEARANCE ETHIQUE

Le Comité National d'Ethique a examiné ce jour le projet de recherche intitulé « Accessing Health Services in Cameroon : The case of seropositives » introduit par Monsieur LUKONG Paul FOKA et Collaborateurs.

Le projet ne comportant aucune méthode invasive préjudiciable aux sujets d'étude, le Comité National d'Ethique ne formule aucune réserve à sa réalisation.

En foi de quoi la présente Clearance Ethique est délivrée pour servir et valoir ce que de droit.

LE PRESIDENT

Professeur Lazare KAPTUE

APPENDIX 2

ACCESSIBILITY TO HEALTH SERVICES: HOSPITAL–BASED SURVEY

Section A: General information

A1 Sex: Male Female

A2 Tribe _____ Religion _____

A3 How old are you? _____

A4 Where were you born? _____

A5 In which area (village) do you live now _____ how long have you been living there _____

A6 At which level did you leave school? _____

A7.1 Are you currently working (tick one box): Yes No (go to A.7.3)

A7.2 If yes, where is your work place found _____ what type of work do you do? _____

A7.3 If no, where was your last work place located _____ and what type of work did you do? _____

A 7.4 What other source of income do you have? _____

A8.1 Which of these describe your marital situation (please tick one box and answer

(please tick only one box and answer the associated question)

the questions associated to it)? 1: married → when did the relationship start?_____ ii de facto iii cohabitation iii divorced → when did the relationship end?_____ iv: single → do you have a regular boy/ girl friend? ------ Yes ------- No-

A8.2 Do you have any other partner? Yes No (go to section B)

A8.3 If yes, have you had sex with this person, within the last 6 months? - Yes-- No

A8.4 If yes, was there an exchange of gifts? -------- Yes---------- No.

A8.5 If yes, please state the type of gift you either received or gave _____

_____

Section B: Question regarding health status

B 1.1 On a scale of 1 - 5 how would you rate your health?

1 very healthy ---------- 2 healthy---------- 3 ok

4 unwell ---------- 5 very unwell

B.1.2 If 4 or 5 what do you think is making you unwell? _____

_____

B1.3 How long have you been feeling unwell? _____

B 2.1 Have you received treatment in other hospital within the last 12 months?

Yes No

B 2.2 If yes, state the name of the hospital and where is this hospital located?

A: name_____ B: location of hospital_____

B3.1 Have you tested for HIV/AIDS at the hospital? Yes No

B3.2 If yes, did you find out the results of the test? Yes No (males go to Q B5.1)

B 3.2.1 Please state the reason for not seeking the result and go to Q B5.1

_____

_____

B3.3 If yes, what was the result diagnosed? I negative II positive
III unknown

B 4.1 For female, are you expecting to have a baby □Yes □ No (go to QB5.1)

B 4.2 In which hospital and place are you going to deliver? _____

_____

B5.1 If no, was any other illness diagnosed? Yes No

B 5.2 If yes, what was the illness diagnosed? _____

_____

B5.3 Is the diagnosed illness making you unwell? Yes No

B5 4 If no, do you think any of these is making you unwell (please tick one box)? ----------
----- A: Witchcraft ---------- B: Ancestors angry ---------- C: Natural ----------
D: Contaminated food ---------- D: -Bad water

B 6.1 Has your partner been tested for HIV Yes NO

B 6.2 If yes, have you discussed the results with your partner? Yes NO

B 6.2 If yes, what is the HIV status of your partner (spouse)?

Unknown positive negative

B 6.3 If no, please, state the reason for not seeking to know the results

_____

_____

Section C: Questions regarding treatment

C 1 How long did you take to reach the hospital (please tick one box)?

<1 hour---------- 2 -3 hours--------- >4 hours

C 2 How much did it cost you to get to the hospital? _____

C 3 How long did you wait t o start your consultation?

<30 minutes 30-60 minutes >60 minutes

C 4 How many weeks have you been in this hospital? <1 wks 1-3 wks

>3 wks

C.4.1 Did you come to the hospital immediately you felt unwell? Yes NO

C4.2 If no, which of the following explain why you did not come to the hospital sooner:

A lacked money B sought traditional medicine C did not feel sick

D self treatment E hospital too far F others (please explain)

_____

_____

C 5.1 Who pays for the treatment? --------- A: myself-------- B : family (husband, wife /parents)--------- C: others (friends, church, red cross)

C 5.2 Which of these explain how your treatment is / was paid for?

I: cash---------- II: worked to cover treatment--------- III: gifts ---------

IV: others (please explain)_____

_____

C 6.1 On a scale of I - 5, how satisfied are you with your current treatment?

I: very satisfied---------- 2: satisfied ---------- 3: ok--------

4 not satisfied---------- 5: very dissatisfied

C 6.2 Please give a reason for the choice above _____

_____

C 7 Please is there any suggestion of anything you think that can be done to improve your health situation_____

_____

PATIENTS' ACCESSIBILITY TO HEALTH SERVICES IN CAMEROON: COMMUNITY SURVEY

Sex:---------- Male ---------- Female---------- Religion_____

How old are you? _____

Where were you born?_____

Where do you live now _____ how long have you been living there? _____

At which level did you leave school? _____

Are you currently working (please tick one box): ---------- Yes -------- No

If Yes, Where is your work Place found _____ what sort of work do you do?

_____

_____

If No, where was your work place located _____ and what type of work did you do? _____

Do you have any other source of income? _____

Which of these describe your marital situation (please tick one box)? -------- 1: Married--------

when did the relationship started? ---------- II De facto (cohabitation)---------- III

Divorced ---------- when did the relationship ended? ---------- IV: Single (please go to question

Do you have any other partner? ---------- Yes ---------- No

If yes, have you had sex with this person, within the last 6 months? ------ Yes ------- No

If yes, was there an exchange of gifts? -------- Yes---------- No.

If yes, please state the type of gift you either received or gave _____

_____

Section B: Questions regarding your health and treatment sought

On a scale of 1 - 5 how would you rate your health?

I Very healthy ---------- 2 Healthy---------- 3 Ok---------- 4 Unwell ---------- 5Very unwell

If 4 or 5 what do you think is making you unwell?

Have you received any treatment in the hospital within the last 12 months?

Yes---------- No

If yes, what is the name of the hospital and where is this hospital located (fill in the spaces below)?

A: Name_____ B location (town)_____

Were you tested for HIV/AIDS at the hospital?---------- Yes---------- No

If yes, did you find out the results of the test?---------- Yes ---------- No-----

please state the reason for not seeking the result_____

_____

Were you diagnosed with an illness at the hospital? ---------- Yes---------- No

If yes, what was the illness diagnosed? _____

_____

Is the diagnosed illness making you unwell? Yes No

If no, do **you** think any of these is making you unwell (please tick only one box)? ----------

A: Witchcraft ---------- B: Ancestors angry ---------- C: Natural ----------

D: Contaminated food ---------- D: --------Bad water

Have your partner been tested of HIV---------- Yes---------- No

If yes, have you discussed the results with your partner? ---------- Yes---------- No

If no, please, state the reason for not seeking the results _____

_____

_____

_____

Section C: Treatment

Currently you are not in the hospital, please tick one box that best describes your reason for not receiving hospital care.---------

A Chose to be cared for by family --------- B: Sent home by the hospital --------- C: Religious reason---------- others (please explain) _____

_____

Are you receiving any treatment for a health related illness at the moment?

--------- Yes--------- No

If yes, what is the nature of your treatment? ---------- A: Traditional healer-------- B: Purchasing drugs.

If purchasing drugs, tick any that best describes the source. --------- I: Pharmacy,--------- II hawkers, --------- III: Sharing with relatives --------- IV: others (please explain) --------- V: Hospital visits --------- VI: being cared for by family

Did you come to this village or town for this treatment? ------- A: Ye ------- B: No

If yes, why did you choose this place? --------- I: Live to be closer to treatment ------- II: Cheaper treatment--------- Be cared for by the family

How many weeks and/ or months, have you been on this treatment? _____

Who pays for the treatment? --------- A: Myself--------- B: Family (husband, wife /parents)-------- C: Others (friends, church, red cross)

Considering the nature of your illness, please explain how you pay for this treatment?

_____

_____

On a scale of I-5, how satisfied are you with your current treatment?

I: Very satisfied---------- 2: Satisfied ----------3 : Ok----------

4 Not satisfied---------- 5: Very dissatisfied

Please give reason(s) for the choice above _____

_____

Which of these explain how your treatment was paid for?

I: Cash---------- II: Worked to cover treatment--------- III: Gifts from (friends, red cross) --------- IV: Others (please explain)_____ _____

_____

Please is there any suggestion of anything you think that can be done to improve your health situation_____

_____

_____

_____

_____

_____

_____

_____

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