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**CELL-LIFE: A NEEDS ASSESSMENT
STUDY FOR AN HIV/AIDS MANAGEMENT
TOOL.**

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**CELL-LIFE: A NEEDS ASSESSMENT STUDY FOR AN HIV/AIDS
MANAGEMENT TOOL.**

A dissertation presented to the Department of Civil Engineering University of Cape
Town

In fulfilment of the requirements for the degree of Master of Science in Civil
Engineering.

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August 2003

III

DECLARATION

I hereby declare that this thesis is my original work and has not been submitted in any form to another University.

Signed by candidate

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ABSTRACT

This research presents a proposal for the assessment of technology to manage antiretroviral treatment. The system called Cell-Life has been successfully tested at a pilot site in Gugulethu, Cape Town from September 2002 till date and offers a cost-effective solution for adherence monitoring, side effect management, effective home based care and reducing pill count dependence at the clinic.

With the aid of the Cell-Life SIM card menu (please see *Appendix A*, page 63) on a cell-phone the therapeutic counsellor is equipped with a live-link to the clinic or doctor while visiting patients. The menu allows entering data about the patient's drug adherence, side effects and symptoms, scheduling visits to the clinic and alert messages. The data is sent using short message service (SMS) and stored in a database, which can be accessed via the Internet by a doctor who will receive a complete report on the patient's status quo. The main benefits of the system lie in creating a communication link between the clinic/doctor and the therapeutic counsellor at minimal cost. Another benefit is the collection of reliable data relating to drug adherence and the minimising of human error through pre set menu options on the phone.

The pilot study has shown that management of anti-retroviral therapy is possible in resource-constraint urban settings. But for a provincial or national rollout of the Cell-Life system, the challenge is the lack of the required infrastructure, technology, personnel and logistics for effective operation of the Cell-Life systems specifically in the rural areas of South Africa. This research investigated the availability of the Cell-Life requirements in the Western Cape.

The findings showed that the Cell-Life systems could be implemented in the health regions investigated across the Western Cape. It was also shown that an in depth needs assessment study is required before implementing the Cell-Life system in any community.

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GLOSSARY OF TERMS AND ABBREVIATIONS

ADHERENCE	Ability for a patient to adhere to a treatment regime
AIDS	Acquired Immune Deficiency Syndrome which in the context of this research is caused by the human immunodeficiency virus (HIV)
ANTI-RETROVIRAL DRUGS	Drugs that inhibit the HIV virus from replicating in the body
CLINIC	A health facility for outpatient care
HIV	Human Immunodeficiency Virus
HIV/AIDS	Acquired Immune Deficiency Syndrome that is caused by the human deficiency virus
RURAL AREA	An area outside of cities and towns
RURAL CLINIC	A clinic situated in a rural area.
TREATMENT REGIME	Course of drugs as prescribed by a medical doctor.
URBAN AREA	A geographical area constituting a city or town

CHAPTER 1

1.1 BACKGROUND TO THE STUDY

HIV/AIDS has been identified as one of the leading causes of death in South Africa. The Medical Research Council estimates that in the year 2000 alone, 40% of adult deaths aged between 15 and 49 were HIV/AIDS related. The overall adult death rate related to HIV/AIDS was 20% in the same year. The projections show that without treatment, the number of HIV/AIDS related deaths could be expected to reach over 5 million by the year 2010. (Galloway 2001)

The introduction of anti-retroviral drugs (ARV's) as part of HIV clinical care is seen as one way to prolong and improve the quality of life of HIV positive patients. Effective anti-retroviral therapy requires a 95% adherence rate to the anti-retroviral therapy supported by a strict time and diet regime. To achieve the required adherence rate structures must be provided to increase the patient's adherence to the therapy. Regular intake of medication must be promoted so as to avoid developing new HIV drug resistant strains. In addition, side effects need to be monitored closely to ensure patients are well advised in time to stop or to change their medication. (Hermann 2002)

The monitoring of treatment is not a new phenomenon. The example of the spread of Tuberculosis (TB) through unmonitored treatment is known worldwide. Although there are drugs available to treat TB, multi-drug resistant strains of TB have even been found in first world countries such as the United Kingdom (UK). Patients not adhering to their treatment regime give rise to multi-drug resistant TB strains. To combat the spread of these resistant strains, measures are adopted to ensure patients adhere to their medication. According to Coker (2001), a doctor in the UK may authorise the detention of a patient if it is believed that other people are at risk of infection by having contact with a non-compliant patient. (Coker 2001)

Monitoring of anti-retroviral treatment is part of the solution for effective HIV/AIDS management. The Cell-Life system stems from this idea. It aims to assist the current health care services by establishing a virtual infrastructure through a combination of telecommunications, the Internet and Geographical Information Systems (GIS). The

GIS serves the purpose of capturing, storing, checking, integrating, manipulating, analysing and displaying spatial data related to HIV/AIDS. In addition, the GIS will assist public health officials and policy makers to identify the places and communities where there is the greatest need for HIV/AIDS prevention. Areas where the lack of infrastructure is severe will be highlighted in the GIS. For further reading on the topic of GIS, please refer to *Geographical Information Systems: Principles and Technical Issues* (Longley *et al* 1999)

Figure 1 shows the overview of the Cell-Life system.

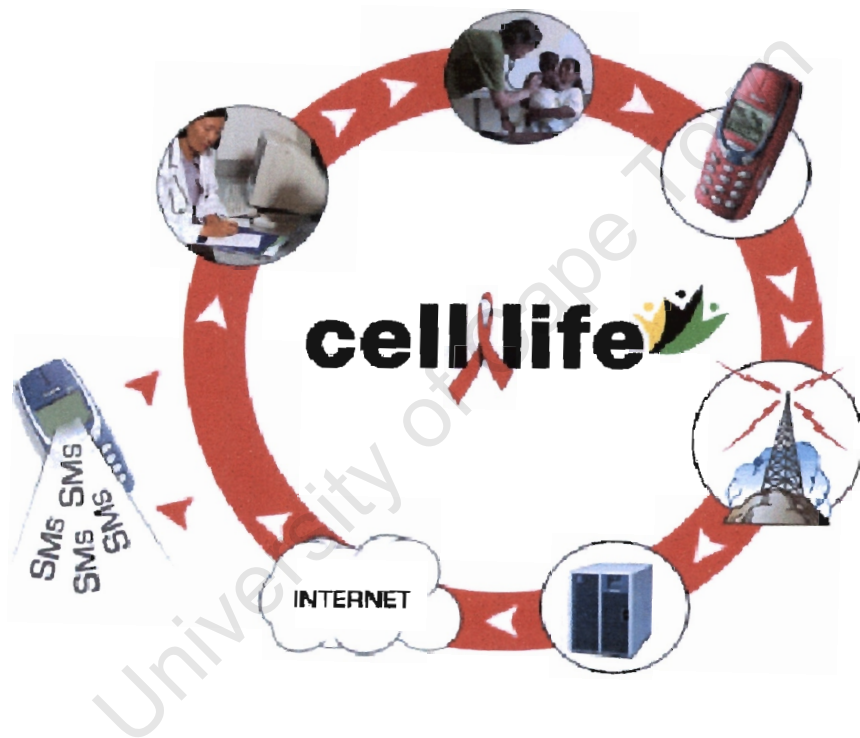


Figure 1 Cell-Life System's Overview (Davies *et al* 2002)

The main elements of the Cell-Life system are the database and the web server. The web server allows access to the database from any computer connected to the Internet. Short service messages (SMS) are sent and received via cell phones through the web server. (Davies *et al* 2002)

Currently a pilot study that is part of a drug trial is being run in Gugulethu, Cape Town. The Cell-Life system has been implemented in the drug trial to monitor patients on anti-retroviral treatment. Some of the HIV positive members of the community who are part of the trial are trained as therapeutic counsellors to understand the difficulties associated with HIV/AIDS. This is done so that the counsellor can act as a peer supporter and provide information about the difficulties that come with anti-retroviral therapy to patients. Each counsellor is employed to liaise with between 15 and 20 patients as well as the community clinic. (Bekker 2003)

Using a cell phone with a Cell-Life SIM card menu as shown in figure 2, a therapeutic counsellor collects data on the status of the patient. A detailed Cell-Life's SIM card menu can be found in *Appendix A*, page 63. The data collected ranges from the number of tablets taken since the last visit, to making a follow up appointment with the doctor. A doctor or nurse via Internet connection can access the information from the cell phones. Figure 3 shows a personalised page when a user logs into the Cell-Life website.



Figure 2 Cell-Life's menu (www.celllife.org)

celllife

HOME
ADHERENCE
SYMPTOM
APPOINTMENT
ALERT
VISIT
PATIENTS
LOGOFF

Hello Dr Davies

Welcome to the Cell Life management application.

You have 14 alert(s).

You have 3 new messages in your inbox.

From	Subject	Date
Thandi	Patient needs immediate attention	2002-08-14
Ursula	Nelfinavir Adherence reports for the last mont	2002-08-14
Angela	Appointment Request	2002-08-14

Your appointments for today are:

- 09h00 Mrs Ngubana Patient complained about rash and nausea
- 12h00 Mrs Nkuba Patient complained about nausea
- 14h00 Mr Fish Patient complained of severe chest pain

Figure 3 Cell-Life's personalised page (www.celldlife.org)

The database stores the patient ID, name, surname, location and current drugs that patients are taking. In addition, the database stores adherence reports, symptoms reports, appointments reports, alerts reports, visits done by counsellor, patient status and general comments about the patient as shown by Figure 4. Such database allows monthly/yearly reports about the status of the patient.

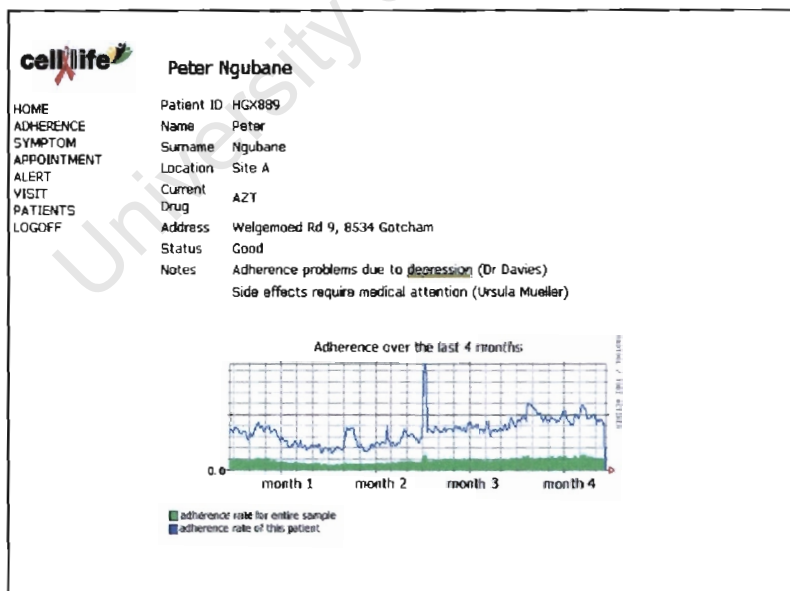


Figure 4 Patient folder (www.celldlife.org)

The above information is linked to the previously mentioned GIS that consists of geographical layers such as the position of the clinics, position of all patients on anti-retroviral treatment, road/streets layout, electricity coverage, cell phone coverage etc. For further reading on the use of GIS in this context, please refer to: The use of GIS in the management of HIV/AIDS: A Study of Gugulethu (Busgeeth 2003).

1.2 PROBLEM STATEMENT AND OBJECTIVE OF THE STUDY

The problem statement of this research is based on the need to provide management tools to efficiently manage anti-retroviral therapy. Effective anti-retroviral therapy requires effective home based care, effective adherence to the anti-retroviral drugs, effective early detection of side effect indicators, confirmation of socio-economic status of the patients, reduction in pill count dependence at the clinic and the provision of spatially referenced information. Technology can offer tools to efficiently manage the above-mentioned issues.

However, the problem is how to ensure success of such technology in the communities in terms of infrastructure, technology, staff and logistics as the needs differ from community to community. As with any introduction of a new technology, needs assessment studies must be conducted to identify gaps in the user communities.

This needs assessment study will support the identification of the current status of the infrastructure, technology, staff and logistics for successful implementation of the Cell-Life technology in the communities.

1.3 RESEARCH APPROACH

Questionnaires and interviews were used to perform the technical, infrastructure, staff and logistics assessments. Nurses who are managing the public clinics were targeted for interviews and completion of the questionnaires. For the questionnaire, please refer to *Appendix C* page 66. The stratified random sampling method was used to select a sample of public clinics in the Western Cape. The questionnaires and interviews requested the following information per clinic:

- infrastructure:
 - electricity supply
 - telephone connectivity and the number of telephone lines
 - accessibility of clinics to patients
 - existing computer infrastructure
- technology
 - the availability of the Internet
 - cell-phone coverage
- staff
 - the number of doctors and nurses
- logistics
 - the percentage of the community served by the clinic that has access to electricity
 - the percentage of the community served by the clinic that has access to a cell phone
 - management of patient information
 - computer literacy of staff members
 - the distance to the nearest clinic
 - form of transport used by patients to access health care
 - the availability of an ambulance
 - the number of beds
 - HIV/AIDS prevalence per clinic
 - are anti-retroviral drugs provided

1.4 SCOPE AND LIMITATIONS

Questionnaires and interviews will only be conducted in public clinics. A detailed discussion of the medical concepts of what causes a patient's non-adherence to drugs is beyond the scope of this study. In addition, this research is built on the premise that ARV's are effective treatment that can be provided to HIV positive patients to suppress the viral load in the body. The intension was to include the Boland health region in this research, but authorities in charge of the clinics in the area declined to participate. Due to time and financial constraints, only technological, infrastructure, staff and logistics assessments will be conducted.

1.5 STRUCTURE OF THE THESIS

To achieve the stated objectives of this research the thesis is structured as follows:

Chapter One:

The purpose of this chapter is to give background information on the current HIV/AIDS situation in South Africa. It uses the premise that ARV's are a clinical solution for HIV+ patients and argues for the importance of adherence to ARV's .A description of how Cell-Life manages anti-retroviral therapy in Gugulethu is given.

Chapter Two:

This chapter discusses how GIS and cell phone technology has been used in some parts of the world for health care management. A statement about the importance of conducting a needs assessment study for the successful implementation of the Cell-Life system is given.

Chapter Three:

This chapter discusses the concepts and theories of needs assessment studies. In addition, a needs assessment model is examined to highlight the procedures followed in conducting a needs assessment study.

Chapter Four:

This chapter gives the Cell-Life infrastructure, technology, staff and logistics requirements, which will support a successful implementation of the Cell-Life system in any community.

Chapter Five:

The background information about the Western Cape is presented. In addition, results of this research are shown using Bar graphs, Box and Whisker plots. Furthermore, the results of the ANOVA and Chi-square test are given.

Chapter Six:

The findings of this research are discussed. In addition, comparisons between the Cell-Life requirements per clinic and the status quo of the clinics are made.

Chapter Seven:

Chapter seven draws conclusions on the findings of this research. Furthermore, recommendations are proposed for future works.

The appendix section shows the following appendixes:

Appendix A: Cell-Life SIM card menu

Appendix B: Authorisation letter

Appendix C: Questionnaire

Appendix D: Cell-Life system

Appendix E: Confidence intervals

Appendix F: West Coast clinics

Appendix G: South Cape clinics

Appendix H: Metro clinics

CHAPTER TWO

2.1 HEALTH CARE AND TECHNOLOGY.

The primary aim of using technology in health care is to provide an improved service to the public. Technology enables the ease of data sharing, storage, manipulation, critical analysis and visual display of data, which allows effective management of large numbers of patients over a wide geographical area. To illustrate how technology has been used in health care and implemented successfully in a community, this chapter will discuss case studies where geographic information systems were used to manage malaria in Peru and South Africa. Furthermore, a case study is discussed where the cell phone technology is used to monitor patients on anti-retroviral drugs in the United States of America. Lastly, the Ugandan experience is discussed where technology was implemented to provide an improved service to pregnant mothers in the Iganga District.

2.2 CASE STUDY: GIS IN HEALTH CARE

The concept of using GIS in health care has been used to manage and monitor diseases such as malaria. In Padre Cocha, Peru, all houses, streets and public buildings were mapped using Global Position System (GPS), as there were no maps available for this site to efficiently evaluate malaria distribution. Each house was mapped and assigned a unique identification number. Information on the material used to construct the house was recorded. This was important, as damp houses tended to house more positive malaria.

Members of the community were trained on how to enter collected data to the GIS. To obtain demographic data for the village, the research team and the community conducted a community census. The health workers acquired the malaria case data continuously at the clinic. A location database was designed for the GIS, which was updated whenever a change occurred. The results of this project identified the “hot spots” of malaria cases, which assisted decision makers to take the appropriate steps to combat the spread of malaria in this study area. (Roper *et al* 1998) The Peru case study highlighted the use of community members, health workers and technology for disease management, which is one of the main aims of the Cell-Life system.

In South Africa, GIS has been used to map malaria distribution near the Mozambique border. Clinic technicians located the position of the hut that houses positive malaria using GPS. Collected data was brought back to the doctor who used a GIS to map malaria distribution in the area. The malaria distribution layer was combined with different layers such as roads, rivers etc. The GIS system identified the worst off affected communities, which allowed decision makers to channel resources to the highest need areas. (Martin *et al* 2002)

Both case studies show that the concept of using GIS in malaria management works. It can be assumed the same concept can be used to manage HIV/AIDS, but the challenge will be the privacy issue associated with declaring one's HIV status. Currently in South Africa, only the patient can disclose his or her HIV status. This makes it difficult to determine the actual HIV prevalence by areas and therefore planning becomes impossible. At the moment, predictions of HIV infection rates are determined by extrapolating antenatal surveys. The Cell-Life system will guarantee privacy of the HIV positive patients by limiting access to the system to the medical professionals.

The proposal of combining the cell phone and GIS technology for HIV/AIDS management would allow an efficient method of acquiring, storing and analysing patient data. In addition, the cell phone would allow updating of patient data in the GIS on an auto-update basis. The cell phone will further provide a cheaper alternative to GPS for positioning purposes.

The Census 2001 of South Africa showed that 67.9% of the population consists of people with ages above 14 years. About 30% of these people are cell-phone owners (SCSA 2003). In 2001, 40% of adult deaths aged between 15 and 49 were HIV/AIDS related (Galloway 2001). Lastly, with over 14.4 million cellular subscribers in South Africa (SCSA 2003), it could be generalised that the South African public has adapted to using a cell phone. In addition, when the Cell-Life system is implemented countrywide, there will be no need of providing each and every patient with a handset. A challenge is the lack of electricity supply in some areas. However possibilities of using solar technology to provide a source of energy could be pursued.

2.3 CASE STUDY: CELL PHONE TECHNOLOGY IN HEALTH CARE

A project that uses cell phones to remind TB patients run by doctor David Green already exist at the Chapel Street clinic in Woodstock, Cape Town. When a doctor prescribes medication. The patients willing to be reminded of the time to take their medication have their names captured into a database. In addition, the database stores the times and medication to be taken by the patient. Text messages are then sent to the patient's handsets at relevant times containing the name of the drugs to be taken. (Green 2002)

Similar projects have been carried out in other parts of the world, where the cell phone technology has been used to deliver text messages to pagers to increase patients' adherence to their medication. Joe Nicholson who tested positive for the HIV virus in the mid-1980's in the United States of America developed MediMom in 1999. According to Fields (2001), Joe Nicholson asked one of his employees to write a computer program that will send the message "1234" to his pager three times a day to remind him to take his medication. The system was upgraded to use the Internet and wireless devices to deliver text messages to improve the patient's adherence to medication. The messages are sent at specific times with strict instructions on food restrictions and the number and names of drugs patients need to take at that particular moment. (Fields 2001)

To highlight procedures that can be followed in implementation of health care technology in a community, the Ugandan experience is discussed below.

2.4 CASE STUDY: THE RESCUER PROJECT

In an attempt to reduce maternal mortality in Uganda, the Rural External Services and Care for Ultimate Emergency Relief (RESCUER) was set up in the Iganga district in 1995. The RESCUER aimed to link Traditional Birth Attendants (TBAs) and Safe Motherhood Assistants in remote villages with health facilities. (Kaifuka 2000)

The RESCUER project uses two-way radios as a form of communication. In cases of emergency, the TBA is instantly able to establish contact with the identified referral

point. The TBA reports on the type of emergency and receives instructions on how to handle the case in order to reduce the chances of death. The health facility will then dispatch transport to the village to transport the mother to the hospital. If there is a need, the referral point will communicate with the district hospital for immediate ambulance response. (Kaifuka 2000)

The RESCUER project began by conducting a feasibility study to find out if the RESCUER system was feasible for the Iganga District. The district was divided into 12 catchments areas including two islands situated in Lake Victoria to identify health referral points. In each area, a health facility was identified as a potential referral point in terms of its proximity to the population, accessibility and serviceability. A needs assessment study was conducted to find out the weaknesses and gaps in terms of the size of the referral health point, the qualifications of available staff, available equipment, logistics, drug supply and the physical infrastructure. After collecting all the required data from questionnaires, interviews, workshops and site visits, a list of minimally required equipment for the RESCUER project was established. (Kaifuka 2000)

The referral points were equipped with very high frequency (VHF) radio base stations. The stations were on a 24-hour basis to allow the easy access of walkie-talkies to a cluster of TBAs in remote villages. Four to six TBAs shared a walkie-talkie. Solar powered VHF radio base stations were provided for areas where electricity supply was non-existing. (Kaifuka 2000)

As a quality check for the project, evaluation took place six months later. The evaluation assessed the projects strengths, weakness, threats, viability, sustainability and its potential for replication in other districts and other African countries. Some of the outcomes of the evaluation process identified a poor commitment from the health workers, patients and communities. Low salaries, inadequate medical equipment and poor health infrastructure were also identified as being barriers to the project's success. Even though there were problems associated with the project, the project was a success as the maternal mortality in this village was reduced. Table 1 shows some of the data collected in the village. (Kaifuka 2000)

Table 1 Results of the RESCUER project

Year	1995	1996	1997 (Jan to March)
Antenatal: re-attendance	24029	29894	4079
Normal deliveries	5410	6094	1356
Discharged undelivered	598	718	122
Abortion	752	616	184
Premature births	77	99	26
Peri-natal death	28	10	19
	1995	1996	1997(Jan-June)
Referrals	342	1028	579
Maternal death	48	33	16

Table 1 shows the RESCUER project contributed to the reduction of maternal mortality. The number of referrals increased which showed that the community was using the technology to assist pregnant mothers. There was no mention in the literature if the RESCUER project was expanded to cover a wider geographical area. (Kaifuka 2000)

The above-mentioned case study highlighted the importance of a district based needs assessment study before implementation of a health care technology in a community. By completing a needs assessment study, barriers that might hinder successful implementation of the health technology can be identified before the project commences. Some of the implementation difficulties of the RESCUER project were transport problems, lack of staff and untrained TBAs who tended to delay the referral of high-risk cases. (Kaifuka 2000) The RESCUER project makes no mention of patient information management.

In conducting the technical, infrastructure, staff and logistics analysis, this research will also look at the method used to manage patient information in each clinic. This procedure will enable the determination of computer literacy of staff in each clinic to assess what level of training should be provided to staff members before implementing the Cell-Life System.

2.5 SUMMARY

This chapter described how geographic information systems and cell phone technology has been used in some parts of the world for healthcare management. Lessons learnt from this chapter are that technology can provide an effective tool for diseases management over a wide geographical area. A community based needs assessments study before implementation of a healthcare technology in a community is a crucial step to its successful implementation. The next chapter will explore the concepts and theories of need assessments studies. In addition, a needs assessment model for successful implementation of a health technology is discussed.

University of Cape Town

CHAPTER THREE

3.1 NEEDS ASSESSMENT: DEFINING THE CONCEPTS

This chapter discusses the concepts of needs assessments studies and introduces a needs assessment model for health care technology projects.

Needs assessment studies are usually conducted when the circumstances require a specific status quo to change. According to Kaufman (1979) these studies are tools for constructive and positive change (Kaufman 1979). Jeffrey *et al.* (1996), in the paper *How to fail in project management without really trying*, state that one of the reasons for a project to failure is not conducting needs assessment studies. Kaufman (1979) defines a needs assessment study as a " formal process which determines the gaps between current outputs and required outputs and places these gaps in priority order." (Kaufman 1979: pp. 8)

Wachter (2000) defines a needs assessment study for a health care technology as a decision making tool that can be applied to developing a health care technology with the aim of examining the current status of a given health care service area. It involves identifying the infrastructure, technological, resource, cost and revenue needs. The outcome of the study should provide proof that the project will meet its own objectives and the needs of the community.

Below is a description of the Doolittle and Cooks needs assessment model for a health care technology project. (Wachter 2000)

3.2 THE DOOLITTLE AND COOK'S NEEDS ASSESSMENT MODEL

Conducting a need assessment study for health care technology projects is important, but there is no clear methodology as to how to perform this procedure. Methodologies vary from project to project. Wachter (2000) describes the Doolittle and Cook's needs assessment model as follows:

The Doolittle and Cook's needs assessment model considers three analyses: clinical, economic and technical. The model poses questions that need to be answered before

the implementation of a health care technology project in a community. A description of these three analyses is given below.

3.2.1 Clinical Analysis:

Clinical assessment challenges the project planner to identify the clinical area in question and identify the health care services that are offered and those that are not. Identifying the health care services dictates an understanding of where patients go for health care services such as the nearest hospital that offers specialised treatment. Health problems of the community and the resources needed to address these problems must be investigated. In addition, the clinical needs assessment must provide a list of all health care services that residents of the community have to travel to and forge the connection between these services and the health care technology project. The central question that must be answered by the clinical assessment is: What does the patient in the community lack that can be solved with the health care technology? In an attempt to answer this question, a list of all the technology and infrastructure that the community lacks is made. The next step is identifying how the project will be funded. The economic analyses aims to critically consider all expenses of the project. (Wachter 2000)

3.2.2 Economic Analysis

The primary question to be answered by an economic analysis is: Who will pay for all the expenses? A sample list of expenses to consider, as stated by Wachter (2000), is provided below. The list can vary from project to project, but the primary concern is not only to consider the obvious items like equipment purchases and telecommunication costs, but also to consider the less obvious expenses:

Sample expenses for a health care technology site as stated by Wachter (2000):

- program administrator salary
- nursing staff salary
- technician salary

- administration assistant salary
- equipment (server, computers etc)
- telecommunication line charges
- equipment maintenance
- equipment upgrade

According to Wachter (2000), the ideal way of cutting cost at the first phase of the project is providing fewer and less expensive services at the beginning until the project gets recognition (Wachter 2000). For Cell-Life, it is of utmost importance that the project gains enough recognition for possible funding from the South African government. In this way it will be able to provide a service to a wider population, as the Ministry of Health is the main organisation responsible for the planning and delivery of public health care services in South Africa. Investigating the technology available in a health care technology sites marks the beginning of the technological analysis of the Doolittle and Cook's model of needs assessment.

3.2.3 Technological Analysis

The technological analysis examines the technological needs and resources before starting a health care technology project. Some sites can have equipment that can also be used for the proposed health care technology project. For example, in the case of Cell-Life, some of the clinics may have Internet connection and computers that can also be used for Cell-Life purposes. The objective is to identify exactly what equipment is already owned and what must be purchased before offering health care technology services. (Wachter 2000). Goodman (1988) states that the technological analyses can be conducted co-currently with infrastructure analysis (Goodman 1988).

3.3 NEEDS ASSESSMENT STUDY: CELL-LIFE.

This research will adopt both the clinical and technology analysis from the Doolittle and Cooks needs assessment model. The questions to be answered by the clinical analysis will be addressed by the infrastructure assessment of this research. In addition to the clinical and technology assessment, staff and logistics assessment will

be conducted to investigate the availability of the required staffing and logistics to support a successful implementation of the Cell-Life system.

The economic analysis will not be conducted as the Cell-Life project has a working relationship with the Sozaphila project, which funded in conjunction with the Department of Health the salaries of the personnel. The cell phones, airtime and maintenance was funded by Vodacom South Africa. The Sozaphila project trains people living with HIV as counsellors and assists in improving the standard of living of the counsellors by providing anti-retroviral drugs and employment (Bekker 1999).

Community participation, which was not investigated, ties in with the Cell-Life needs assessment study. The reason for not conducting such analysis was the fact that it can be better conducted by Social Scientists who are specialised to deal with social issues. For the Cell-Life project, the community would include the patients, doctors and nurses. Community participation will address the following questions: “What are the exact needs of the patient? Can the needs of the patient be met through the health care technology or would another alternative be more appropriate? How do doctors and nurses feel about computers and what is their attitude towards technology” (Wachter 2000. pp 9). Emmett (2000) in his paper: *Beyond community participation? Alternative routes to civil engagement and development in South Africa* states that community participation is an essential step in implementing a project (Emmett 2000). For example, the introduction of solar ovens technology in rural Kenya entailed convincing the communities of the concept of solar ovens rather than providing the ovens. This included providing a demonstration of the technology to the communities to highlight the advantages the solar oven has compared to other available alternatives. The impact of convincing the community instead of providing solar ovens was that the community saw the need of the oven thus guaranteeing its usage. Providing the ovens to the community without a demonstration could have resulted in the solar ovens becoming “white elephants” that were of no use to the community. (Kammen 1993)

Siden (1999) from Wachter’s (2000), *Needs Assessment: A Key to Building Better Telemedicine Programs* suggests that health care technology planners should consider holding focus groups with all relevant groups to gather qualitative data about the

needs and resources of the remote sites. Obtaining this kind of information before the implementation of the health care technology project could help in building a health care technology project that meets the needs of the community. After collecting the necessary data on the needs of the community, demands for the health care technology project can be increased by educating the community about the health care technology project. This will highlight the benefits as compared to the alternatives available. This procedure will enable continuous use of the healthcare technology project by the communities. Project evaluation will be the last step to a successful needs assessment study of a health care technology project. This step will differentiate between conducive and non-conducive strategies. (Wachter 2000)

3.4 SUMMARY

In this chapter, the theories and concepts of needs assessment studies have been discussed. Lessons learnt from this chapter are that a needs assessments study is an important step to see through successful implementation of health care technology in a community. The next chapter discusses the infrastructure, technology, staff and logistics requirements for the Cell-Life system. The aim of the chapter is to show the core requirements that the needs assessment must investigate for successful implementation of the Cell-Life system

CHAPTER FOUR

4.1 CELL-LIFE REQUIREMENTS

The Cell-Life system aims to provide a tool for effective management of:

- adherence to anti-retroviral drugs by patients
- monitoring of side effects
- effective management of home based care
- monitoring socio-economic status of patients
- reducing pill count dependence at the clinic
- store patient, health worker and counsellors' information per clinic
- provide position of the clinic, patients, therapeutic counsellors, road/streets layout, electricity coverage, cell phone coverage and geographical referenced health data such as the most affected TB areas

This chapter presents the requirements that are needed for successful implementation of the Cell-Life system in a community. There are four categories of the Cell-Life requirements namely the infrastructure, technology, staff and logistics requirements. The author identified the above-mentioned requirements as the core requirements for effective operation of the Cell-Life System in a clinic. Requirements without which the Cell-Life system cannot operate are ranked the highest. All other requirements will be ranked high. Requirements that are ranked high are equally important, but the Cell-Life system can be operated without these requirements. Table 2 shows a detailed list of the Cell-Life infrastructure requirements, the relevance of the requirement to the Cell-Life system, the alternatives, the system requirements for the system per clinic and rankings. The suggested alternatives have not been investigated due to financial constraints, but may provide a realistic alternative in cases where the requirement is unavailable.

4.2 CELL-LIFE INFRASTRUCTURE REQUIREMENTS

The Cell-Life infrastructure requirements are electricity supply, telephone connection, accessibility to the clinics, computers and cell phones fitted with the Cell-Life SIM card menus.

Table 2 Cell-Life infrastructure requirements

Requirements	Relevance	Alternatives for Cell-Life	System requirements per clinic	Ranking
Electricity supply to the clinic	Supplying power to electrical equipment. Charging cell phones.	Solar power Generators	100% electricity supply	Highest
Telephone connection to the clinic	Internet access. Daily running of clinic.	Cell phone	1 telephone line	Highest
Accessibility to the clinic by patients	Delivering of drugs to the clinic. Patient, staff and councillor access to clinic	None	Accessible by road	High
Computer in the clinic	Database, GIS, data integration etc. Allows multiple users to log on to one database.	None	1 computer	Highest
Cell phones and Cell-Life SIM cards menus	Data acquisition tool	None	1 cell phone per counsellor	Highest

It is important to know what percentage of the community served by the clinic has access to electricity. If the clinic alone has an electricity supply in the community, then possibilities of cell phone battery exchanges should be taken into consideration in the implementation stages of the Cell-Life project. The suggested alternative for electricity coverage is a solar power generator. This is a realistic alternative to electricity but will depend on the availability of funds to install solar power equipment in the clinic. It is also important to know the percentage of the community served by the clinics that has access to a cell phone. This will provide information as to what level of training must be provided to the staff in the implementation stages.

4.3 CELL-LIFE TECHNOLOGY REQUIREMENTS

The Cell-Life technology requirements are computer packages, the Internet and cell phone coverage. Table 3 shows a detailed list of the Cell-Life technology requirements, the relevance of the requirement to the Cell-Life system, the system requirements per clinic, the alternatives and rankings

Table 3 Cell-Life technology requirements

Requirements	Relevance	Alternatives for Cell-Life	System Requirements per clinic	Ranking
Computer packages	Hosting of Cell-Life system	Paper based filing system	Please refer to section below	Highest
Internet	Information flow from cell phone to the world wide web and vice versa	Using cell phones for internet access	Standard	Highest
Cell phone coverage	Allows operation of a cell phone in the community	Paper based systems	100% cell phone coverage	Highest

Computer packages are the hardware and software that allows the Cell-Life system to be hosted in a computer. The hardware requirements for the Cell-Life system are:

- 950 MHz AMD Duron
- 256 Mega Bytes RAM
- 650K Cache
- 20 Giga Bytes hard disk
- PCI Slots
- Ethernet Cards: 1 co-ax and 1 RJ45
- CD ROM
- floppy drive
- 14" Monitor
- Keyboard and Mouse
- 1 x GSM Modem and Vodacom SIM
- 1 x Powercom 1000 VA unalterable power supply

The Cell-Life's open source free software requirements are:

- BSB UNIX OS
- PostgreSQL Database
- PHP and PERL Scripts

- Apache Web Server and Kammel Modem Software. (Anand 2003)

For an illustration as to how the software links with the hardware, please see *Appendix D*, page 71.

The existence of the required infrastructure and technology for the Cell-Life project in the community will not guarantee successful implementation. Adequately trained and well-equipped staff must also exist in the clinic. Table 4 shows a detailed list of the Cell-Life staff requirements, the relevance of the requirement to the Cell-Life system, the need for Cell-Life per clinic, the alternatives and rankings.

4.4 CELL-LIFE STAFF REQUIREMENTS

The Cell-Life staff requirements are a medical doctor, nurse, social worker, therapeutic counsellor and systems administrator. The availability of social workers, therapeutic counsellors and systems administrators were not investigated in this report. The use of social workers, therapeutic counsellors and systems administrators are currently uniquely used by the Sozaphila and Cell-Life projects.

Table 4 Cell-Life staff requirements

Requirements	Relevance	Alternative for Cell-Life	System Requirements per clinic	Ranking
Medical doctor	Responsible for managing of anti-retroviral therapy, home based care and socio-economic issues of patients.	None	One	Highest
Nurse	Assist the doctor in managing anti-retroviral therapy.	None	A minimum of one	Highest
Social worker	Counselling and training of therapeutic counsellors	None	One	Highest
Therapeutic counsellor	Collects patient data. Act as a counsellor to patients	None	One per twenty patients	Highest
Systems administrator	Managing of cell phones (maintenance, training of staff and airtime). Liasing with social worker Managing incoming data from cell phones	None	One per fifty clinics	Highest

The Cell-Life project does not aim to replace the medical doctor. It is a tool that will allow a doctor to manage a larger group of patients over a wider geographical area.

The doctor will work closely with the nurse, who will assist in managing anti-retroviral therapy. The social worker will work closely with the therapeutic counsellor and the systems administrator. In addition to counselling and training of the therapeutic counsellor, the social workers will liaise with the systems administrator to make sure cell phones are in working order. The systems administrator will be responsible for maintaining cell phones, training of staff members on the use of the Cell-Life system. In the long run, the Cell-Life system should allow the doctor to assign new cell phone numbers and authorise the usage of the Cell-Life's system to new counsellors. It is of utmost importance that the doctors, nurses, social workers and counsellors are well trained and equipped to efficiently operate the Cell-Life system.

4.5 CELL-LIFE LOGISTICS REQUIREMENTS

In addition to investigating the infrastructure, technology and staff available to the selected clinics across the Western Cape, this research will also investigate the logistics requirements for successful implementation of the Cell-Life system, which are shown in table 5.

Table 1 Cell-Life's logistics requirements

Requirements	System Requirements per clinic	Ranking
Access to electricity by community	30% per community	Highest
Access to cell phones by community	20% of the community	Highest
Computer literacy by staff members at the clinic	10% of the staff members per clinic	Highest
HIV positive patients at the clinic	Minimum of 10% per clinic	Highest

The Cell-Life technology will easier be adapted in the communities, when the technological aspects of the Cell-Life system are not new. An investigation to the percentage of the community served by the clinic that has access to electricity will gauge the need for cell phone battery exchanges between the clinic and the therapeutic counsellor's place of residence. Where electricity supply is non-existing at the counsellor's place of residence, the counsellor can exchange an empty cell phone battery for a recharged battery at the clinic. The minimum requirement for the Cell-

Life system is electricity supply to the clinic. The 30% access to electricity stated as systems specification for the Cell-Life system per clinic is an experience related to the developers of the system.

The level of training to be provided to the therapeutic counsellors will be identified by the percentage of the community served by the clinic that has access to cell phones. High percentage of access to cell phones will show easier adaptation of the cell phones by the counsellors whereas low percentages will show the need for an in depth training to be provided to the counsellors. Communities where there is a high percentage of staff that are computer literate will easily adapt to the Cell-Life system, as staff members will be familiar with the use of computers.

Where distances between two clinics are above the average walking distance for a person in South Africa, which currently stands at 4.5 km (Behrens et al 2002) possibilities of providing transport to counsellors will have to be investigated. Ideally, a counsellor will manage patients in the vicinity of his/her residential place.

The percentage of patients that are HIV positive defines if there is a need for the Cell-Life system in the community. A minimum of 10% is required to justify development cost for the Cell-Life system.

4.6 SUMMARY

This chapter discussed the infrastructure, technology, staff and logistic requirements of the Cell-Life system. The above-mentioned requirements form core requirements for the Cell-Life system to operate efficiently and to provide an anti-retroviral therapy management tool in the community. The requirements are based on the experiences related to the developers of the system. The next chapter explains why the Western Cape was selected as a study area for this research. In addition, the methodology used to conduct the technical, infrastructure, staff and logistic assessment in selected clinics across the Western Cape is discussed. Lastly, the results of the technical, infrastructure, staff and logistics assessment in the selected clinics across the Western Cape are presented.

CHAPTER FIVE

5.1 WESTERN CAPE STUDY

South Africa consists of nine provinces with an estimated population of 44.8 million people (Stats SA 2003). Table 6 shows the percentage of the population in each province and the estimated HIV/AIDS prevalence rate per province, extracted from the results of the South African Census 2001 and the antenatal clinic survey of 1999 conducted by the Department of Health of South Africa.

Table 6 Population % and HIV/AIDS prevalence rate in South Africa

Province	Percentage of population (2001)	Estimated HIV prevalence rate in percentages (1999)
Eastern Cape	14.4	18.0
Free State	6.0	10.1
Gauteng	19.7	11.4
KwaZulu-Natal	21.0	27.9
Limpopo	11.8	27.3
Mpumalanga	7.0	32.5
Northern Cape	1.8	18.0
North West	8.2	23.9
Western Cape	10.1	7.1

According to the above-mentioned statistics, KwaZulu Natal has the largest population in the country followed by the Gauteng province. Mpumalanga has the largest number of HIV-infected people followed by KwaZulu Natal. Provinces that are worst affected by HIV/AIDS pandemic need management tools like the Cell-Life system to be implemented to effectively manage the pandemic.

The Western Cape will be used in this study as a model for the national rollout of the Cell-Life system. It was selected on the basis that the author was familiar with the Western Cape since based at the University of Cape Town. The Cell-Life project has a working relationship with the Department of Health in the Western Cape, which made it easier for the author to collect data. In addition, the Western Cape has areas

that represent both rural and urban settings, which will allow conclusions to be drawn that are representative for a national implementation of the Cell-Life system. However, the fact that the Western Cape has always been and still is one of the most developed provinces in the country should be taken into consideration in the final conclusions of this study (Stats SA 2003).

5.2 BACKGROUND INFORMATION

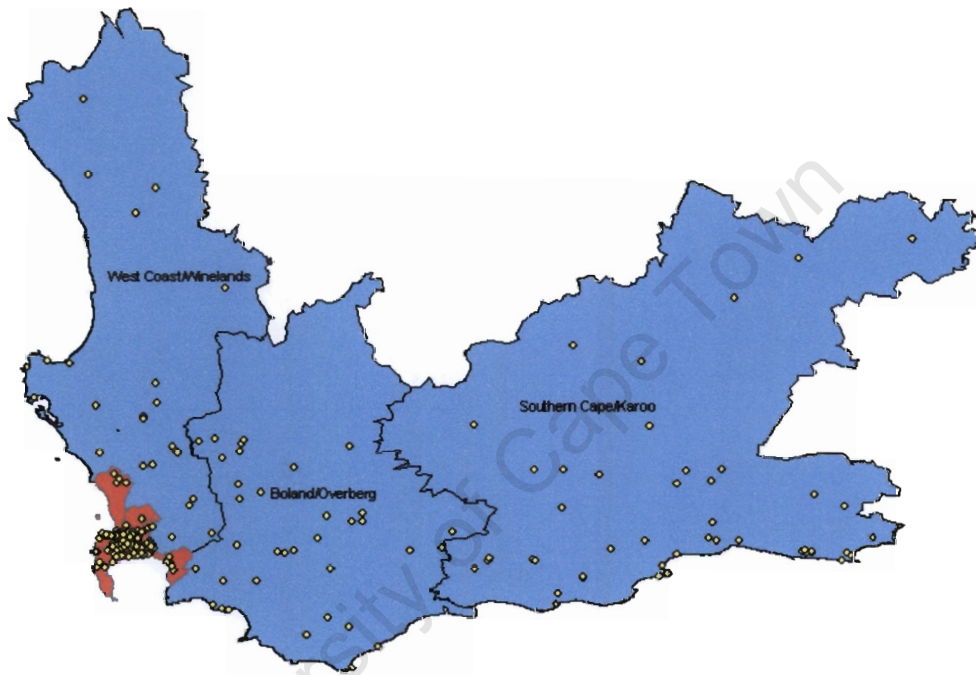


Figure 5 Health regions of the Western Cape (Department of Environmental Affairs and Development Planning 2003).

Figure 3 shows the Western Cape divided into four health regions, namely Boland, Metro, South Cape and West Coast. The region in red is the Metro Health region. The highest authority that is responsible for clinics in the four health regions is the Department of Health in the Western Cape. The yellow points are positions of clinics across the Western Cape. It can be seen that a high concentration of clinics falls in the

Metro health region, whilst other three health regions show a high concentration of clinics along the coast. The shorter the distances between two clinics implies a high concentration of people in that area. The distances between two clinics along the coast is shorter compared to clinics situated inland (Department of Environmental Affairs and Development Planning 2003).

The Western Cape has a population of 4.5 million people (Stats SA 2003). 55.2% of the population have access to a telephone or a cell phone, which is the highest of all provinces in South Africa. A total of 88.9% of the population lives in urban areas. The province has the highest educational rates compared to any other province with a total of 10.6% of people aged 20 years and above holding tertiary qualifications. Gauteng province follows second with 8.4%. 39% of the population in the Western Cape have at least a secondary school education. (Stats SA 1998)

As far as provincial health infrastructures are concerned, the Western Cape has a total of 287 health infrastructures. 229 of these health infrastructures are provisional clinics, of which 55 are in the Boland, 86 in the Metro, 48 in the South Cape and 40 are in the West Coast Health region. The spatial distribution of the health clinics is such that health infrastructures are easily accessible by roads. The rest of the health infrastructures are Community Health Centres, Correctional Services, Youth Centres and Dental Centres. (Department of Environmental Affairs and Development Planning 2003).

The 2001 HIV Antenatal Survey conducted by the Department of Health of the Western Cape, showed an estimated HIV/AIDS prevalence rate of 9.2%, which is an increase of 2.1 % from the 1999 antenatal clinic survey, conducted by the Department of Health of South Africa. There have been a number of reasons to explain the increase, but these are beyond the scope of this research. The Khayelitsha Health District, which falls under the Metro health region, has the highest HIV/AIDS prevalence rate of 22% (Department of Health 2003). Ideally this would be the perfect setting to test the Cell-Life technology. However, local pilot studies are already at an advanced stage aiming to create a model for anti-retroviral therapy management in resource constraint settings. The Medecins Sans Frontiers (MSF) project works in collaboration with the provincial government of the Western Cape to provide support

to a government-run programme to prevent mother-to-child transmission of HIV. It also runs infectious disease clinics within the government primary health care centres. Three clinics were opened in April 2000 and have provided treatment for opportunistic infections for over 2,300 people living with the HIV virus in Khayelitsha. The MSF project aims to show that it is feasible to administer anti-retroviral therapy in resource poor settings and develop a model for anti-retroviral rollout across South Africa based on family support. Therefore the MSF project was not suitable for the Cell-Life system since it does not use the concept of therapeutic counsellor's, which forms a core requirement of the Cell-Life system's operation.

5.3 METHODOLOGY

A combined qualitative and quantitative study was carried out in selected clinics across the Western Cape between the 1st of March and 31st of May 2003. A sample of 53 public clinics was selected to investigate the current infrastructure, technology, staff and logistics available at these clinics.

5.3.1 Sampling Method

The stratified random sampling method was used to select the clinics. This sampling method involves dividing the population into homogeneous subgroups and then performing a simple random sample in each group. Simple random sampling is to select a sample size out of a population such that every unit has an equal chance of being selected. (Gumedze 2003) For this research, StaPro® in Microsoft Excel® was used to perform the simple random sampling. A minimum of 25% of the total number of clinics per health region was considered enough for a sample size to truly represent all the clinics in that health region (Gumedze 2003). In an attempt to have a homogeneous population, only clinics were considered for this research. Community Health Centres, Correctional Services, Youth Centres, Reproductive Centres etc were excluded from this research.

Authority to conduct this research in the City of Cape Town was obtained from the Director of Health Services for the City of Cape Town. Please see *Appendix B* page 64 for approval letter. A verbal consent to conduct the research was obtained from

nurses and area managers who are managing the clinics in the South Cape and West Coast health regions. Table 7 shows the number of health facilities in each region, the sample size from each region and the percentage of the total number of health facilities that constituted the sample size. The intention was to include the Boland Health region in this study, but officials in charge of clinics in this region declined to participate in this research.

Table 7 Sample size per health region

Health region	Number of facilities	Sample size	Sample size percentage
Metro	86	34	40
South Cape	48	8	17
West Coast	40	11	28
Total	174	53	30

Table 7 shows 17 % of the clinics in the South Cape health region formed the sample size for this health region. This was due to the difficulties experienced by the author in acquiring permission to conduct the study in this region. Under these circumstances, even though the sample size was below the suggested minimum of 25 %, it was considered enough to draw conclusions from data collected. The overall sample size was 30%, which was more than the expected minimum sample size that could truly reflect the situation on the ground for the three health regions. For a list of the selected clinics please see *Appendix F, G and H*, pages 77-78.

5.3.2 Data Collection

Questionnaire and interviews were conducted with nurses in the selected clinics across the three health regions in the Western Cape. The aim of the questionnaire was to gather the following information per clinic:

- electricity supply and access to electricity by the community served by the clinic

- cell phone coverage and access to a cell phone by the community served by the clinic
- existing computer infrastructure per clinic.
- the availability of the Internet access per clinic
- the number of telephone lines per clinic
- patient information management per clinic
- staff available per clinic
- computer literacy of staff per clinic
- accessibility to clinics
- the distance between two clinics
- HIV/AIDS data per clinic
- administration of anti-retroviral drugs per clinic

For a copy of the questionnaire completed by the nurses, please see *Appendix C*, page 66. Questionnaires were completed through telephonic interviews.

5.3.3 Data Analysis

The primary aim of the data analysis was to establish a common value that reflects the availability of the variables investigated per health region. This will identify the gaps in terms of infrastructure, technology, staff and logistics between the health regions.

The statistics software STATISTICA® was used to analyse the collected data. For the quantitative data, Box and Whisker Plots were plotted for:

- the percentage of the community served by the clinics that have access to electricity per health region
- the percentage of the community served by the clinics that have access to cell phones per health region
- the percentage of staff per clinic that is computer literate per health region,
- the percentage of patients that are HIV+ per health region.

The Box and Whisker plots visually display the quantitative data. The median, non-outlier ranges and outliers of the variables per health region are also shown. The importance of the median is to get an overview of the data that will be analysed. The non-outlier range shows the distribution of the majority of the observations. Outliers are values that are unusually large or small in the sample. (Keller *et al* 1999) The Box and Whisker plots also provide data for 25%, 50% and 75% of the clinics surveyed to highlight discrepancies in the studied sample per health region. The 25% and 75% is a standard range used to provide data below and above the median value of a variable (Gumedze 2003). In an attempt to provide a measure of location and spread of the variables investigated in this research, the descriptive statistics calculates the sample mean, minimum values and maximum values for the quantitative data. The sample mean provides a measure of location of the majority of values in the sample. The minimum and maximum values provides a measure of spread of the values in a sample. (Bradfield *et al* 1996)

For the qualitative data, Bar graphs are plotted for:

- the percentage of clinics with or without computers per health region
- the percentage of computers connected and not connected to the Internet in the Metro health region
- the percentage of clinics that use paper based filing system; computers or both the computer and paper based filing systems to manage patient information in the Metro health region

To illustrate statistical significance, the ANOVA test was conducted. The statistically significant concept is to know if the collected data can be considered as a true reflection of the studied population. The p value is the minimum acceptable error for a variable investigated to truly reflect the studied population. For the 95% confidence interval, the p value must be less than 0.05. (Gumedze 2003) The 95% interval is the most commonly used probability associated with confidence levels (Bradfield *et al* 1996). For each of the variables investigated, the ANOVA test provided a 0.95 probability that the average value of the variables is contained in the 95% interval.

This will provide realistic values that can be used in planning for a successful implementation of the Cell-life System in the Western Cape.

Finally the Chi-square test is conducted to provide frequency tables of the availability of computers, computers connected to the Internet and method of data management per health region. In addition it is used to test if there is an association between the health regions and the availability of computers, computers with Internet and method of data management. The section below presents the results of the Western Cape Study. For further reading on the statistics concepts, please refer to Statistics for Management and Economics (Keller *et al* 1999)

5.4 RESULTS

5.4.1 Box and Whisker Plots

The clinics surveyed had 100% electricity supply and telephone connection. Therefore, Box and Whiskers were not plotted for these variables. The number of doctors and nurses will be accurately represented by the descriptive statistics as the variability of the above-mentioned variables was found to be minimal across the three health regions.

Figure 6 shows Box and Whisker plots for percentage of community served by the clinics that have access to electricity in the West Coast, South Cape and the Metro health region.

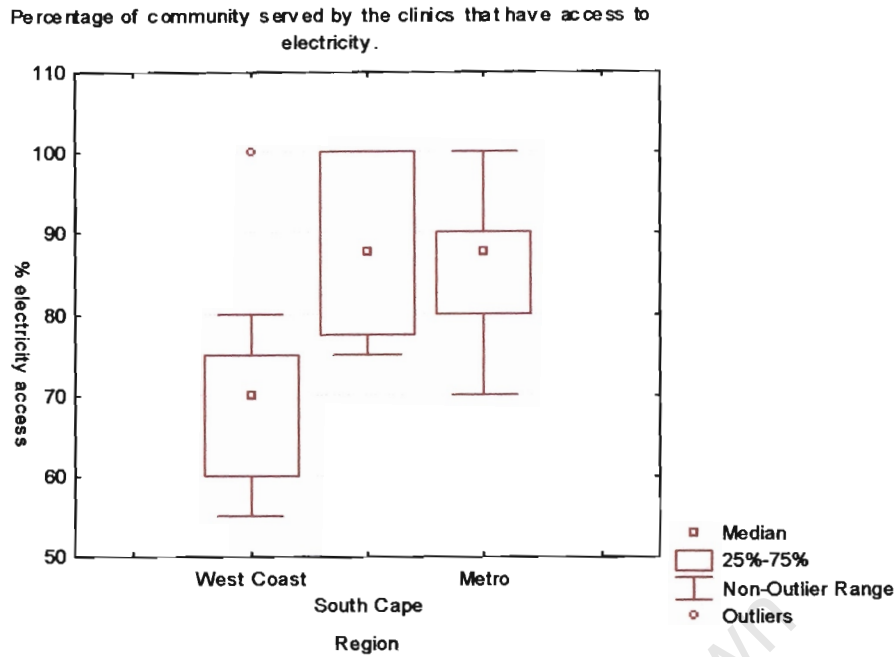


Figure 6 Access to electricity by community

Table 8 shows a summary of the results from the Box and Whisker plots for the percentage of community members served by the clinics that have access to electricity across the West Coast, South Cape and Metro health regions.

Table 8 Summary for electricity supply

Region	Variable	In 25% of clinics	In 50% of clinics	In 75% of clinics
Metro	Electricity	<80%	>87%	<90%
South Cape	Electricity	<78%	>87%	<100%
West Coast	Electricity	<60%	>70%	<75%

The West Coast health region has less people that have access to electricity compared to the South Cape and the Metro health region. The median lies at 70% compared to the 85 % in the Metro and 87% in the South Cape health regions. There were less than 80% of the community that have access to electricity in 25% of the clinics surveyed in the Metro, less than 78% in the South Cape and less than 60% in the West Coast. In 75% of the clinics surveyed, less than 90% of the community has access to electricity

compared to the less than 100% in the South Cape and less than 75% in the West Coast. This shows more people who have access to electricity live in the South Cape followed by the Metro health region.

Data collected from the West Coast health region shows one outlier at 100%. The non-outlier range is between 55% and 80% for the West Coast, 75% and 100% for the South Cape and between 70% and 100% for the Metro health region. The non-outlier ranges confirms that there is a large percentage of the community served by the clinics that have access to electricity in the South Cape followed by the Metro health region. The worst off health region is the West Coast. Possibilities of cell phone battery exchanges will have to be investigated for this region.

Figure 7 shows Box and Whisker plots for percentage of community served by the clinics that have access to cell phones in the West Coast, South Cape and the Metro health region.

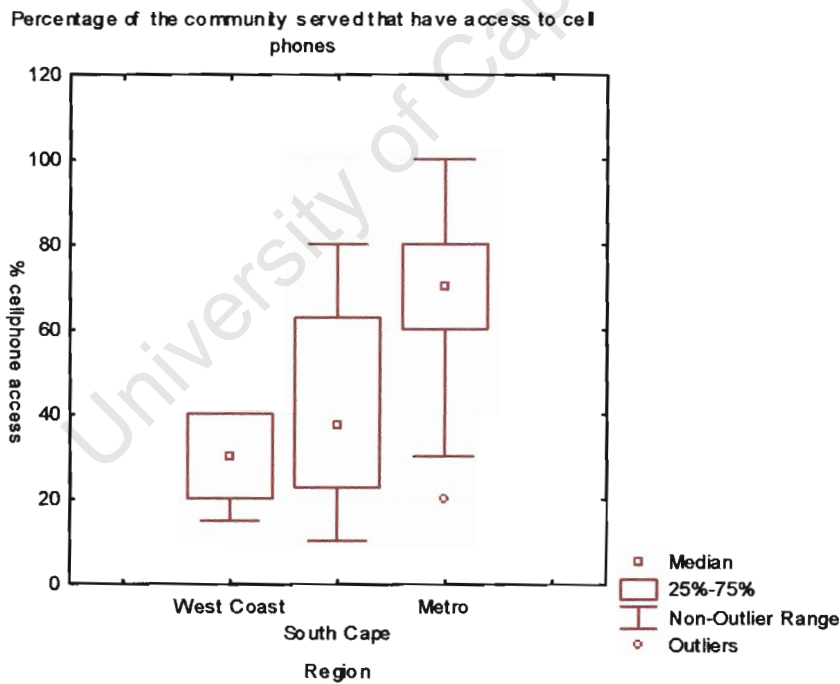


Figure 7 Access to cell phone by community

Table 9 shows a summary of the results from the Box and Whisker plots for the percentage of the community served by the clinics that have access to cell phones across the West Coast, South Cape and Metro health regions.

Table 9 Summary for access to cell phone

Region	Variable	In 25% of clinics	In 50% of clinics	In 75% of clinics
Metro	Cell phone	<60%	◇70%	<80%
South Cape	Cell phone	<22%	◇39%	<62%
West Coast	Cell phone	<20%	◇30%	<40%

The Metro health region shows a 70% median compared to the 39% in the South Cape and 30% in the West coast health region. In 25% of the clinics surveyed in the Metro health region, less than 60% of the community served by the clinics has access to a cell phone compared to the less than 22% in the South Cape and the less than 20% in the West Coast. In 75% of the clinics surveyed, less than 80% has access compared to the less than 62% in the South Cape and the less than 40% in the West Coast. Data collected from the West Coast shows a non-outlier range between 18% and 40%. The South Cape has a non-outlier range between 10% and 80% and the Metro shows a non-outlier range between 30% and 100%. The Metro shows one outlier at 20%.

It can be expected that therapeutic counsellors selected from the three health regions should easily adapt to using the Cell-Life system, as cell phones exist in these communities. Additional training would have to be provided for the use the Cell-Life SIM card menu to collect patient data.

Figure 8 shows Box and Whisker plots for percentage of staff that is computer literate in the West Coast, South Cape and the Metro health region.

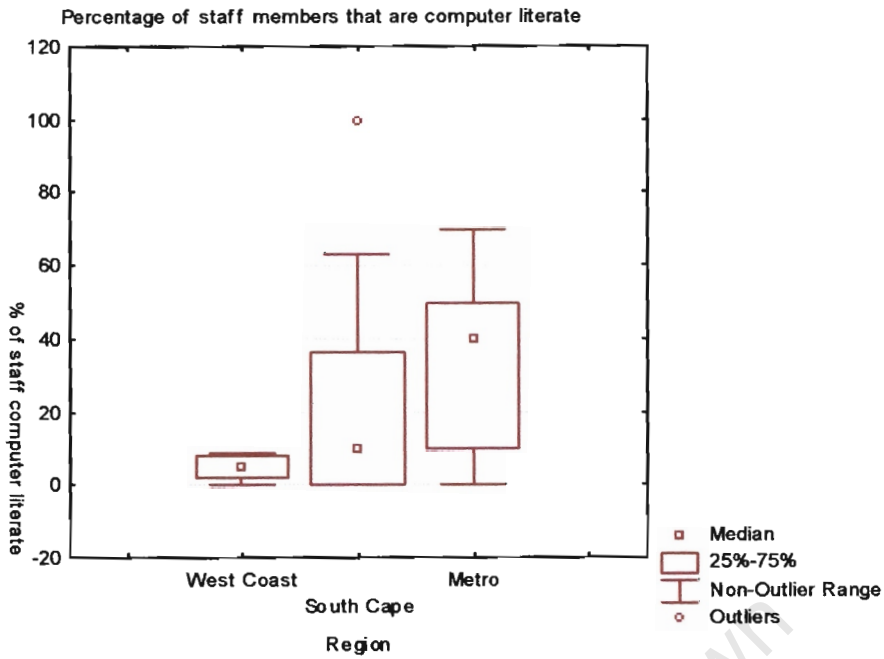


Figure 8 Staff's computer literacy

Table 10 shows a summary of the results from the Box and Whisker plots for the percentage of staff members that are computer literate in clinics across the West Coast, South Cape and Metro health regions. This study based computer literacy on the efficient use of Microsoft Word®, Microsoft Excel® and the Internet.

Table 10 Summary for computer literacy

Region	Variable	In 25% of clinics	In 50% of clinics	In 75% of clinics
Metro	Computer literacy	<10%	>39%	<50%
South Cape	Computer literacy	0%	>8%	<38%
West Coast	Computer literacy	<3%	>4%	<5%

The results from the Box and Whisker plots highlights the need for training of staff members to efficiently use of the computer before the implementation of the Cell-Life system in the three health regions. The worst off health region is the West Coast followed by the South Cape.

In 25% of the clinics surveyed, less than 10% of the staff members are computer literate in the Metro, non of the staff members are computer literate in the South Cape and less than 3% in the West Coast. In 75% of the clinics surveyed, less than 50% of the staff is computer literate in the Metro, less than 38% in the South Cape and less than 5% in the West Coast. The non-outlier ranges are between 0% and 8% in the West Coast, between 0% and 62% in the South Cape and between 0% and 65% in the Metro health region. The South Cape health region shows one outlier at 100%.

Figure 9 shows Box and Whisker plots for percentage of patients that are HIV positive in clinics across the West Coast, South Cape and the Metro health regions.

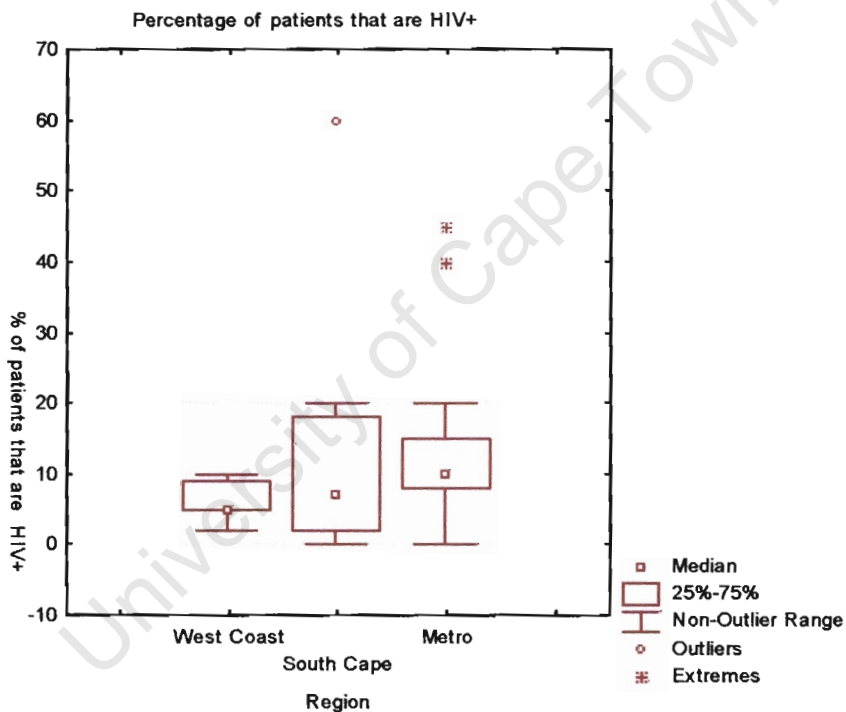


Figure 9 HIV positive patients

Table 11 shows a summary of the results from the Box and Whisker plots for the percentage of patients that are HIV positive in clinics across the West Coast, South Cape and Metro health regions.

Table 11 Summary for HIV+ patients

Region	Variable	In 25% of clinics	In 50% of clinics	In 75% of clinics
Metro	HIV+ patients	<8%	<10%	<15%
South Cape	HIV+ patients	<2%	<7%	<18%
West Coast	HIV+ patients	<5%	<5%	<9%

Most HIV positive patients live in the South Cape health region. The data collected from this region shows a non-outlier range between 3% and 19%. It also shows an outlier at 60%. The median is at 7%. Data from the Metro health region shows extremes at 40% and 45%. The non-outlier range is between 0% and 20%. The Metro health region, showed a higher percentage of HIV+ patients in the 25% and 50% range compared to any other health region. The South Cape health region shows a higher percentage of HIV positive patients in the 75% range compared to any other health region. The data collected from the three health regions justifies the need for the Cell-Life system to manage HIV/AIDS in these communities. Below are Bar charts showing the percentage of clinics with or without a computer in the three health regions.

5.4.2 Bar Chart

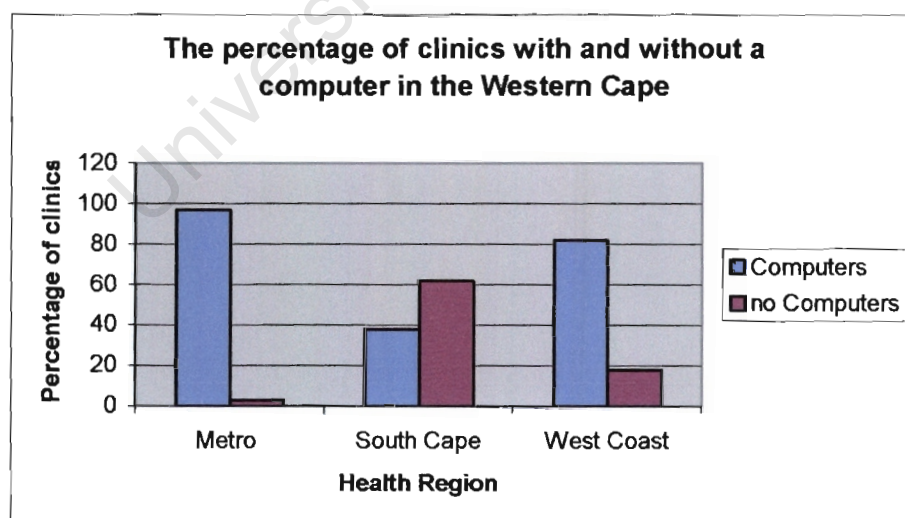
**Figure 10** Availability of computers

Figure 10 shows that 97% of the clinics surveyed in the Metro health region have computers and only 3% of clinics do not have computers. In the South Cape health region, 38% have computers, 62% of the clinics do not have computers and lastly in the West Coast 82% of the clinics have computers and 18% of clinics do not have computers and. The computer infrastructure that exists in the Metro health region is enough for successful implementation of the Cell-Life system. In implementing the Cell-life system in the three health regions, the available computers can be used for Cell-Life purposes but there will have to be fitted with the appropriate hardware and software as stated in chapter 4 of this research.

Figure 11 shows the percentage of clinics that are connected and not connected to the Internet in the three Health regions.

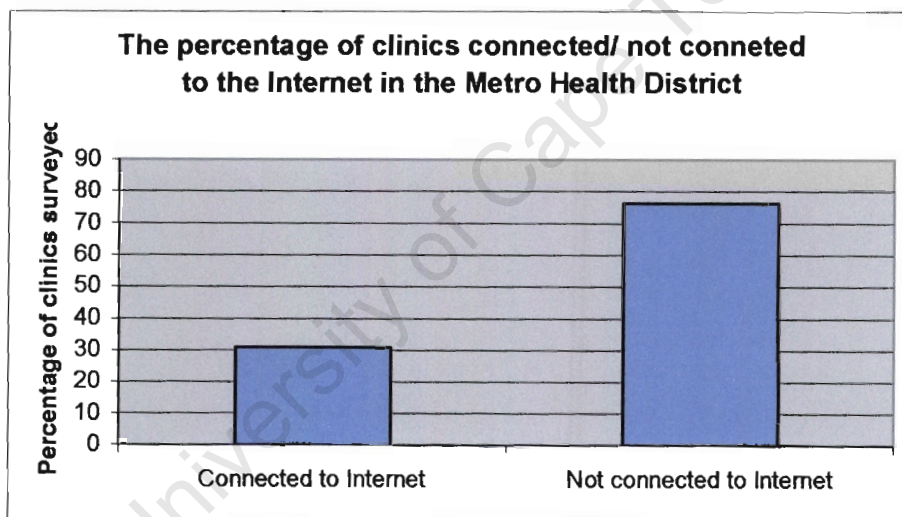


Figure 11 Internet connection

Figure 11 shows that 76% of the clinics surveyed in the Metro health region are not connected to the Internet and 24% are connected to the Internet. In the South Cape Health region, only one of the clinics surveyed has an Internet connection, which represent a percentage of 12%. In the West Coast all clinics surveyed have no Internet connection. This is one variable that is lacking in clinics across the three health regions. The implication of this finding is that clinics must be provided with Internet

connection as it a core technology requirement of the Cell-life system. Providing Internet connection to the clinics will only entail providing a modem, as there is telephone connection in clinics across the three health regions. A decision must be taken though as to how many computers need to be connected to the Internet per health region.

Figure 12 shows the percentage of clinics in the Metro health region that use paper based filing system, computers or both to manage patient information.

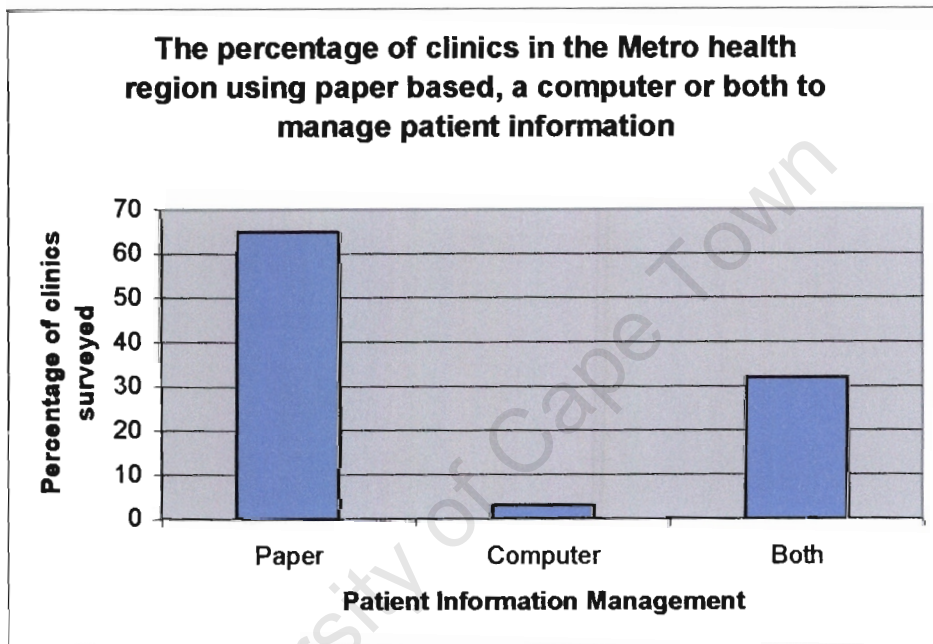


Figure 12 Patient information management

Even though more than 30% clinics in the South Cape and West Coast health regions have computers, all clinics surveyed use paper based filing systems to manage patient information. In the Metro health region, a total of 65% of the clinics surveyed are using paper based filing systems to manage patient information, 3% of them are using a computer and 32% used both paper and computer. There is a need to investigate what the computers in the clinics are used for. Ideally, with more than 50% of clinics in the Metro and West Coast health regions with computers, the clinics should be managing patient information using databases. This finding highlights the need to

show the advantages of using information technology against paper filing systems to manage patient information across the three health regions.

Below is a table showing the descriptive statistics per health region:

- for percentage of community served that have access to electricity supply
- for percentage of community served the have access to cell phones
- the number of telephone line per clinic
- the percentage of staff that are computer literate
- the nearest clinic
- the number of doctors and nurses
- the percentage of HIV positive patients

For each variable, the mean, maximum values and minimum values are shown. This was an attempt to show a point estimate and spread for each variable. Knowing such values will provide information for effective planning for the Cell-Life's system in the communities.

5.4.3 Descriptive Statistics

Table 12 Descriptive statistics

Region	Variable	Sample Size	Mean	Min	Max
Metro	Electricity access (%)	34	87.23	70.00	100.00
Metro	Cell phone access (%)	34	68.82	20.00	100.00
Metro	Telephone lines	34	2.00	1.00	4.00
Metro	Computer literacy (%)	34	31.46	0.00	70.00
Metro	Nearest clinic (KM)	34	7.26	1.00	10.00
Metro	Number of Doctors	34	1.00	0.00	5.00
Metro	Number of Nurses	34	5.00	2.00	12.00
Metro	HIV+ patients (%)	34	12.32	0.00	45.00
South Cape	Electricity access (%)	8	88.12	75.00	100.00
South Cape	Cell phone access (%)	8	41.87	10.00	80.00

South Cape	Telephone lines	8	3.00	1.00	7.00
South Cape	Computer literacy (%)	8	24.12	0.00	100.00
South Cape	Nearest clinic (KM)	8	53.93	1.00	140.00
South Cape	Number of Doctors	8	2.00	0.00	7.00
South Cape	Number of Nurses	8	3.00	1.00	6.00
South Cape	HIV+ patients (%)	8	14.25	0.00	60.00
West Coast	Electricity access (%)	11	71.81	60.00	100.00
West Coast	Cell phone access (%)	11	32.27	15.00	50.00
West Coast	Telephone lines	11	1.00	1.00	2.00
West Coast	Computer literacy (%)	11	4.90	0.00	9.00
West Coast	Nearest clinic (KM)	11	3.90	2.0	22.00
West Coast	Number of Doctors	11	1.00	01.00	1.00
West Coast	Number of Nurses	11	3.00	2.00	6.00
West Coast	HIV+ patients (%)	11	7.18	4.00	10.00

The descriptive statistics of the three health regions as shown in Table 7 are:

- a mean of 87.23% and 68.82% percentage of people that have access to electricity and cell phone in the Metro health region compared to the 88.12% and 41.87% in the South Cape and the 71.81% and 32.27% in the West Coast health region
- the South Cape health region has a mean of three telephone lines per clinic compared to two in the Metro and one in the West Coast health region
- the Metro Health region shows the highest mean of 31.46% of staff that are computer literate compared to a mean of 24.12% in the South Cape and 4.90% in the Western Cape health region
- distances between two clinics are large in the South Cape compared to any other health region. The South Cape has a mean distance of 53.93 km between two clinics, the Metro has a mean distance of 7.26 km and the West Coast has a mean distance of 3.90 between two clinics
- the South Cape shows the highest mean of number of doctors per clinic. It has a mean of two doctors with the Metro and West Coast having one each

- the Metro shows a high mean of number of nurses compared to any other Region. It has a mean of five nurses with the South Cape and West Coast having three each
- the South Cape health region shows a percentage of 14.28% people that are HIV positive per clinic. The Metro, which shows an average of 12.32%, and 7.18% in the West Coast.

The descriptive statistics shows that the three health regions have a mean above 50% of its people that have access to electricity. The 100% electricity supplies and telephone connection in clinics across the health regions will provide a platform for successful implementation of the Cell-Life System. With a percentage above 50% of the community served have access to electricity across the health regions, there will be no need for possibilities of battery exchanges in the communities as therapeutic counsellors can strategically be selected from places that have electricity supply.

The average walking distance for a black person in South Africa was found to be 4.5 km in order to access work, shopping, school and health care. A study carried out in Langa and Mfuleni in the Western Cape showed an average walking distance amongst low-income households in resource constrained areas was 2.8 km. (Behrens 2002, Voster *et al* 1989, Pienaar 1994)

The Metro health region shows an average distance of 7.26 km to the nearest clinic, the West Coast shows an average of 3.90 km and the South Cape an average of 53.93 km. Possibilities of providing transport money for counsellors to be recruited from the South Cape and Metro health regions will have to be investigated in implementing Cell-Life in these communities.

The descriptive analysis showed the sample mean values, maximum and minimum values. The sample mean is a single value known as a point estimate. (Bradfield *et al* 1996) For implementation of the Cell-Life system it is of utmost importance to know what the acceptable range of values is for each of the investigated variables necessary for successful implementation of the Cell-Life system.

5.4.4 The ANOVA Test

The ANOVA tests will give a probability of 0.95 that the confidence interval will contain the true population value. It showed a p value of less than 0.05 that indicates statically significance, which implied that the collected data could be considered for analysis to truly reflect clinics in the Metro, South Cape and West Coast health regions.

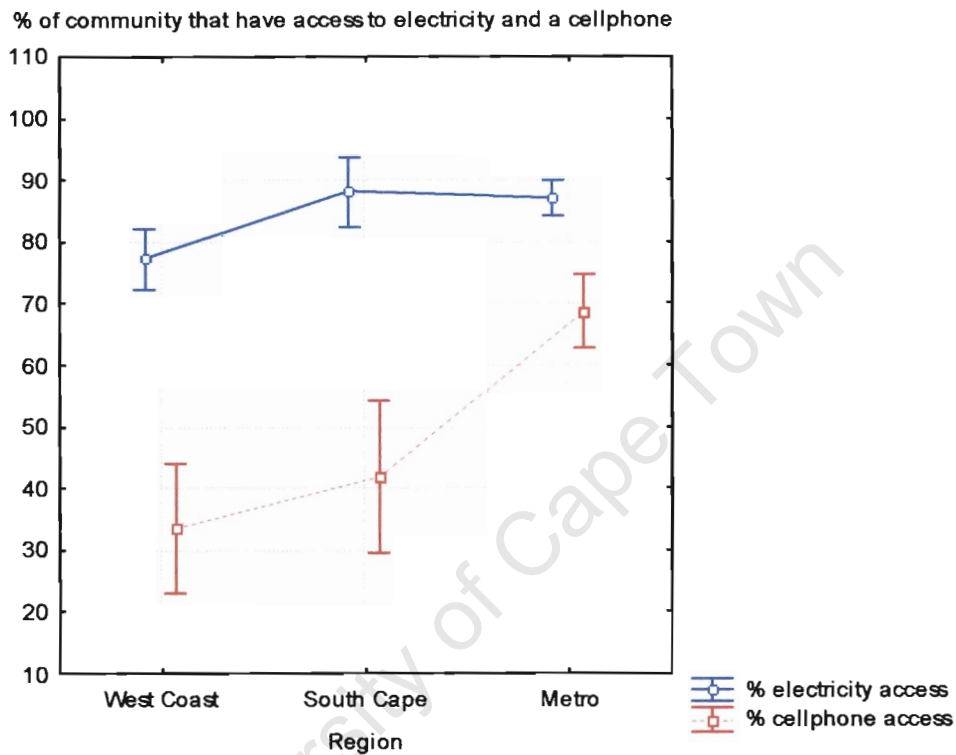


Figure 13 Percentage of electricity and cell phones access.

Figure 13 shows that there is a 0.95 probability that the true value of the percentage of the community that have access to electricity lies between 72% and 82% in the West Coast health region. Between 82% and 92% in the South Cape, between 85% and 90% in the Metro health region. Similarly the true value of the percentage of the community that have access to a cell phone lies between 22% and 42% in the West Coast, between 30% and 55% in the South Cape, between 62% and 75% in the Metro health region. The results of the ANOVA show that the variables investigated meets the Cell-Life requirements as stated in chapter 4 of this research. The implication is

that the West Coast, Metro and South Cape can support a successful implementation of the Cell-Life system.

Table 13 shows the probability of 0.95 that the confidence interval will contain the true population value for:

- the percentage of the community served by the clinics that have access to electricity per health region
- the percentage of the community served by the people that has access to a cell phone per health region
- the number of telephone lines in the clinics per health region
- the percentage of staff that is computer literate per health region
- the number of doctors and nurses per health region
- the percentage of patients that are HIV + in the clinics per health region.
- the distance to the nearest clinic per health region

For display of the confidence intervals, please see *Appendix E*, page 72.

Table 13 Confidence intervals ($p < 0.05$)

Variable	Confidence level	Metro	South Cape	West Coast
Electricity	Lower 95%	85	82	72
	Average	87	88	77
	Upper 95%	90	95	82
Cell phone	Lower 95%	62	29	22
	Average	69	41	34
	Upper 95%	75	55	45
Telephone	Lower 95%	1	2	1
	Average	2	3	1
	Upper 95%	2	3	2
Computer literacy	Lower 95%	24	9	0
	Average	32	24	5
	Upper 95%	37	38	17
Number of doctors	Lower 95%	1	1	0
	Average	1	2	1
	Upper 95%	2	3	2
Number of nurses	Lower 95%	4	1	2

	Average	5	3	3
	Upper 95%	6	4	5
HIV + patients	Lower 95%	8	6	0.1
	Average	13	14	6
	Upper 95%	16	22	13
Nearest clinic	Lower 95%	1	41	0.4
	Average	7	53	5
	Upper 95%	12	65	14

The ANOVA test provided 95% confidence interval for quantitative data. The Chi-square test will provide frequency tables for the qualitative data. In addition, it will also test for an association between the availability of computers, Internet connection, method of patient information management and the three health regions.

5.4.5 Chi-Square Test

The Chi-square test was conducted to test for association between the three health regions and the availability of computers, Internet and using the computer; paper based filing systems or both to manage patient information. It indicates that there is no association between a health region and having a computer in the clinic. However, there is an association between computers connected to the Internet and how patient information is managed within the health regions. The implication of this finding is that the Metro, the South Cape and the West Coast health regions all lacked computers with Internet connection and the majority of the clinics in the three health regions relies on paper based filing systems to manage patient information. Table 14 shows the frequency table for clinics with computers and computers connected to the Internet in Metro, South Cape and West Coast health region.

Table 14 Frequency table: computers and Internet

Region	Computer YES	Computer NO	Internet NO	Internet YES
Metro	33	1	26	8
South Cape	3	5	7	1
West Coast	9	2	11	0
Total	45	8	44	9

Table 14 shows the frequency table for the method used for patient information management in the three health regions.

Table 15 Frequency table: information management

Region	Paper	Both	Computer	Row Totals
Metro	22	11	1	34
South Cape	8	0	0	8
West Coast	11	0	0	11
Total	41	11	1	53

Even though there are computer infrastructures that exist in the clinics in all three Health regions, a majority of the clinics use paper based filing systems for managing patient information. There are eleven clinics in the Metro health region that were using the computer on a trial basis to manage patient information. There is only one clinic that is using a computer to manage patient information. The clinics in the West Coast and South Cape are strictly using paper based filing systems for patient information. In these health regions, there is a need to raise the awareness of using computers for data management before implementation of the Cell-Life system.

5.5 SUMMARY

This chapter gave the results of the questionnaires from clinics situated in the Metro, South Cape and West Coast health regions. The data collected showed relationships between the variables investigated and the three health regions. The next chapter will explain the relationships in an attempt to provide an answer if the infrastructure, technology, staff and logistical requirements available in the selected clinics can support the successful implementation of the Cell-Life system across the Western Cape.

CHAPTER SIX

6.1 DISCUSSION

The aim of this research was to use the Western Cape province, as a national needs assessment study model to assess the infrastructure, technology, staff and logistics requirements for the Cell-Life system available in selected clinics across the Western Cape. This chapter will critically discuss the gaps shown by the findings of this research in clinics across the Metro, South Cape and West Coast health regions. The Cell-Life requirements will be compared with the Cell-Life needs per clinic to show if the available infrastructure, technology, staff and logistics will support a successful implementation of the Cell-Life system. Table 16 shows the infrastructure needs of the Cell-Life system and the infrastructure available in the Metro, South Cape and West Coast health regions.

6.1.1 Infrastructure Assessment

The findings of this research show that the Metro, South Cape and the West Coast health regions meet the Cell-Life infrastructure requirements as stated in chapter 4. This suggests that the infrastructure in these health regions supports a successful implementation of the Cell-Life. Table 16 shows that the available infrastructure in clinics across the health regions is beyond the needed Cell-Life infrastructure. Every clinic surveyed has an electricity supply and telephone connection. All clinics are accessible by road. Patients walk and use public transport to seek healthcare.

Table 16 Infrastructure assessment

Requirements	System Requirements per clinic	Infrastructure available		
		Metro health region	South Cape health region	West Coast health region
Electricity supply to the clinic	100% electricity supply	100% electricity supply	100% electricity supply	100% electricity supply
Telephone connection to the clinic	1 telephone line	2 telephone lines	3 telephone line	1 telephone line
Accessibility to the clinic by patients	Accessible by road	Accessible by road	Accessible by road	Accessible by road
Computer in the clinic	30% per health region	97% have computers	38% have computers	82% have computers

The Metro health region has the highest number of clinics with computers followed by the West Coast region. 97% of the clinics surveyed have computers and 3% do not have. 82% of the clinics surveyed in the West Coast have computers. Lastly in the South Cape health region, 38% of the clinics surveyed have access to computers. All of the clinics surveyed are not dedicated HIV/AIDS clinics but do administer anti-retroviral drugs to pregnant mother. This shows that the existence of a management procedure for anti-retroviral drugs per clinic.

6.1.2 Technology Assessment

The three health regions have 100% cell phone coverage by Vodacom, MTN and Cell C, which are the three cell phone service providers in South Africa. Cell phone coverage is a core requirement for the Cell-Life system. Even though the available Internet connection in the health regions did not meet the need for Cell-Life per clinic the availability of telephone connection and computer will allow Internet connection and installing of the required software in the near future.

Table 17 Technology assessment

Requirements	Systems specifications per clinic	Technology available		
		Metro health region	South Cape health region	West Coast health region
Internet	100% of the clinics per health region	24% of the clinics	12% of the clinics	Zero percent
Cell phone coverage	100% coverage per region	100% coverage	100 % coverage	100% coverage

The availability of staff to operate the Cell-life's system varies from region to region. Table 18 shows the staff needs of the Cell-Life system and the staff available in clinics across the Metro, South Cape and West Coast health regions.

6.1.3 Staff Assessment

The findings of this research show that staff available in the clinics across the three health regions meets the staff needs for Cell-Life per clinic. This research did not investigate the availability of social workers, therapeutic counsellors and systems administrators. This is because the use of therapeutic counsellors, social workers and systems administrators to manage anti-retroviral therapy is currently uniquely used in the Gugulethu project.

Table 18 Staff assessment

Requirements	System requirements per clinic	Staff available		
		Metro health region	South Cape health region	West Coast health region
Medical doctor	One	1	2	1
Nurse	At least one	5	3	3

The West Coast region has the highest number of doctors with each clinic having access to two doctors. The Metro and South Cape has one doctor each per clinic. It must be noted that a doctor serves more than one clinic on a rotational basis. The Metro showed the highest number of nurses with five in each clinic and the South

Cape and West Coast having a total of three each. The availability of logistics to aid successful implementation of the Cell-Life system varies from region to region.

6.1.4 Logistics Assessment

The findings show that the computer literacy of staff members per clinic in the West Coast health region is below the need for the Cell-Life system. This implies that computers lessons will have to be offered to staff members before implementing Cell-Life. Furthermore there is no justification of implementing the Cell-Life in this region as the percentage of HIV+ patients is below the need for the Cell-Life system per clinic. It shows 6% of patients are HIV positive. An in depth analysis of this variable needs to be investigated across the West Coast as there might be communities that have more than 10% HIV positive patients per clinic.

Table 19 Logistics assessment

Requirements	Need for the Cell-Life system per clinic	Logistics available		
		Metro health region	South Cape health region	West Coast health region
Access to electricity by community	30% per community	87%	88%	77%
Access to cell phones by community	20% per community	69%	41%	34%
Computer literacy by staff members at the clinic	Minimum of 10% per clinic	32%	24%	5%
HIV positive patients at the clinic	Minimum of 10% of the patients per clinic	13%	14%	6%

The logistics available in the Metro and South Cape can support a successful implementation of the Cell-Life system. Members of staff in clinics across the West Coast will require computer training before implementation of the system as it showed 5% of staff that are computer literate which is below the need of this variable for the Cell-Life system per clinic.

The results of the Bar graphs and ANOVA test showed the hypothesis that the infrastructure, technology, staff and logistics are available across the Metro, South Cape and West Coast health regions is compatible with the findings of this research. The results showed variations in the quantitative and qualitative variables investigated but all variables investigated were available in the three health regions.

6.2 SUMMARY

The aim of this chapter was to discuss the findings of this study. In addition, comparisons between the Cell-Life requirement and the status quo of the clinics were made. The following chapter will draw conclusions based on the findings of this research and recommendations will be made for future works

University of Cape Town

CHAPTER SEVEN

7.1 CONCLUSIONS AND RECOMMENDATIONS

This research was motivated by the need to provide technological management solutions to HIV/AIDS countrywide. The problem was to ensure the success of such technology in the communities in terms of infrastructure, technology, staff and logistics as the needs of the community differs.

Chapter two described the use of GIS in managing malaria and highlighted the challenges of GIS in managing HIV/AIDS. It further described the use of the cell phone technology in healthcare and a case study in implementing health care technology in a rural area. Chapter three presented a needs assessment model and showed the procedure to be followed in conducting this needs assessment study. Chapter 4 provided the Cell-Life requirements and the Cell-Life system needs per clinic. Finally, chapter 5 provided the findings of this research and results were shown using Bar graphs, Box and Whisker and plots. Furthermore, the results of the ANOVA and Chi-square test were given. Chapter 6 gave a discussion of the findings and provided comparisons between the Cell-Life requirements per clinic and the status quo of the clinics. This chapter will draw conclusions based on the findings of this research and make recommendations for future works.

7.2 CONCLUSIONS

Even though the available Cell-Life requirements across the three health regions can support the Cell-Life system in each region, the Metro health region is the most developed compared to the South Cape and West Coast health regions. This needs assessment study identified the gaps across the regions in terms of infrastructure, technology, staff and logistics to ensure effective planning for a successful implementation of the Cell-Life system. Successful implementation is gauged by the availability of the Cell-Life requirements across the health regions.

It will be inaccurate to extrapolate the findings of this study to the Boland health region. Conclusions on this region can only be drawn after regional needs assessment study has been conducted, as it shares no common features with the health regions investigated.

The drawback in conducting a regional needs assessment study is the assumption that the regions consist of homogeneous communities. This gives a generalised view of the communities, which is very likely not a true representation of what is available on the ground. However the objectives of this study were met as an overview of what is available in the communities was shown.

The model used to conduct this needs assessment study can be adopted for a national model for the Cell-Life system. It must include the economical assessment to provide the financial implications for upgrading the Cell-Life requirements to match the needs of the Cell-Life system per clinic in areas where they are lacking.

Based on the findings and the conclusions of this research, the author would like to make the following recommendations

7.3 RECOMMENDATIONS

The Cell-Life system should not be implemented without a needs assessment study. The needs assessment study must be health district based to provide information to truly reflect the district. It has been identified that the workload of doctors in the Western Cape at the moment is high, as they have to serve more than one clinic. Nurses and therapeutic counsellors must drive the Cell-Life system. Therapeutic counsellors must be members of the community who will know their area and have a relationship with other community members. Furthermore, there is a need to evaluate the Cell-Life system implemented in a community to find out if it meets its own objectives and the need of the community.

For implementing of the Cell-Life system in a clinic, an in depth needs assessment study must be conducted to answer the following questions:

- How anti-retroviral therapy is managed for clinics that supply anti-retroviral drugs to patients?
- What is the number of patients on anti-retroviral therapy?
- What is the number of counsellors if any in each clinic?

- What is the walking distance that needs to be covered by the counsellors to make visits to patients?
- How patient information is currently collected?
- In the process of collecting data, what questions are asked of the patients?
- What feedback is gathered from these questions?
- From data collected and stored by the Cell-Life system what are the benefits in the short and long term?
- Who will have access to the collected information besides the doctor?
- Should there be changes in the Cell-Life card SIM card menu, what features must be adopted and discarded?
- In what language should the Cell-Life SIM card menu be?
- How many of the available staff will need to be trained with the Cell-Life system?
- Will it be worthwhile for the Cell-Life system to train all the staff available in a clinic?
- Does the number of HIV positive patients per clinic justify the need for the Cell-Life system?
- What is the exact number of computers per clinic?
- What are these computers used for in the clinics?
- What are the specifications of each computer per clinic?

The study must include answers to the following questions that can be conducted by social workers and psychologist as they are well equipped to respond to social issues:

- Will people in the community be comfortable being interviewed by a counsellor in an attempt to collect patient information?
- How long will a counsellor who may have to walk around in a township keep her phone before it gets stolen?
- Will the counsellors feel safe in carrying a cell phone in the locations where crime levels are known to be high?
- Why staff members have not changed from paper based filing systems even though computers are available in the clinics?

- Can staff members see the benefit of using information technologies for managing patient information?

This has been done successfully in Gugulethu (Skimmer 2003).

The final recommendation of the author is that Cell-Life needs to forge a working relationship with the Department's of Health in the other provinces as done in the Western Cape. Forging these relationships will enable Cell-Life to manage HIV/AIDS across South Africa in the future.

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APPENDIXES:

APPENDIX A: CELL-LIFE SIM CARD MENU

Figure 14 Cell-Life SIM card menu (Davies *et al* 2002)

APPENDIX B: AUTHORISATION LETTER

05/05/2003 10:59

021-4211980

HEALTH DEPARTMENT

PAGE 01/01

Civic Centre
 12 Hertzog Boulevard
 P O Box 2815, Cape Town 8000
 Ask for: **H Mahomed**
 Tel: 40082883
 Fax: 421-1980
 E-Mail:
 Ref:
 Filename:

Iziko loLuntu
 12 Hertzog Boulevard
 P O Box 2815, Cape Town 8000
 Cela: **H Mahomed**
 Umnxeba: 40082883
 Ifeksi: 421-1980
 Hassan Mahomed@capetown.gov.za
 Iref
 Verw:
 N:\BACKUP 8 APRIL 2003\RESEARCH\RESEARCH25.DOC

Burgersentrum
 Hertzog-boulevard 12
 Postbus 2815, Kaapstad 8000
 Vra vir: **H Mahomed**
 Tel: 40082883
 Faks: 421-1980

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

City Health Directorate

To
 Dr Ulrike Rivett
 V Nxumalo
 UCT

2003-05-02

Dear Dr Rivett and Mr Nxumalo

RE: The feasibility of using cell-life to manage HIV/AIDS across the Western Cape

Thank you for your request to conduct research on our clinics. Permission is hereby granted for you to conduct the research as set out in your research proposal. We would value any research recommendations which would help to improve our organisation's services. However, we do expect the following from you:

- 1 All individual staff information obtained must be kept strictly confidential.
- 2 Informed consent must be obtained for interviews conducted or for completed questionnaires.
- 3 Ethics approval for your research should have been obtained from a relevant institution's Ethics Committee.
- 4 A copy of your final report should be sent to the Health Directorate within three months of its completion and a feedback session to the services and staff should be held.

In general, all research conducted in our services should be done in an ethical and sensitive manner. Please let me know if you need any assistance.

We thank you for your co-operation.

For the Director: City Health Services

APPENDIX C: QUESTIONNAIRE**DEPARTMENT OF CIVIL ENGINEERING
UNIVERSITY OF CAPE TOWN**

Title: The feasibility of using Cell-life to manage HIV/AIDS across the Western Cape

Investigator: Dr U Rivett
Mr V. Nxumalo

Date:

Clinic's Name:

Clinic's Number:

Dear:

I am a Masters student in Civil Engineering at the University of Cape Town and your clinic is invited to participate in the above-mentioned research study. The purpose of this study is to conduct a needs assessment to establish infrastructural and technological levels of clinics across the Western Cape. The findings of this study could have implications for Telecommunications and Information Systems being used to provide supporting health care services for HIV+ patients across rural South Africa.

Your voluntary participation will require approximately 10 minutes to complete the enclosed questionnaire. Completion and return of the questionnaire will be seen as evidence of your willingness to participate in the study and your consent to have the information used for the purposes of the study.

The information you provide will be kept confidential. [Data will be stored securely](mailto:nxmvus001@mail.uct.ac.za) and will be available only to individuals conducting the study.

If you have any questions at any time about the study or the procedures, you may contact me via phone at 021 650 3568 or by e-mail at nxmvus001@mail.uct.ac.za. For more additional information about the project please see:

Your participation in this study is voluntary; you may decline to participate by not completing the questionnaire.

Thank you for your assistance.

Sincerely,

Mr Vusie Nxumalo

Please answer the following questions by crossing out the right answers and completing comments in the space provided.

1.0 Does the clinic have electricity supply?

- Yes
 No

2.0 If not, what is an alternative source of energy?

- Solar
 Generator
 Biogas
 Other (please state)

3.0 What percentages of people in the village have access to electricity?

- Between 10% and 20%
 Between 20% and 40%
 Not Sure
 Other (please specify)

4.0 Does cell phone coverage exist in the area?

- Yes
 No
 Not sure

If yes, who is the cellular network provider?

- MTN
 Vodacom
 Cell C
 Not sure

5.0 What percentages of people are using cell-phones in the area?

- Between 10% and 20%
 Between 20% and 40%
 Not sure
 Other (please specify)

6.0 How many telephone lines exist in the clinic?

(Please state exact number)

7.0 Is there a tarred road leading to the clinic?

- Yes
- No

8.0 If not what are the alternatives?

- Path
- Dirt road
- Other (please specify)

9.0 How often does a bus/taxi come to the clinic?

- Between 1 and 3 per day
- Between 3 and 5 per day
- Other (please specify)

10.0 If not, what are the available transport means?

- Cars
- Walking
- Other (please specify)

11.0 Does the clinic have a computer?

- Yes
- No

12.0 Does it have Internet access?

- Yes
- No

13.0 Have you used a computer before?

- Yes
- No

14.0 What percentages of your staff in the clinic are computer literate?

- Between 10% and 30%
- Between 30% and 40%
- Between 40% and 60%
- Other (please specify)

15.0 How is the patient's information managed?

- Computer database
- Paper based filing system
- Other (please specify)

16.0 How far is the next clinic/hospital?

- Between 10 km and 20 km
- Between 20 km and 50 km
- Between 50 km and 60 km
- Not sure
- Other (please specify)

17.0 What is the name of the clinic?

18.0 How many doctors does the clinic have?
(Please state exact number)

19.0 How many nurses does the clinic have?
(Please state exact number)

20.0 Does the clinic have an ambulance?

- Yes
 No

21.0 How many beds does the clinic have?

- Between 10 and 20
 Between 20 and 30
 Between 30 and 40
 Other (please specify)

22.0 What percentages of HIV/AIDS patients does the clinic have?

- Between 0% and 10%
 Between 10% and 20%
 Not sure
 Other (please specify)

23.0 Does the clinic give out anti-retroviral drugs to HIV+ patients?

- Yes
 No

If not, why (please specify)

--
THANK YOU FOR YOUR TIME

University of Cape Town

APPENDIX D: CELL-LIFE SYSTEM

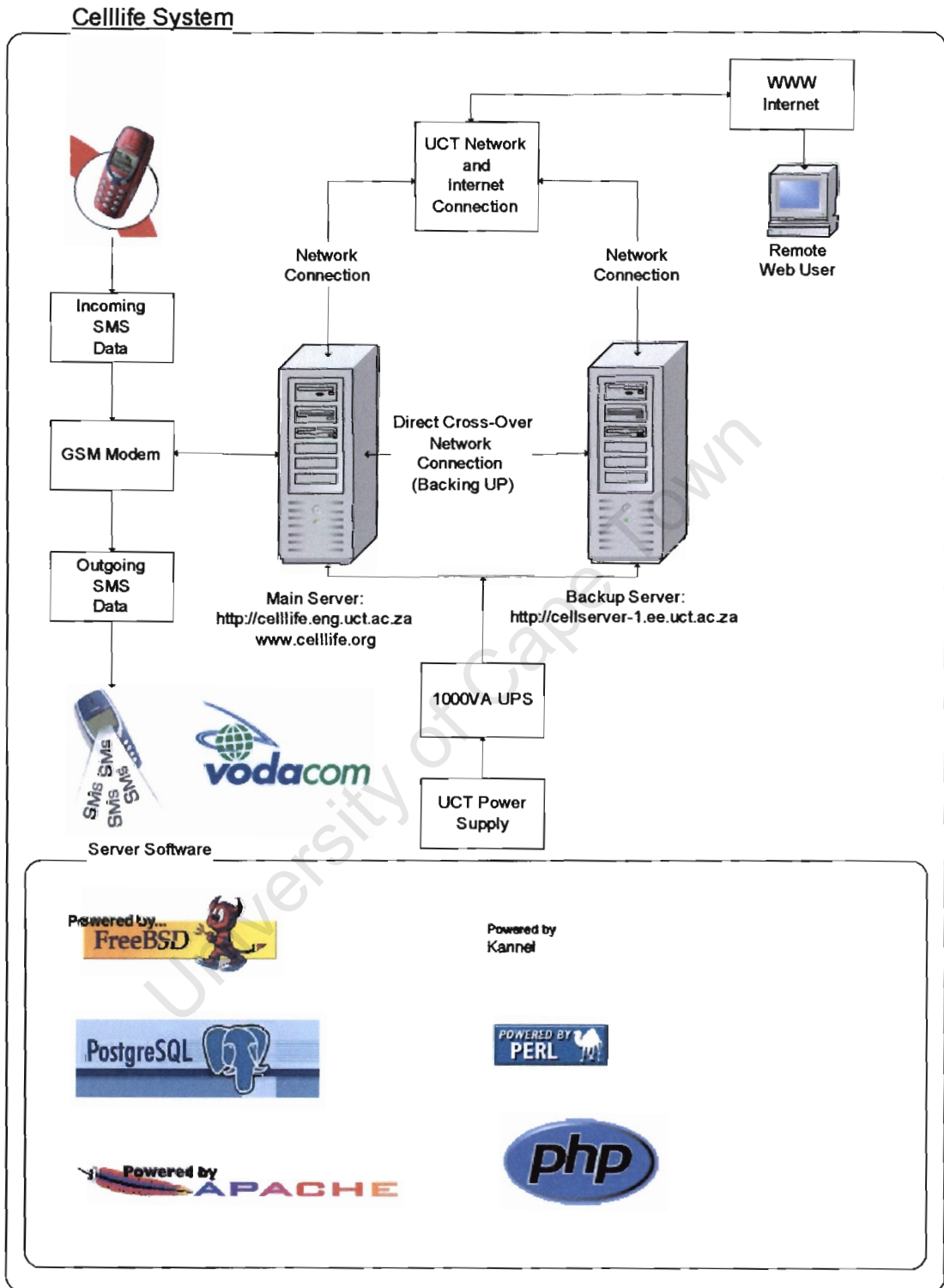
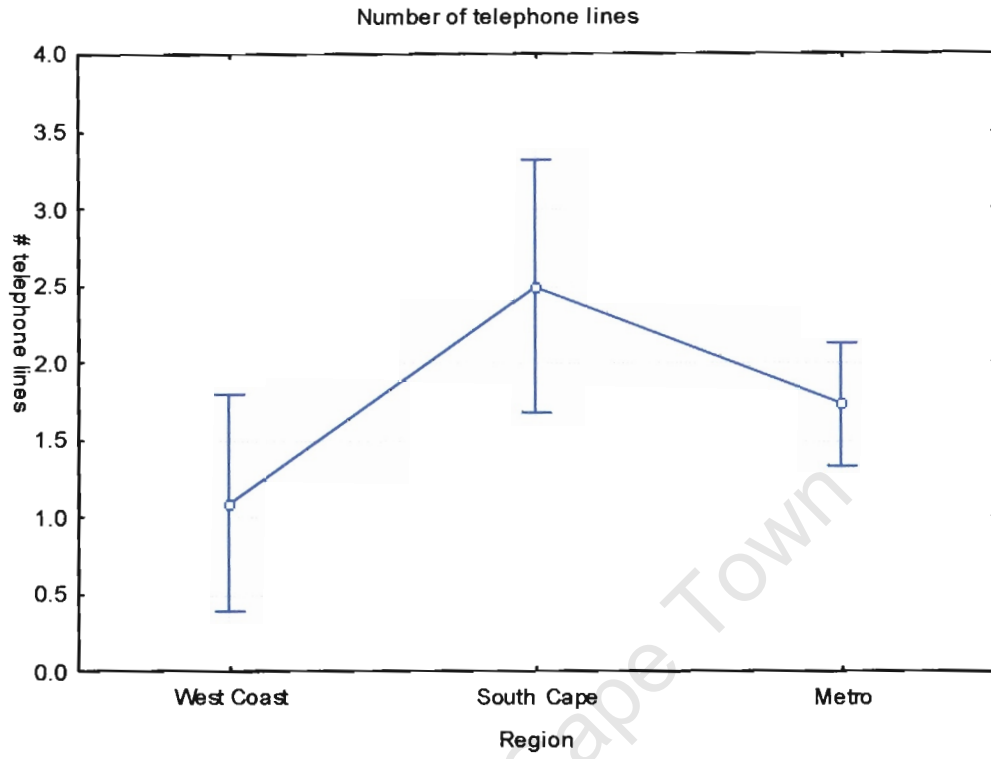


Figure 15 Cell-Life system (Anand 2003)

APPENDIX E: CONFIDENCE INTERVALS**Figure 16** Number of telephone lines

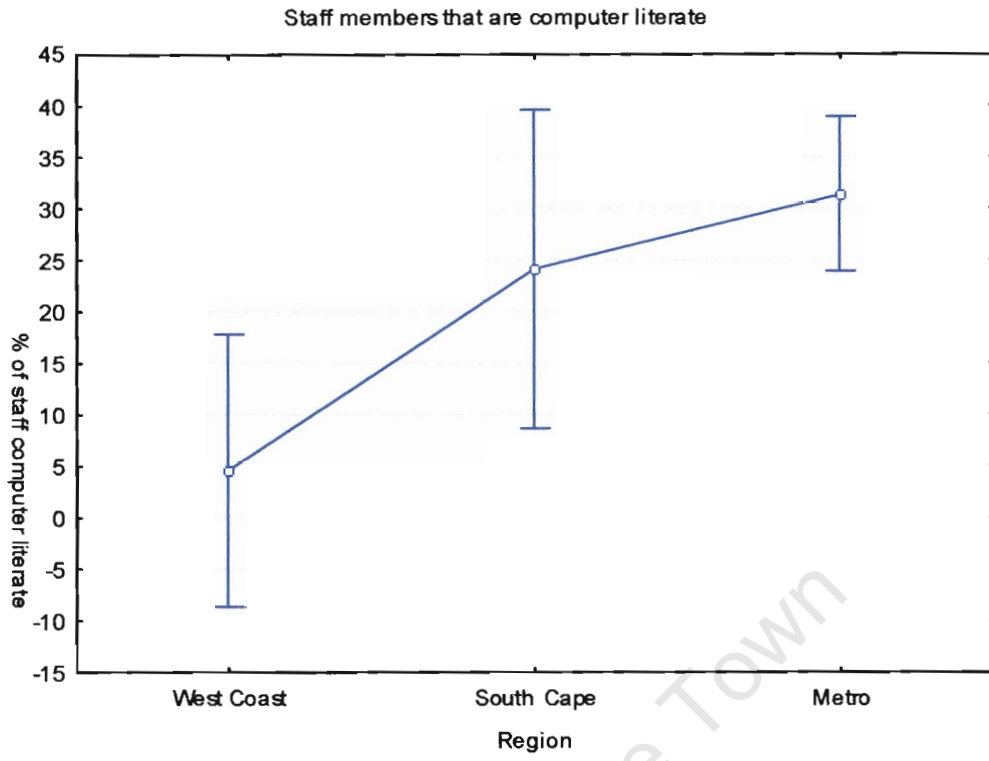


Figure 17 Computer literacy

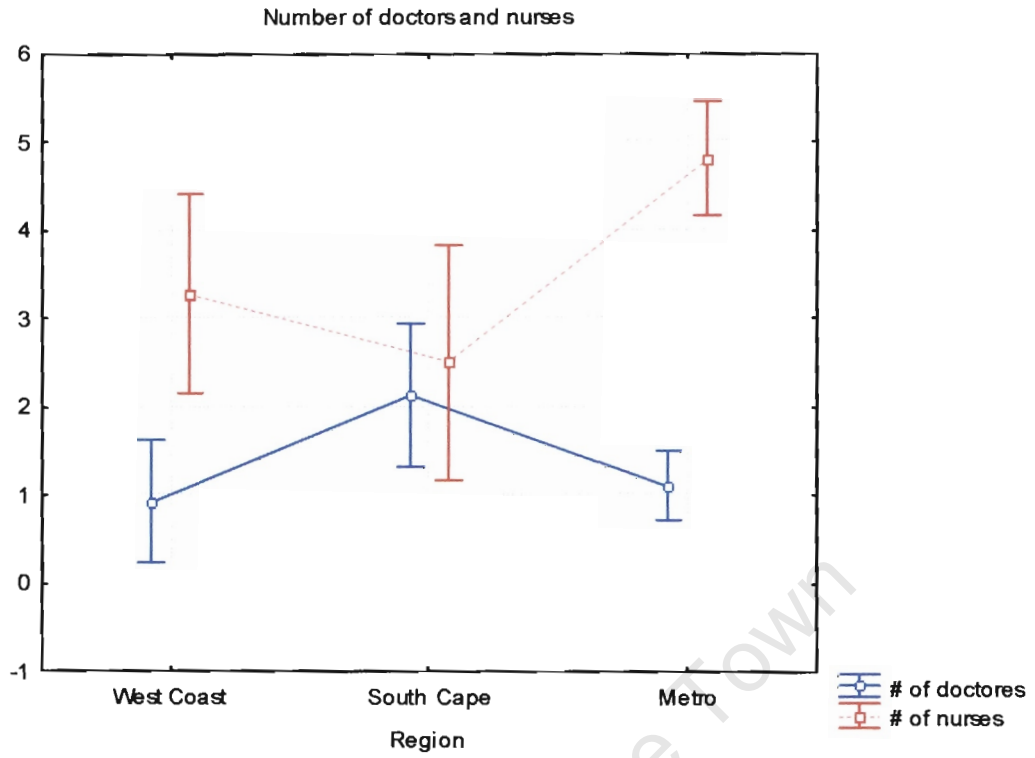


Figure 18 The number of doctors and nurses per clinic

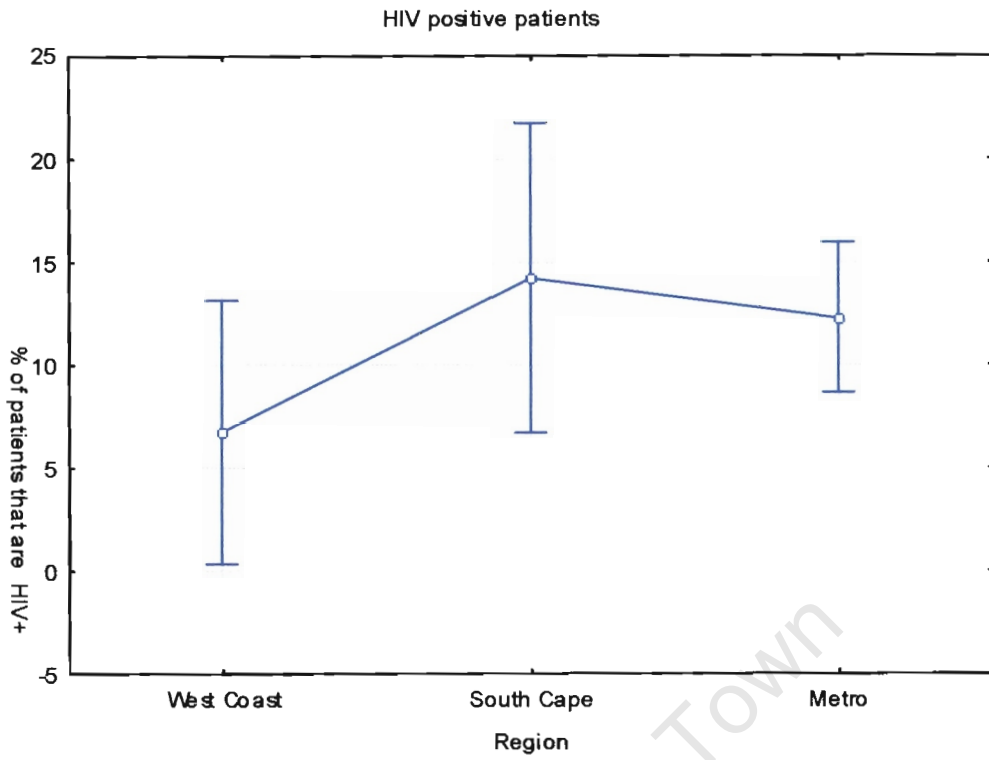


Figure 19 HIV positive patients.

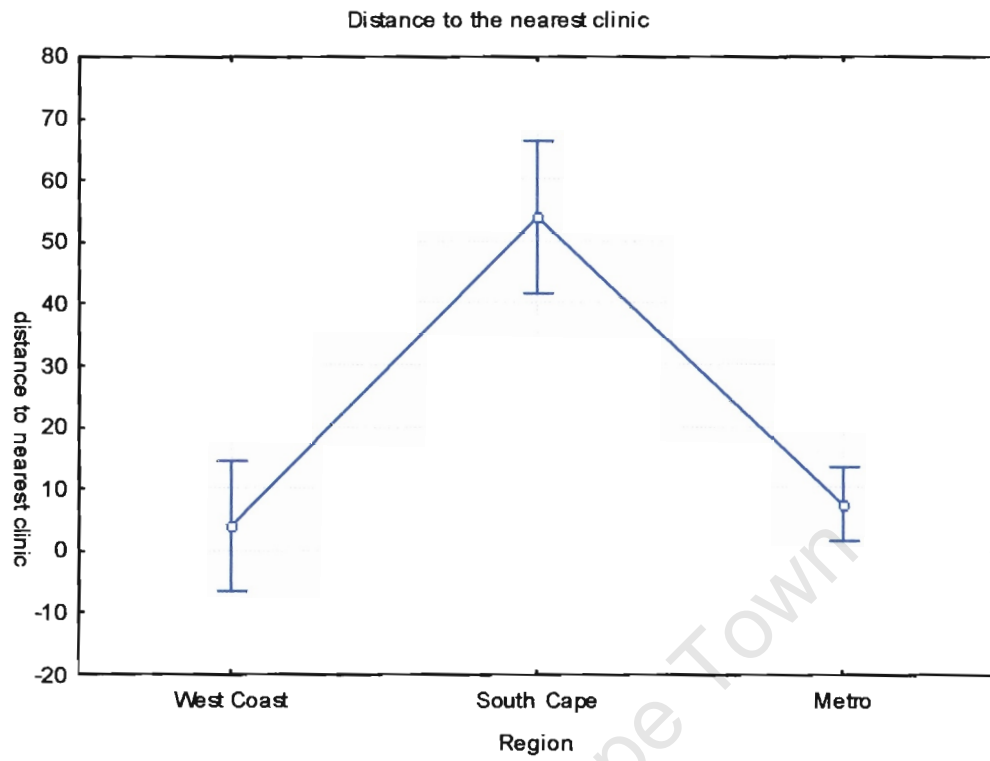


Figure 20 Distance to the nearest clinic

APPENDIX F: West Coast clinics**Table 20** West Coast clinics

Region	Name of the clinic
West Coast	Victoria
West Coast	Idasvalley
West Coast	Don & Pat Bilton
West Coast	Klapmuts
West Coast	Kylemore
West Coast	Aan-Het-Pad
West Coast	Bird Street
West Coast	Kayamandi
West Coast	Hillcrest
West Coast	Langville
West Coast	Citrusdal

APPENDIX G: South Cape clinics**Table 21** South Cape clinics

Region	Name of the clinic
South Cape	Kranshoek
South Cape	Wit Lokasie
South Cape	Sedgefield
South Cape	Calitzdrop
South Cape	Prince Albert
South Cape	Riversdale
South Cape	Merweville
South Cape	Herbertsdate

APPENDIX H: Metro clinics**Table 22 Metro Clinics**

Region	Name of the clinic
Metro	Bloekombos
Metro	Brackenfell
Metro	Brighton
Metro	Harmonic
Metro	Dennermere
Metro	Northpine
Metro	Wallaceden
Metro	Fagan
Metro	Godorns
Metro	Macassar
Metro	Sir Lowry's
Metro	Somerset West
Metro	Albow Gardens
Metro	Melkbosstrand
Metro	Pella
Metro	Pretoe Park
Metro	Saxon Sea
Metro	Table View
Metro	Silvertown
Metro	Hanover Park
Metro	GreenPoint
Metro	Eastridge Clinic
Metro	Lentegeur Clinic
Metro	Mandalay Satellite Clinic
Metro	Rocklands Clinic
Metro	Strandfontein Clinic
Metro	Tafelsig Clinic
Metro	Weltevreden Valley Clinic
Metro	Westridge Clinic

Metro	Wynberg
Metro	Grasspark
Metro	Langa
Metro	CapeTown Station
Metro	StrandFontein

University of Cape Town