UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Validation of tuberculosis notification in RSA: an epidemiological analysis of the reported tuberculosis cases and deaths in the period 1993 to 2003

NH Ntuli

Student Number: 2221322

Masters of Science in Epidemiology

Faculty of Health Sciences

School of Public Health and Health Systems

University of Pretoria

© University of Pretoria

Declaration

"This thesis has been written in partial fulfillment of the requirement for award of MSc in Epidemiology. The examiners cannot, however, be held responsible for the views expressed, nor the factual accuracy of the contents"

Dedication

To my two sons, Hassan and Ntobeko.

Acknowledgements

I would like to express my sincere gratitude to Prof Matjila for patiently guiding me through the various stages of this research project to its successful completion.

I am immensely indebted to Dr Makubalo, the Cluster Manager: Health Information, Evaluation and Research at the National Department of Health. She recommended a couple of research questions including the challenges of underreporting and completeness of disease surveillance as well as granting access to national datasets on tuberculosis. Dr Mvusi, the Director: National TB Control Programme, provided me with the needed support and approval to use data from the Electronic TB Register. I would also like to thank Pakiso Netshizdivhani, Rika du Plessis, Freck Dikgale, Lusanda Mahlasela, Carina Idema, Omphemetse and Dr Mugero.

Initially, my study programme was funded for by the tuition fee provided through the Department of Health - World Health Organization Fellowship.

Abstract

Tuberculosis (TB) remains one of the major public health problems in South Africa. The overall aim of the research project was to evaluate the completeness of TB notification data. A descriptive study design was used. The TB data from the Disease Notification System for the period 1993 to 2003 were analysed to describe 11 year trends by province, sex and population group. The levels of under-reporting of tuberculosis were estimated by comparing the annual numbers and the rates of notified cases and deaths per 100 000 population with the data of registered cases in the electronic TB register and registered TB deaths from the Statistics South Africa's metadata on causes of deaths in South Africa.

A total of 768896 cases and 39052 deaths were recorded in the Disease Notification System for the period 1993 to 2003. The annual case load declined from 42099 cases in 1993 to 36081 in 1996, then peaked to 89111 in 1998. The peak in 1998 resulted mainly from two-fold increases in notified cases in the provinces of Eastern Cape, KwaZulu-Natal and Western Cape. There was also a three-fold increase in Western Cape in 2001 and four-fold increase in Northern Cape in 2002. The lowest numbers of notified cases were for Mpumalanga in the years 1993 to 1996. In Limpopo, a total of 13 cases only were notified between the years 1999 to 2003 inclusively.

Nationally and provincially, the annual numbers of notified cases and deaths and rates per 100 000 population were consistently higher among males than females. The Wilcoxon signed rank test comparing the medians between male and female cases showed a p-value of 0.003 indicating that the difference exists between the two medians.

Nationally the lowest number of deaths was 1967 notified deaths in 1994 and the highest number of deaths was 6085 notified in 2002. The number of deaths notified varied between the provinces and fluctuated between the years. It was the highest for the years 1993 to 1996 in Western Cape and the highest for the years 1997 to 2003 in Eastern

Cape. It was the lowest in Mpumalanga for the years 1993 to 1997 and the lowest in Limpopo for the years 1999 to 2003 and KwaZulu-Natal in the years 2002 to 2003.

The Disease Notification System was found to have lesser numbers of notified cases in comparison to registered cases recorded in the TBSYS or electronic TB register. The percent difference between notified and registered cases ranged between 28% in 2001 to 69% in 1996.

Comparison of notified and registered TB deaths for the period 1997-2003 showed that the annual numbers and rates of registered deaths in the Statistics South Africa's metadata were higher for all the years than the notified deaths in the disease surveillance system.

It is recommended that the disease surveillance system is evaluated periodically, facility data assessment tools are introduced and capacity for surveillance is strengthened at all levels of the national health systems.

.

Abstrak

Een van die belangrikste openbare gesondheidsprobleme in Suid-Afrika bly om te wees Tuberculosis (TB). Die oorliggende oogmerk van die navorsingsprojek was om te evalueer die volledigheid van TB bekendmakings data. 'n Beskrywende studie ontwerp is gebruik. Die TB data van die "Disease Notification System" vir die periode 1993 tot 2003 was geanaliseer om te beskryf 11 jaar tendense deur provinsie, geslag en bevolkingsgroep. Die vlakke van lae aanmelding van tuberculosis was geskat deur te vergelyk die jaarlikse getalle en die vlakke van aangemelde gevallle en sterftes per 100 000 van die bevolking met die data van geregistreerde gevalle in die elektroniese TB register en geregistreerde TB sterfgevalle van "Statistics South Africa metadata" oor oorsake van sterftes in Suid-Afrika.

‘n Totaal van768896 gevalle en 39052 sterftes was aangeteken in die “Disease Notification System” vir die periode 1993 tot 2003. Die jaarlikse gevalle het afgeneem van 42099 in 1993 tot 36081 in 1996. Dit het egter weer gestyg tot 89111 gedurende 1998. Die styging in 1998 is hoofsaaklik die oorsaak van ‘n tweeledige verhoging in die aangemelde gevalle in die Oos-Kaap, KwaZulu-Natal en Wes-Kaap Provinsie. Daar was ook ‘n drie-ledige verhoging in die Wes-Kaap in 2001 en ‘n vierledige verhoging in die Noord-Kaap gedurende 2002. Die laagste nommers van aangetekende gevalle was vir Mpumalanga gedurende die jare 1993 tot 1996. Gedurende die jare 1999 tot 2003 is slegs 13 gevalle inklusief aangemeld in Limpopo.

Die jaarlikse getalle van aangemelde gevalle en sterftes asook die syfer per 100 000 van die bevolking was nasionaal en provinsiaal konstant hoër onder mans as vroue. Die “Wilcoxon signed rank test” wat vergelyk die mediaan tussen manlike and vroulike gevalle wys ‘n “p-value of 0.003”. Dit dui daarop dat die verskil tussen die twee mediane voorkom.

Nasionaal was die laagste getal sterftes in 1967 en aangetekende sterftes in 1994 en die hoogste getal van sterftes 6 085 aangeteken in 2002. Die getalle van sterftes aangeteken verskil tussen die provinsies en wissel tussen jare. Dit was die hoogste in die Wes-Kaap vir die jare 1993 tot 1996. In die Oos-Kaap die hoogste vir die jare 1997 tot 2003. In Mpumalanga en KwaZulu-Natal onderskeidelik die laagste vir die jare 1999 tot 2003 en 2002 tot 2003.

Dit is gevind dat die “Disease Notification System” minder getalle van aangemelde gevalle het in vergelyking met geregistreerde gevalle aangeteken in die “TBSYS” of elektroniese TB register. Die persentasie verskil tussen aangemelde en geregistreerde gevalle het ‘n speling van tussen 28% in 2001 tot 69% in 1996.

Vergelyking van aangemelde en geregistreerde TB sterftes vir die tydperk 1997-2003 bewys dat die jaarlikse getalle en tempo van geregistreerde sterftes in die “Statistics

South Africa's metadata" hoër was vir al die jare as die aangemelde sterftes in die "disease surveillance system"/ siekte waarneming stelsel.

Dit word aanbeveel dat die "disease surveillance system"/siekte waarneming stelsel periodiek geevalueer word, fasiliteit data waarneming instrumente ingevoer word en kapasiteit vir waarneming versterk word op alle vlakke van die nasionale gesondheidstelsel.

List of Acronmys

AIDS	Acquired Immunodeficiency Syndrome
CDCs	Communicable Disease Coordinators
CFR	Case Fatality Rate
DOTS	Directly Observed Treatment Strategy
EC	Eastern Cape province
EpiInfo	Epidemiology Information System
ETr.net	Electronic TB register database
FS	Free State province
Fcases	Female cases
Fdeaths	Female deaths
GP	Gauteng Province
HIV	Human Immunodeficiency Virus
ICD	International Codes of Diseases
IUATB/LD	International Union Against Tuberculosis and Lung Diseases
KZN	KwaZulu-Natal province
LP	Limpopo province
Mcases	Male cases
Mdeaths	Male deaths
MDGs	Millennium Development Goals
MP	Mpumalanga province
NC	Northern Cape province
NTCP	National Tuberculosis Control Programme
NW	North West province
TB	Tuberculosis
TBCP	Tuberculosis Control Programmes
TBSYS	Tuberculosis Database System
UN	United Nations
WHO	World Health Organisation

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

An Overview of the Chapters

Introductory chapter serves to provide a synopsis of what is covered by each of the chapters. Chapter One: Contextual Background aims to locate the problem of tuberculosis (TB) within the global and national contexts. Specifically, the chapter attempts to provide an overview of the magnitude of the tuberculosis globally and nationally, but also describes the response to tuberculosis. Chapter Two is an attempt to compile information written on the subject of evaluation of disease surveillance systems gathered from peer-reviewed journals, official documentation and other unpublished materials. The chapter focuses on functions of public health surveillance systems, challenges facing these systems and methods used to evaluate the systems. The chapter also provides a statement of the problem of under-reporting of tuberculosis. Chapter Three: Research Methodology covers the research method used focusing on aim and objectives of the research project, study design, data collection and sources. Chapter Four: Data analysis and Results presents the results of analysis in line with the objectives of the research project. It also addresses the limitation of the study. Chapter Five: The chapter provides a discussion of the results in terms of the objective of the research project and also highlights some limitations. Chapter Six: The chapter makes recommendations focusing mainly on measures to improve data completeness and accuracy.

CHAPTER 1: CONTEXTUAL BACKGROUND

1.1 Introduction

This chapter aims to present a brief synopsis of the magnitude of the tuberculosis globally and in South Africa as well as describes the national response to tuberculosis.

1.2 Definition of Tuberculosis

The case definition of a health event under surveillance is critical to ensure specificity in the diagnosis, reporting and comparability.

The Control of Communicable Disease Manual (2004) defines tuberculosis as a mycobacterial disease caused by the infectious agents including *Mycobacterium tuberculosis, Mycobacterium africanun, Mycobarium canneti tuberculosis*, all primarily from human and *Mycobacterium bovis* primarily from cattle [(1)]. The manual further states that exposure occurs when tubercle bacilli in droplet nuclei, 1 to 5 microns in diameter, produced by people with pulmonary or respiratory tract tuberculosis during coughing, singing or sneezing, are inhaled by a vulnerable contact into pulmonary alveolae initiating a new infection.

The sixth draft Strategy and Policy Manual of the South African TB Control Programme (1992) defined tuberculosis as a chronic, communicable bacterial disease resulting from infection with *Mycobacterium tuberculosis*, and also (but infrequently in developed countries), *Mycobacterium bovis*[(2)]. This draft document mentioned that exposure is primarily an airborne spreading by droplet nuclei in the 2-3 micron range.

The South African Tuberculosis Control Programme: Practical Guidelines (2000) defines TB as an infectious disease caused by micro-organisms, bacilli called *Mycobacterium tuberculosis* usually enters the body by inhalation through the lungs[(3)]. The micro-organisms spread from an initial location in the lungs to other parts of the body via the blood stream, the lymphatic

system via the airways or by direct extension to other organs. Pulmonary TB is the infectious and common form of the disease. Extra-pulmonary tuberculosis is a result of the spread of tuberculosis to other organs, commonly pleura, lymph nodes, spine, joints, genitor-urinary tract, nervous systems or abdomen.

1.3 Global Burden of Tuberculosis

Tuberculosis is one of the major causes of disability, morbidity and mortality in many parts of the world in particular the developing countries. In developed countries, TB appears to have been well controlled and managed for many years. This may be attributed to various factors including use of cost effective TB control measures. However, these successes seem to have been reversed by the HIV and TB co-infection, emergence of drug resistant TB strains and migration. Though downward trends of TB mortality and morbidity have been observed for many years in industrialized countries, in the mid 1980s reported cases reached a plateau especially in areas and population with a high prevalence of HIV infection or with large numbers of persons from areas with high prevalence of TB[(1)].

In many parts of the developing countries TB is a major public health problem due factors including poverty and underdevelopment, poor control measures, the spread of Human Immunodeficiency Virus (HIV), and multi drug TB resistance.

The Global Burden of Disease Study predicted dramatic changes in the health needs, which have been commonly termed epidemiological transition[(4)]. The epidemiological transition in developing countries, where four-fifths of the world population resides, states that non-communicable diseases were fast replacing the infectious diseases and malnutrition, as the leading causes of disability and premature death. Despite the epidemiological transition, TB remained as the seventh leading causes of disability and premature death in 1990 and 2005.

Dye et al (1999) states that the global burden of TB has changed since 1990 due to changes in control measures, the spread of Human Immunodeficiency Virus (HIV) and population

growth[5]. Dye, et al. (1999) concluded that high risk and prevalence of *Mycobacterium tuberculosis* infection and TB incidence, prevalence and mortality have remained high due to poor control measures in South East Asia, sub-Saharan Africa and eastern Europe and because of high rates of *Mycobacterium* tuberculosis and HIV co-infection.

In 1991 the World Health Assembly ratified the first global target set for Tuberculosis[6]. These targets related to detection of 70% of new smear positive tuberculosis and successfully treating 85% of these cases by year 2000. These targets were ambitious and potentially attainable but were not reached in 2000. As Dye, et al. (2005) reported the targets set for the year 2000 were deferred to year 2005[7].

In 2000, member states of the United Nations (UN) committed themselves to the Millennium Development Goals (MDGs). The nature of the goals of the MDGs is directly or indirectly relevant to TB control programmes[7]. Goals 1, 3, and 8 are indirectly relevant to TB control. The Goal 1 aims to eradicate extreme poverty and hunger by 2015, Goal 3 aims to promote gender equality and empower women and Goal 8 is to develop a global partnership for development. Goals 6 and Target 8 are directly relevant to TB control. Goal 6 aims to combat HIV/AIDS, malaria and other diseases and Target 8 is to have halted by 2015 and begun to reverse the incidence of malaria and other major diseases, including TB. Among the indicators for Target 8 are Indicator 23: between 1990 and 2015, to halve the prevalence and death rates associated with tuberculosis; and Indicator 24: by 2005, to detect 70% of new smear-positive TB cases arising annually, and to successfully treat 85% of these cases. The latter is the original target ratified in 1991 and deferred in 2000 to 2005.

There were an estimated 8.8 million (140/100 000 population) new cases of tuberculosis in 2003 in the world of which 3.9 million (62/100 000 population) were smear positive and 674 000 (11/100 000) were infected with human immuno-deficiency virus[1]. In 2003, the TB incidence rates were falling or stable in five out of six WHO regions but growing at 1.0% globally. The exception was the African Region where incidence had been rising more quickly in countries with higher HIV prevalence rates. South Africa is ranked 8 globally in terms of estimated number of TB cases with an estimated incidence of 536/100 000 population, new smear positive of 218/100 000 population, the TB mortality for all cases of 73 /100 000

population. Sixty one percent (61%) of TB cases 15 – 49 years of age in South Africa were HIV positive.

There are a number of initiatives that have been promoted by WHO, International Union Against Tuberculosis and Lung Diseases (IUAT/LD) and other organizations. Global strategies and initiatives exert a major influence on the direction of National TB Programmes towards achieving the set goals and targets. National TB Programmes that incorporate global TB agenda are also likely to attract external development support.

1.4 The Burden of Tuberculosis in South Africa

Tuberculosis can be prevented and cured; yet the disease contributes considerably to the burden of disease, disability and death in South Africa. In South Africa, like in most countries in the developing world, the increasing burden of TB is due to poverty, poor programme management including poor adherence, co-infection of HIV and TB, and population increase. Tuberculosis remains one of the major public health problems in South Africa.

Until 1890's tuberculosis was almost unknown in the Transkei and Basutolond[8]. The contact between Europeans infected with TB and black miners set the scene for spread of TB in the dusty, damp and poorly ventilated mines and the overcrowded hostels in the mines[9]. Thus, the mobile mine labourers became the transport medium for the spread of the TB when infected miners returned to their villages and neighbouring countries.

The early developments of public health surveillance system in South Africa are intertwined to the policies of the former colonial and apartheid governments. The creation of the Bantustan and homeland authorities by the former Apartheid government affected the public health surveillance system in the collection, collation, analysis and interpretation of reported TB cases. The improved data capturing forms (G 20/9.1, GW 20/9.2 and GW/10) that were put into effect during the 1980s were not used in all health authorities[10]. One of the so-called national states, Lebowa is reported to have submitted for the first time its complete forms in

1991. Even when the Bantustan and homeland governments reported, the data were incomplete and not timely.

The reported tuberculosis rate was 372 per 100 000 in 1963[10]. The registered mortality rate dropped from a level of 60-70 per 100 000 (1945 - 1953) to about 10 per 100 000 in the 1960s.

As shown in Table 1 below, the total new cases of TB that were diagnosed increased from 50035 in 1985 to 78384 in 1991 in seven health regions of Eastern Cape, Western Cape, Northern Cape, Natal, Orange Free State and Southern Transvaal and northern Transvaal) of South Africa[10]. The incidence per 100 000 population differed with data sources. The TBCP data had higher incidence compared to incidence based on the notification system. Two possible explanations were advanced to explain this [10]. Firstly, the relapses and re-infections have always been added to the number of newly diagnosed cases in the TBCP, whereas these are not always been notifiable. Secondly, all TB cases receiving treatment at health facilities in the seven health regions were recorded on data capturing forms (G 20/9.1, GW 20/9.2 and GW/10), even if they originated from the so-called national states. The notifications recorded the cases according to their residential addresses.

Table 1: Measures of outcome of the TB control Programme. Seven health regions of RSA , 1985-1991

	1985	1986	1987	1989	1990	1991
Total annual caseload	88268	93020	95669	99251	124635	134066
Total new cases	50035	52385	53547	58898	77646	78384
Case load January-June [1]	63251	66829	68896	69802	85812	94858
Cases notified (as on 6/1/1993)	43310	43392	43975	49500	59710	62885
Estimated population ('000)	19067	19469	19874	20285	21117	21544
Prevalence rate per 100 000	463	478	481	489	590	622
Incidence rate per 100 000 (TBCP)	262	269	269	290	363	364
Incidence rate per 100 000 (notifications)	227	223	221	224	283	292
Number cured	43462	43754	45765	46650 [2]	65182	68164
Estimated cure ratio	69%	65%	66%	67%	76%	72%
Number of deaths	3393	3162	2916	3152 [2]	3603	3885
Estimated case fatality ratio	4%	3%	3%	3%	3%	3%
Nett number of absconders	8607	9547	12182	13238 [2]	17592	14665
Nett absconding ratio	10%	10%	13%	13%	14%	11%
Number of re-infections and relapses	4910	5867	6079	9953	9011	8622
Re-infections and relapses as a % of total new cases	10%	11%	11%	17%	12%	11%
Number of known outcomes	55462	56463	60863	63040	86377	86714
Proportion cured	78%	77%	75%	74%	76%	79%
Proportion died	6%	6%	5%	5%	4%	4%
Proportion absconded	16%	17%	20%	21%	20%	17%

[1] For 1985 to 1990, estimated by subtracting half the number of new cases from annual case load

[2] Calculated from distribution of known outcomes

Source: Epidemiological Comments 1993

1.5 National Tuberculosis Control Programme

The Government of South Africa is committed to reducing the burden of tuberculosis. This commitment is evident from a number of policy statements such as the African National Congress's Health Policy Document[11], the Reconstruction and Development Programme[12], the White Paper for Transformation of the National Health System for South Africa[13], the recent Department of Health's Five-Year Strategic Plans 2005-2009[14] and the Government Programme of Action[15]. The interventions to control TB in South Africa are coordinated and managed through the National TB Control Programme, which has been implemented over the years.

The National TB Control Programme evolved over the years based on the technological advances and also national reviews of the programme. Policies and measures to control and manage TB in South Africa can be traced back to 1919. This was the year when the Public Health Act, No 36 of 1919 was promulgated.

Medical interventions in 1940s and 1950s included the introduction of the chemotherapeutic agents: streptomycin in 1944, para-amino salicylic acid in 1947 and isoniazid hydrochloride in 1952[2].

The aim of the TBCP in the 1990's was "to bring about a drastic and sustained reduction in the incidence of tuberculosis and the suffering it causes among the people of South Africa by the implementation of the revised and rationalised Tuberculosis Control Programme" [2].

According to a recent review report on the performance of the National Tuberculosis Control Programme (NTCP) conducted in October 2003, there was an estimated 556 all cases and 226 new smear positive cases per 100 000 population[16]. Case detection was estimated at 424 all cases and 188 new cases per 100 000 population with a treatment success rate of 61% in 2001. In 1996, South Africa was singled out as having one of the worst tuberculosis epidemics in the world with an estimated 160 000 new cases infected and 10 000 deaths[17]. This led to the realisation that the national TB control efforts were ineffective and prompted the government to adopt the Directly Observed Therapy, Short-course Strategy (DOTS) to fight the spread of

TB and set about the task of standardizing procedures related to TB case diagnosis, treatment, and reporting as part of the NTCP[18].

One of the five key elements of the DOTS strategy is effective monitoring and evaluation by using standardised recording and reporting systems referred to as TB Recording and Reporting System. The mandatory Notification System was designed to serve a public health surveillance function and notification of TB is a regulatory requirement in terms of the National Health Act 1977[18]. The TB Recording and Reporting System serves to assist with tracking the progress in patient treatment outcomes and assess programme performance. An electronic TB register forms part of the TB Recording and Reporting System.

The initial occurrence and spread of tuberculosis in South Africa have been linked largely to migration of Europeans through colonial expansion, the migrant labour system and movement of migrant labourers to the rural villages from the mines. The spread of TB was subsequently entrenched by poor living conditions and overcrowding in the mining hostels and apartheid created settlements for the Black people.

The burden of TB morbidity and mortality have been rising which required the global targets set for 2000 to be deferred to 2005. In South Africa, the number of new cases and the prevalence and incidence per 100 000 population were increasing during the 1985 and 1991. Notably, the estimates of incidence per 100 000 population based on TBCP dataset tended to be higher compared to the incidence based on TB data from the notifiable disease system.

There are various factors that seemed to cause and contribute to the rising burden of the TB. These include the emergence of the multi-drug resistant TB, HIV and TB co-infection, poor performance of National Tuberculosis Control Programmes, poverty and underdevelopment. There is hope that the fight against tuberculosis and implementation of DOTS will result in the achieving targets set for MDGs by 2015. Proper surveillance of the TB therefore remains an important element in the fight against TB. The next chapter focuses on role of and methods used to ensure proper surveillance system.

CHAPTER 2: LITERATURE REVIEW

This chapter aims to conduct a literature review on the evaluation of public health surveillance systems. The main focus is on the conceptual framework used to evaluate the public health surveillance system.

2.1 Functions of Public Health Surveillance Systems

One of the key functions of government in South Africa is to promote and improve health of the population. Quality, accurate and timely data are essential to assess the health status, to estimate the burden of disease and to determine the risk factors and the determinants of health in the population.

Public health surveillance is one important source of morbidity and mortality data serving to provide a factual basis upon which government can identify disease occurrence and trends in the population in order to develop prevention and control measures[18] and to allocate resources[19]. Health events are monitored for the following purposes:

- to detect sudden changes in disease occurrences and distribution;
- to follow secular (long-term) trends and disease patterns;
- to identify changes in agents and host factors; and
- to detect changes in health care practices.

2.2 Evaluation of the Public Surveillance Systems

Literature points to the importance of evaluating periodically the public health surveillance systems in order to improve its operational efficiency. The Centers for Diseases Control and Prevention and World Health Organisation have published guidelines for use when evaluating public health surveillance systems. The Updated Guidelines for Evaluating Public Health Surveillance Systems (2001) identified five facets that are critical when evaluating public health surveillance system[20]. The five facets are listed below:-

- Public health importance of the health event under surveillance;

- Objectives and operations;
- System's usefulness;
- Attributes or qualities of the surveillance system; and
- Cost and resource requirements

Each of the above five facets are described in some detail below. Suffice to mention that the focus of the research dissertation is on completeness of TB reporting which is an element of the attribute of sensitivity, and influenced by qualities of acceptability and timeliness.

2.2.1 Public Health Importance of the Health Event

The importance of the health event under surveillance can be assessed by describing it in terms of the current impact of that health event, its potential for spread; and its preventability.

The current impact determines the magnitude of health event by measuring i) disease occurrence including incidence and prevalence rates; ii) severity using case fatality rates and death to case ratios; iii) mortalities including overall and age-specific rates; iv) morbidities including hospitalization and disabilities; and v) health care cost.

The potentiality for spread recognises the need to maintain a surveillance system for diseases that are currently rare or under control, but that could also re-emerge.

Preventability reflects the link between surveillance and public health intervention. Surveillance of infectious diseases is a critical element in providing effective public disease management, control and prevention[21]. In South Africa, the country-wide implementation of Electronic TB register seemed to have been gaining ascendancy as an integral component of DOTS within the National TB Control Programme.

The incidence of TB per 100 000 population, case fatality rates and TB deaths per 100 000 population are of relevance to the current research project when conducting a trend analysis of tuberculosis in the years 1993-2003.

2.2.2 Objectives and Operations

The surveillance system is assessed by looking at its objectives and operations.

All those who are responsible for data handling and management and the maintenance of the system should have a clear understanding of the objectives of the surveillance system.

The operations of the system are assessed by answering a number of questions such as the following:-

- What is the case definition of the health event? Is it practical in this setting?
- What is the population under surveillance?
- What is the time period for data collection (weekly, monthly, annually)?
- What are the reporting and data sources? Who is supposed to report? Who actually does report?
- How are the data handled, captured, transferred, stored? Are there unnecessary delays? How is confidentiality maintained?
- How is the data analysed? By whom? How often? How thoroughly?
- How is the information disseminated? How often are reports distributed? To whom? Does is get all those who need to know?

Answering all of these questions is beyond the scope of this research dissertation. However, questions on time period for data collection, reporting sources, data handling and capturing are some that are relevant to this research project. In this regard, some operational elements of the TB surveillance as part of the notifiable disease surveillance system are described in the Chapter Three.

2.2.3 Usefulness

Usefulness is assessed by asking questions on the extent to which a surveillance system is used to develop actions to address the health event under surveillance. These questions may include the following:-

- what actions have been taken as a result of data and information from the surveillance system?
- who has used the information to make decisions and take actions?
- what other future use might the information have?

The usefulness of the information is influenced greatly by its application in the health service, including feedback mechanisms and dissemination to those who need to know and by the system's attributes.

In South Africa, data and information on TB is expected to be used by various users at facility, district, provincial and national levels who are involved in planning, implementing, management and control of TB. Various indicators have been developed for purpose of monitoring TB trends, programme management and reporting annually to World Health Organisation. It is on the basis of the rising burden of TB based on the available data and information that the Department of Health formulated a TB crisis strategy in 2006 with targeted coverage in the selected geographic areas.

2.2.4 Attributes of the Surveillance System

The Updated Guidelines have identified a set of seven attributes or qualities, which serve as benchmarks for an efficient, useful public health surveillance system. These qualities may be assessed qualitatively or quantitatively, or both.

2.2.4.1Simplicity: this quality describes the ease with which a system operates as a whole and its components parts. For example, the data collection instruments and tools should be designed to ensure easiness in their completion.

2.2.4.2Flexibility: this quality describes the ability of a surveillance system to accommodate changes in operating conditions or information needs with little additional resources. Flexibility is necessary when changes are made in the case definitions, or reporting forms and procedures. However, making a system flexible may sometimes proved to be a challenge. For example, due to new demarcation boundaries of local government municipalities, it is an enormous challenge to realign datasets that were reported using previous magisterial districts.

2.2.4.3Acceptability: this quality describes the willingness of various role players involved surveillance of health events and data management and use to participate in the surveillance system. The acceptability of reporting may be measured by the proportion of those who are reporting and how complete their forms are. Unwillingness to participate in a surveillance system was expressed a few years ago in South Africa. The intention of new government of South Africa to make AIDS a notifiable condition was not feasible due to various concerns and lack of common understanding of the purpose and need for this.

2.2.4.4Sensitivity: this quality refers to the ability of the system to detect cases or other health events it is designed to detect. It also reflects the ability to detect epidemics, outbreaks and changes in diseases occurrence. Sensitivity includes both a case detection and diagnosis and a disease-reporting component[(21)]. Disease-reporting completeness refers to the proportion of those diagnosed with the health events under surveillance that are reported to the appropriate authorities. Sensitivity can be measured by comparing data on a health event occurring in particular area over specified time period using two or more sources of data. Many surveillance systems suffer from under-reporting as they tend detect only a small proportion of cases or other health event than what actually occur.

2.2.4.5 Predictive Value Positive: this quality reflects the proportion of the reported cases that are true cases. Predictive positive is measured by investigating whether the reported cases meet the definition of the true case.

2.2.4.6 Representativeness: this attribute reflects the ability of a surveillance system to accurately show the incidence of a health event in a population by person, place and time. Representativeness includes the accuracy of the data provided and is influenced by acceptability and sensitivity of the system.

2.2.4.7 Timeliness: this attribute is about timely reporting of a health event and submission of data in order for appropriate action to be taken. Timeliness is a key performance

measure of public health surveillance systems, timelines requirements may vary by disease, intended use of the data and the levels of the public health system [22].

2.3 Under-Reporting of Tuberculosis

As public health surveillance plays an important public health function in the prevention and control of disease, the availability of accurate, complete and timely information improves the quality of surveillance data and supports public health decision-making[23]. A number of problems have been identified with the disease notification. Passive surveillance is more often associated with under-reporting of diseases, lack of representativeness of cases that are reported, lack of timeliness in reporting, lack of sensitivity and/or specificity as well as incorrect diagnosis of diseases by health personnel. Under-reporting in passive surveillance systems leads to inaccurate and unreliable notification data[24] and to underestimation of disease burden. Some of these problems of under-reporting are as a result of accessibility and complexity of the notification forms, lack of motivation among health personnel because of poor feedback and perceived uselessness of notification[25] as well as the high turnover of health information officers involved in data collection and processing. These problems affect the system's quality of the data generated as well as the quantity of information produced.

Tuberculosis cases are mostly under-reported, the proportion of incident cases that is notified to WHO is often smaller than the proportion actually of incident case of often treated[5]. A critical literature review on completeness of TB notification in United Kingdom found that notification varied from 7% - 27% in studies that had a denominator and 38%-49% extra cases were identified in studies, which examined specific data sources[26]. Assuming that the level of under-reporting remains reasonably constant, data generated by passive surveillance can be useful in identify trends[26]. It is important to estimate both the levels of under-reporting and the consistency of these levels in order to obtain meaningful rates and trends from notifications[27]. The percentage of under-reporting quoted in the United States of America for more common diseases ranges from 10% to 25%.

Researchers over the years raised concerns about the real incidence of TB in South Africa compared to notified cases. Bradshaw et al., (1987) estimated that only a third to a half of all TB cases that occur in each year were notified. Wilson and Ramphele (1996) observed that in 1981, a total of 766 of tuberculosis cases were officially reported in Lebowa, yet in one of the four hospitals there were between 300 and 400 cases of TB [(9)]. Nevertheless, with consistent underreporting over the years, it is still possible to establish trends. The fraction underreported is sometimes offset by over-diagnosis and by double reporting[(5)]. Information is most reliable for smear positive case recorded and reported as recommended for DOTS programme[(28)].

2.4 Measuring Under-reporting of Tuberculosis

The WHO TB Monitoring and Evaluation has published a virtual workshop on TB epidemiology in order to assist in determining the burden of TB, the overall trend of TB and effectiveness of TB control programme[(29)]. Direct and indirect methods are used to estimate the burden of TB.

Direct methods of measuring TB infection and disease include determining the prevalence of infection through tuberculin surveys, and estimation of the incidence of infection using data on prevalence of infection from tuberculin surveys.

Several indirect methods are used including the notification rate can be multiplied by a factor to correct for under-detection; estimates of the prevalence of disease data can be divided by the duration of infectiousness to arrive at an estimate of incidence of disease (incidence = prevalence / duration); tuberculin survey data can be used to derive the annual risk of TB infection by multiplying the annual risk of infection by the Styblo ratio (50 smear-positive TB cases per 100,000 population correspond to a 1% annual risk of TB infection); and the number of TB deaths in the population (i.e. mortality) can be divided by the case-fatality rate to estimate the incidence of TB (incidence = mortality / case-fatality rate).

2.5 Motivation and Research Question

The advisory group revising the TB Control Programme in 1992 commented that it was not known to what extent the true incidence rate differs from the notified rate. This was because not all al cases of TB are found and notified. The diagnostic criteria used then lacked specificity and sensitivity, therefore many notified cases may have been false positives.

Though the completeness of reporting for TB is improving, consistent under-reporting impedes the accurate estimation of the burden of TB in South Africa [(26)]. The Global Burden of Tuberculosis Report estimated the TB incidence rate of 392 cases per 100 000 for 1997 in South Africa compared to the 305 all cases per 100 000 for 1997 calculated value obtained from using TB register data from TB Reporting and Recording System[(27)]. The Global Burden of Tuberculosis Report took into account the estimation of under-reporting and employed statistical tools to correct underreporting.

This study applies the indirect method making use of notification and reported data. An estimate of the completeness of TB data and level of underreporting using Notification Systems and TB Reporting and Recording System were calculated. The research question to be answered is therefore “What is the level of under-reporting of TB cases and deaths at the national and provincial levels?”

CHAPTER 3: STUDY AIM AND OBJECTIVES

This chapter outlines the overall aim and specific objectives.

3.1 Aim

The aim of the research project is to evaluate the completeness of tuberculosis notification based on notification data and the TB Recording and Reporting System (also referred to as the Electronic TB Register). This aim is achieved through the study of electronic TB register, disease notification system and the deaths notification system.

3.2 Objectives

The objectives of the study were to:

1. Perform an analysis of 11 year trends of reported tuberculosis
2. Estimate the levels of under-reporting of tuberculosis in the period 1993 to 2003 by comparing the annual TB cases and deaths reported with those captured on the electronic TB register
3. Investigate the temporal consistency of underreporting at national and provincial levels

CHAPTER 4: METHODOLOGY

This chapter outlines the research methodology and describes the operations of the disease notification system and the TB reporting and recording system referred to as the Electronic TB Register which were the two main data sources for the research project.

4.1. The setting

South Africa has two parallel national datasets for tuberculosis. One is the TB dataset from the statutory Disease Notification System and the other is the programmatic Electronic TB Recording and Reporting System. The Disease Notification System and Electronic TB Recording and Reporting Systems are housed in the Epidemiology and Surveillance Directorate and the National TB Control Directorate of the National Department of Health respectively. In addition, national TB data for the period 1995-2001 was extracted from the TBSYS and the mortality data were also obtained. The TBSYS is a precursor of the Electronic TB Register.

The National Health Act No. 61 of 2003 repealed the Health Act of 1977 which had until 2003 been the legislation which regulated the notification of 33 medical conditions. Three forms are used across the country as standard format for reporting the notifiable medical conditions as required in terms of regulations prescribed under the National Health Act No. 61 of 2003

4.1.1 The Disease Notification System

The initial notification of cases and deaths from notifiable medical conditions is done on a form called GW 17/5 (Annexure 1). The GW 17/5 in which patient demographic data, details of the disease, including date of onset, possible place of infection, details of investigations done and details of the person notifying the condition are captured. It is a statutory obligation for any health care professional who makes a diagnosis of a notifiable medical condition and death from such a notifiable medical condition to notify such a case twice on two separate GW

17/5 forms, first as a “case” and later as a “death”. In other words, the total number of cases notified contains the total number of deaths notified. This ensures that when estimating the case-fatality rate, all deaths in the numerator are also included as cases in the denominator. The GW 17/5 forms are sent by a service provider who makes a diagnosis of a notifiable disease to the relevant local authority/district, usually a town or city council where the information should be used to implement, if necessary, infection control measures or other follow-up actions.

Once a week each local authority summarises all the individual notifications from the GW 17/5 forms they have received onto two summary forms. Summaries of notified cases are done on the form GW 17/3 (Annexure 2) and notified deaths are summarised onto GW 17/4 (Annexure 3). Each week the local authorities send the completed GW 17/3 and GW 17/4 forms to the appropriate provincial office. Figure 1 below illustrates the data flow and feedback mechanisms between various levels. In addition, at all the provincial offices (and regional offices in some provinces) computer systems (using Epi-Info 6 software) have been installed where the data are keyed in and sent each week on disk, or via e-mail to the national office, where they are added twice a month to the national data set of notifiable medical conditions.

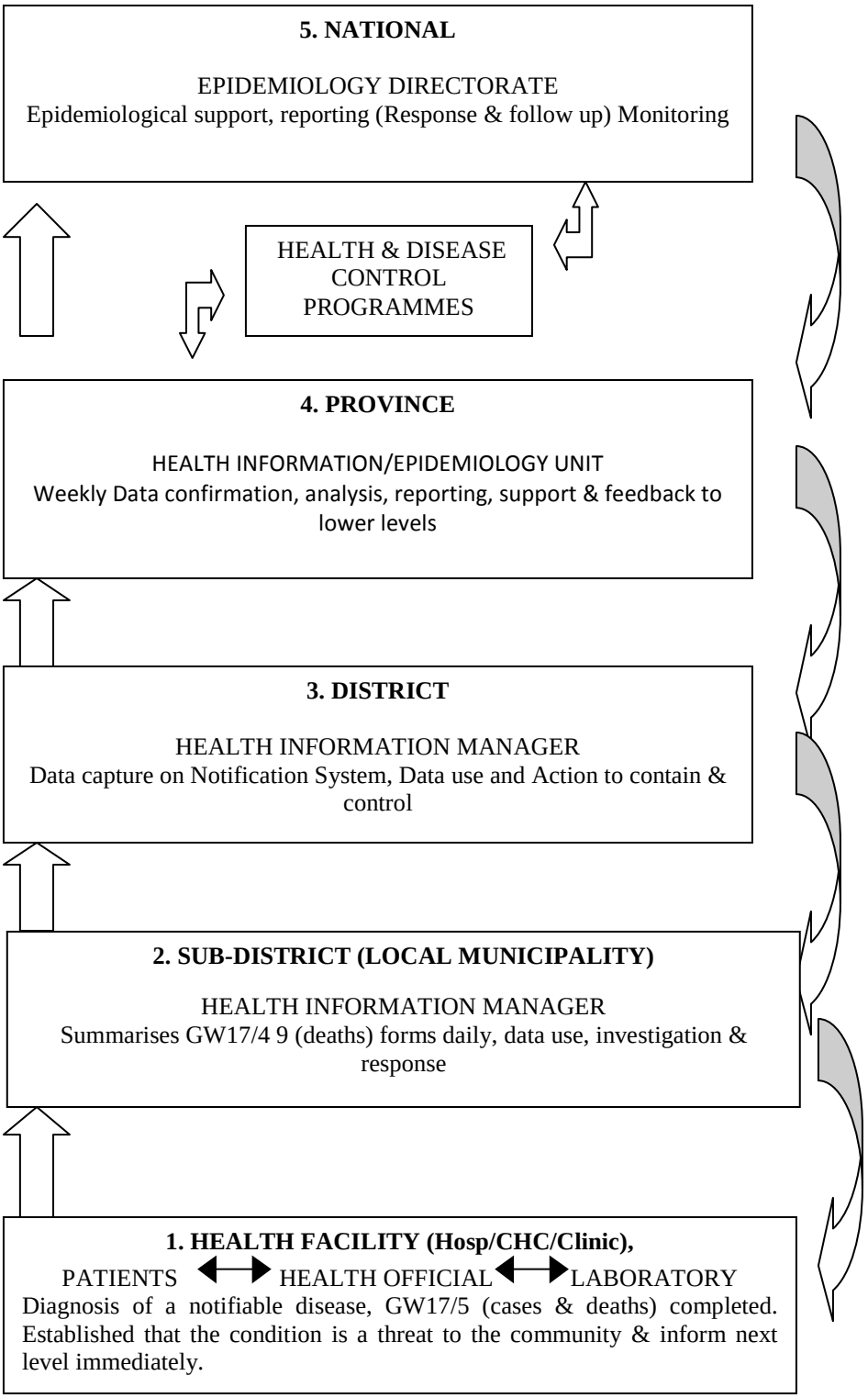

Figure 1: Notifications data flow and investigation & response activities

Source: National Department of Health

The Epidemiology and Surveillance Directorate of the National Department of Health perform the function of collating surveillance data on notifiable conditions. Master files of data dating as far back as 1973 are kept.

4.1.2 The National Electronic TB Recording and Reporting System

The electronic TB Recording and Reporting System was introduced in 2001 as a source of TB information for management support separate from the TB notification system. It was designed to provide information to manage the TB at national, provincial, district and health facility levels. Accurate record keeping of each patient is essential for the proper management by maintaining up-to-date registers and reporting data to the central unit quarterly.

The TB Recording and Reporting System incorporates standardised case definitions, disease classifications, treatment regimens and definitions for treatment outcomes. The definitions conform to the standard WHO/IUATLD recording and reporting system[30]. A new TB register has been introduced. This register contains 15 sets of multi-page forms. Each set consists of 4 attached sheets of different colours. The top three forms are printed on carbonised paper so that entries are transferred to underlying pages. The facility-based health care worker consecutively enters newly enrolled patients. At the end of the quarter, the top (pink) sheet is detached and sent to the district. At the district level, this page is used to define the case finding cohort. The facility continues to update information on each patient on the second (yellow) sheet; this second sheet thus contains a carbon copy of the patient number, name, address, demographic information, and initial diagnostic results as well as newly-entered information on smear status at 2 - 3 months. The sheet is sent to the district at the end of the second quarter, where it is used for sputum conversion data. The third (green) sheet, which is sent to the district after 9 -12 months, contains information on 5 - 7 month smear results and treatment outcome is used to perform the cohort analysis. The final page, which is white, is retained in the facility register. At district-level, Communicable Disease Coordinators (CDCs) or TB Coordinators reassemble registers in facility specific order and enter information in an electronic TB register. The Electronic TB Register (ETR) is used to generate the following standardised reports:

- Report on Case Finding
- Report on Sputum Conversion

- Report on Treatment Outcome
- Facility Profile Reports
- Data validation/Data checks.
- Patient listings

Reports as listed above can be generated to reflect quarterly or annual results and also include summaries by quarter, type of disease, category, age and sex. The Electronic TB Register allows cohort analysis, which is crucial to monitor programme performance in the TB Control Programme.

The NTCP has employed a data analyst to process and analyse national data set and assist provinces and districts. Recently, copies of the data are made available to the Cluster: Health Information, Evaluation and Research.

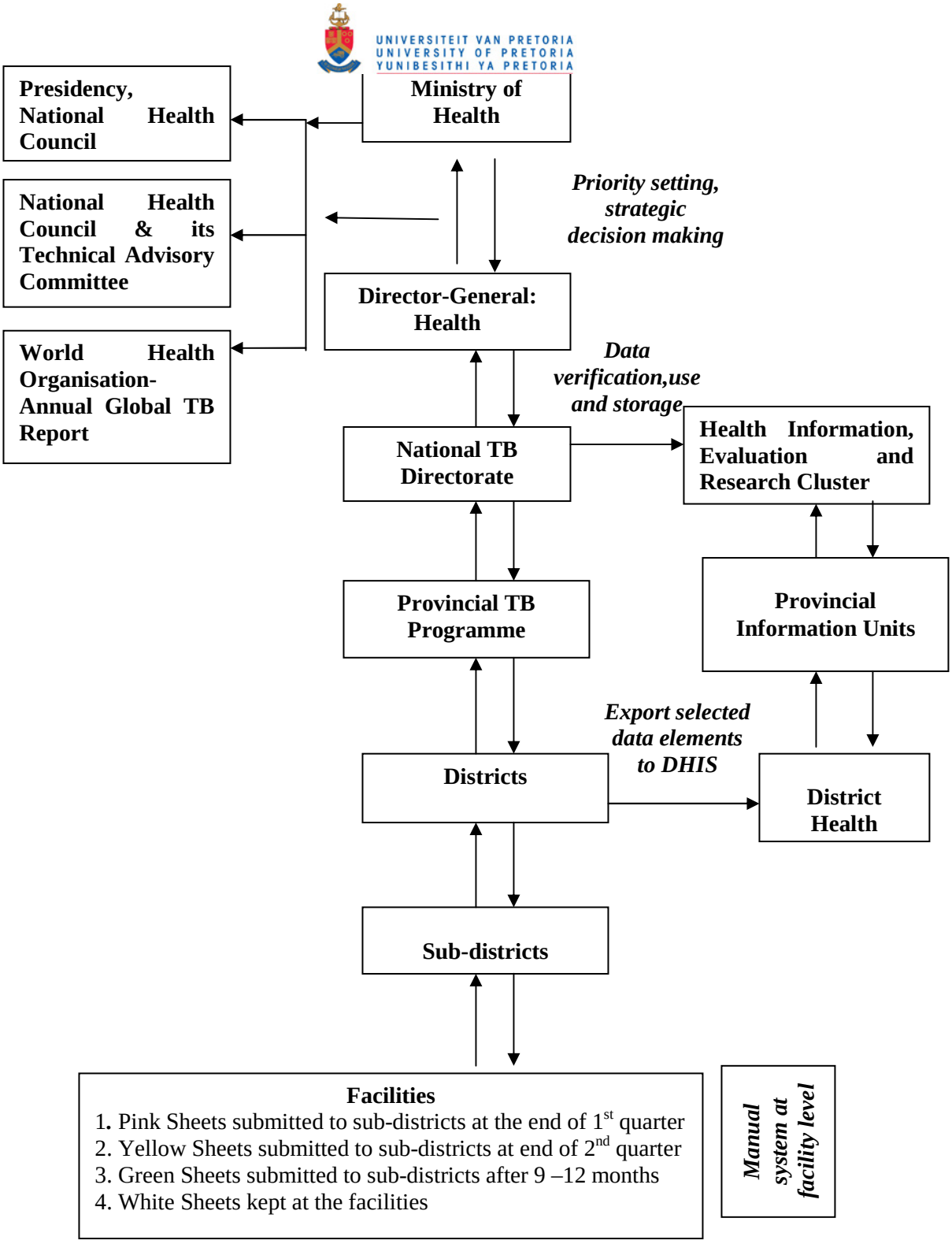

Figure 2: Electronic TB Register Data Flow and Reporting

Access was granted to the Electronic TB Register for all provinces. This required that that the installation of the Electronic TB Register Access Database (ETr.net) on the desktop. The ETr.net has been designed to analyse each provincial data file individually. Unique username and password was issued to the researcher for each provincial data file. The ETR.net contains the following information including:-

- Health Facility name
- Patient's name and surname
- Year: Correspond with a year of date of registration
- Registration date
- Age: Age in years
- Sex: Male , Female
- Disease classification: Type of TB
- Site of the disease
- Treatment start date
- Treatment end date
- Patient type: moved in, newly registered, transferred in
- Patient categories
- Regimen
- Last updated- last date when the dataset was updated
- Died before treatment
- Treatment outcome: complete, cured or died

4.1.3 Access to the TB Data

Access was granted to the dataset on notified TB cases and deaths on EpiInfo 6 Software for the period 1993-2003. The variables captured by the EpiInfo 6 are listed in Annexure 4.

In addition, the TBSYS data files were also accessed. The TBSYS was a computer system developed by Department of Health in 1995 for use at regional and provincial levels. The TB datasets that were captured on the Epi-Info 6 and this database was called TBSYS. The TBSYS contained files for all nine provinces. All files had data for years between and including 1995 and 2001. Data files for the provinces of North West and Mpumalanga did not contain records in them. The TBSYS ceased to be used with the gradual use of the ETR.net.

4.2 Sources of data

Sources of data were the Disease notification system, the Electronic TB Reporting and Recording system, the formerly used TBSYS data files and causes of death data from Statistics South Africa. The ETRnet was used to validate the TB notification data as the degree of completeness of TB data in the Electronic TB register is far higher than that in the Disease notification system

A compact disc containing meta data on the causes of deaths in South Africa for the years 1997 to 2004 was obtained from Statistics South Africa [(35)]. The meta data files included an instruction manual on how to create frequency tables

The data collection and flow process as described in section 4.1.1 above has not been uniformly implemented as intended or supposed to be. There have been various challenges or reasons why the notification system is not optimally being used to notify TB. It has been suggested that the current TB notification system as a source of data, be replaced by data collection tools of the electronic TB register as described in section 4.1.2, in so doing eliminate duplication. Indications are that even before the latter tools were introduced, there was a decline in the support for the use of notification system and poor compliance by health

professionals in notifying diagnosed TB cases. There has never been periodic evaluation of the notification system as whole or its component parts in the past 20 years and its regular reviews have been restricted to ad-hoc meetings held between national and provincial officials responsible for disease surveillance. The use of the tools for the electronic TB register since its inception has received visible support and active support visits from both National TB Programme and the TB management and coordinators in provincial and district offices.

4.3 Study Design

The research is a descriptive study design that compares the 10 year time trends in TB notifications with the concurrent trends in electronic TB patient register in the 9 South African provinces.

4.4 Variables Studied

The main variables studied were the number of cases and deaths notified during the period 1993 – 2003, the types of tuberculosis notified, the dates of notification and the notifying province.

The data from ETR.net were exported from the ETR.net to the Microsoft Excel worksheet. The following variables were:-

- Year: Correspond with a year of date of registration
- Registration date
- Sex: Male , Female

Access was granted to the dataset on notified TB cases and deaths on EpiInfo 6 Software for the period 1993-2003. Demographic variables contained in the notification system include age, gender and population group of the patient, magisterial district and province where the notification was reported. Annexure 4 shows international codes for disease and different types

of TB that are notified by law [30]. The following variables from the Disease Notification System were used :

- DCODE : For various types of the TB captured using the ICD codes;
- TYPE: For cases and deaths captured as “L” and “D” respectively;
- RACE: For population groups captures as “A” for Asians, “B” for blacks, “C” for coloureds and “W” for whites;
- SEX: For sex of the patients captured as “f” for females and “m”for males
- YEAR: for year in which the case and death was notified;
- PROV: for provincial names captured as “EC” for Eastern Cape,“FS” for Free State, “GA” for Gauteng, “KZ” for KwaZulu-Natal, “MP” for Mpulamalanga, “NC” for Northern Cape ,”NP” for Limpopo, “NW” for North West, and “WC” for Western Cape; and
- COUNT: captured as 1 in every record.

CHAPTER 5: ANALYSIS AND RESULTS

5.1 Data Cleaning

5.1.1. Incorrectly Captured Variables in Notified TB Dataset of the Disease Notification System

The data on disease notification system uses EpiInfo 6 in which data can be recorded as either a variable “deaths” or a variable “cases”. The variable names used in the EpiInfo 6 for cases are denoted by “L” and for deaths as “D”. Table 2 below shows that in the period 2000 to 2003, the dataset contained the variables “!”, “A” and “l” which were as a result of incorrect capturing.

A total of 37 records were captured incorrectly as “!” of which 31 and 6 were in 2002 and 2003 respectively. A total of 29 records were captured incorrectly as “A” of which 23 and 6 were in 2002 and 2003 respectively.

A total of 447 records were captured as “l” for the years of 2000 to 2003, the majority of which were in 2003. The small letter “l” records were re-categorised as variable “L” that is “cases”. All the “!” records were excluded from analysis. The “A” are TB suspects which should not have been captured[1] .

Clearly, all the incorrectly captured records should have been identified and corrected immediately when the datasets were cleaned in the provincial offices in preparation for submission to the national office. These records seemed to be found in the years 2001, 2002 and 2003.

[1] Personal communication with Ms L Mahlasela, Deputy Director : Epidemiology and Surveillance ,29 August 2006

5.1.2 Missing Data in the Disease Notification System

Data for age, race, and sex variables were missing in a number of records. The age variable was not used in the analysis. Analysis of cases and deaths notified by either “race” or “sex” variables excluded those missing values. The sex variable was missing in 16 cases in the datasets of KwaZulu-Natal and 14 cases of Northern Cape. The race variable was missing for 12 cases in the datasets of KwaZulu-Natal and 174 cases in the datasets of Northern Cape.

5.1.3 Data Cleaning in the Electronic TB Register

The data of TB cases registered in the Electronic TB Register contained some errors which had to be corrected before the analysis was done. The main variable that was corrected was the “YEAR”. There was a huge number of TB cases in all provincial datasets for which the variable “YEAR” and the year extension of the variable “DATE REGISTERED” (dd/mm/yyyy) were not similar. In regard, the variable “YEAR” was changed to the year extension of the variable “DATE REGISTERED”. For example, Table 2 below shows the corrections made in the data set of the province of KwaZulu-Natal.

Table 2: Corrections made in the data set of the province of KwaZulu-Natal

Year of the variable "DATE REGISTERED"	Variable "YEAR		No of records changed
	Changed from	Changed to	
2000	2002	2000	4
2001	2002	2001	28
2001	2003	2001	2
2002	2001	2002	61
2002	2003	2002	134
2003	2002	2003	59
2003	2004	2003	788
2003	2005	2003	1

In addition, to changes made in the variable "YEAR", there were a few records of double entry. A double entry record had all variable fields containing identical data and one of the records was deleted. For instance, the dataset for KwaZulu-Natal contained double-captured 3 records.

5.2 Results

5.2.1 National Trends for the Period 1993-2003

An analysis of 11 year trends of notified tuberculosis was performed for the number of cases and deaths per year, the number of cases and deaths per 100 000 population per year and the case fatality rates per year for the period 1993 to 2003. All frequency tables on the number of cases and deaths were done in analysis of the EpiInfo 6.

The national mid-year population estimates in Annexure 5 for the years 1993 -1995, 1997-2000, 2002-2003[36, 37, 38, 39, 40] and the census population for years 1996[41] and 2001[42] were used to calculate estimates of TB cases and deaths per 100 000 population**.** The rates per 100

000 population and case fatality rates were calculated manuals using a scientific calculator. Annexure 5 shows the midyear population estimates and the census population by provinces.

The 25th, 50th (median), and 75th percentiles were calculated in Stata Version 8.1 to describe the distribution of the number of notified cases and deaths during the 11 year period. The Wilcoxon signed rank test calculated in Stata Version 8.1 was used to determine the differences between male and female TB cases and deaths. Then Wilcoxon signed rank test is non-parametric test [43] as the distribution of notification data was suspected to be not normally distributed.

5.2.2 Distribution of Notified TB Cases, 1993-2003

Nationally, the lowest number of notified cases was 36081 in 1994 and the highest was 121617 notified cases in 2002 as can be seen in Figures 3 and 4. The annual cases load declined from 42099 in 1993 to 36081 in 1996, then increased sharply from 48076 in 1997 to 89111 in 1998.The median was 59909 cases, 25% of the cases less or equal to 39312 and 75% of the cases less or equal to 89628.

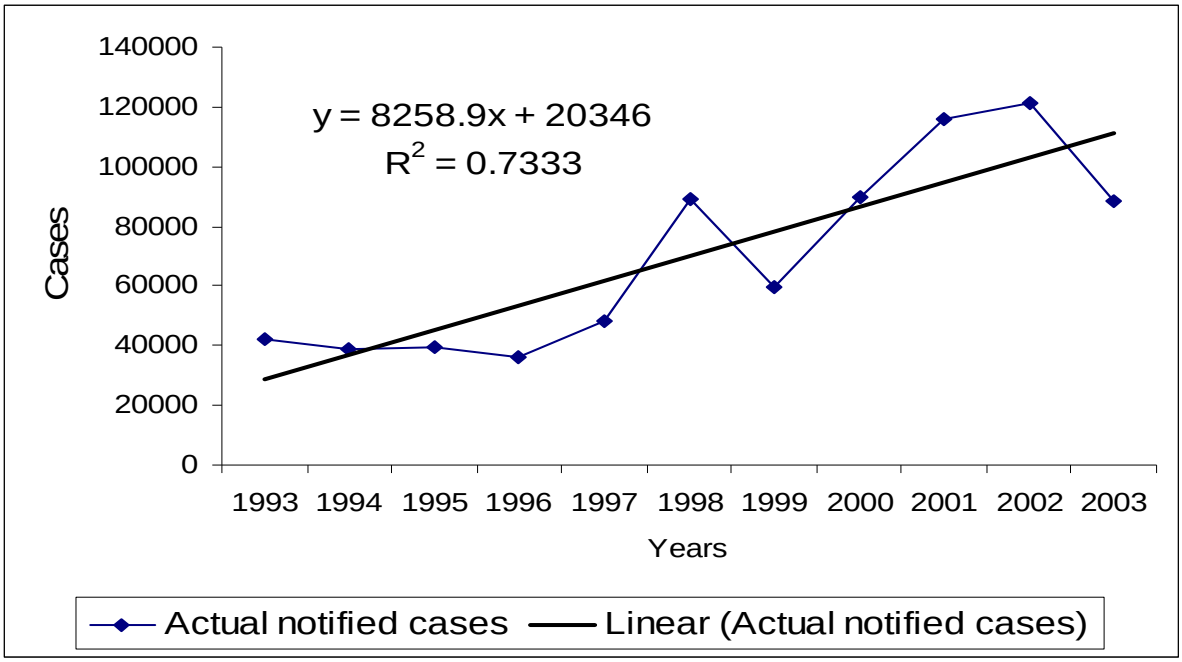

Figure 3: Actual and predicted number of notified cases 1993-2003

The annual provincial number of cases notified (as shown in Figure 3 and Annexure 7) shows that above-mentioned increase resulted mainly from the two-fold increase in the provinces of Eastern Cape (EC), KwaZulu-Natal (KZN) and Western Cape (WC) which occurred in 1998. In 1999 the annual cases load decreased to 59909, thereafter it increased to 121561 in 2002 and decreased again to 88295 in 2003. There was a three-fold increase in Western Cape in 2001 and four increase in Northern Cape in 2002.

Figure 4 below presents the provincial distribution of cases notified in the 11 year period 1993 to 2003. It can be seen that there were marked variations in the notified between the provinces and between years per province.

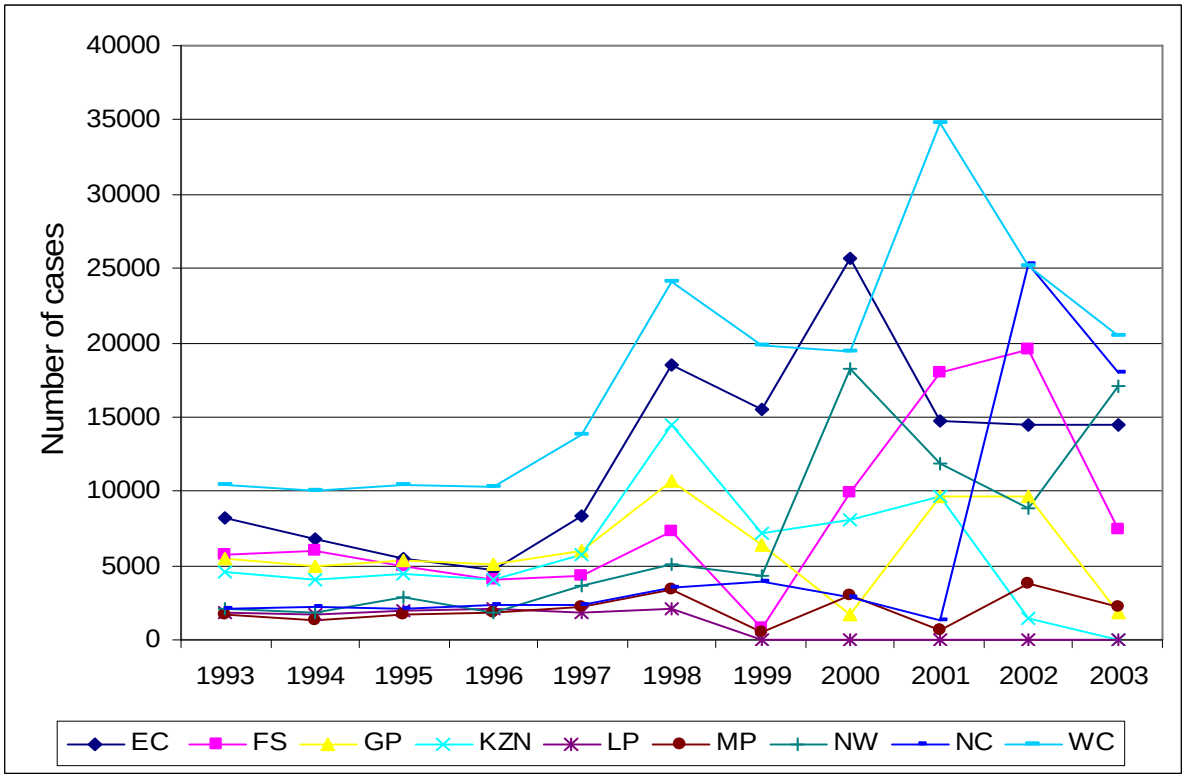

Figure 4: Annual number of notified cases by province, 1993-2003

The numbers of notified cases were consistently the highest in the Western Cape for all the years with the exception of the years 2000 and 2002 when the notified cases were highest in Eastern Cape and Northern Cape respectively. In 2003 there were massive decreases in the provinces of Free State, Gauteng, KwaZulu-Natal, Mpumalanga, Northern Cape and Western Cape. The lowest numbers of notified cases varied between provinces during the 11 year

period with Mpumalanga notifying consistently lower numbers in the years 1993 to 1996. In Limpopo the notification of TB cases seemed to have almost grounded to halt between the years 1999 to 2003 inclusively. A total of 13 cases were notified by that province during that period. In KwaZulu-Natal the number of cases dropped to 1384 and 15 cases in 2002 and 2003 respectively. The poor data in Limpopo and KwaZulu-Natal during years 1999 to 2003 are a cause for concern.

The trend pattern of the numbers of notified cases in all provinces tended to be inconsistent between the years. For example, in the Eastern Cape province, the number of notified cases increased from 8165 in 1993 to 14457 in 2003, and the median was 11457 cases in the 11 year period. The lowest number of notified cases in that province was 4648 in 1995 and the highest number of notified cases was 25666 in 2000.

5.2.3 Distribution of Notified Deaths, 1993-2003

Nationally the lowest number of deaths was 1967 notified deaths in 1994 and the highest number of deaths was 6085 notified in 2002 as shown in Figures 5 and 6 (see Annexure 6). The median was 2830 deaths, 25% of the deaths were less or equal to 2346 and 75% of the cases less or equal to 4563 for the eleven year period.

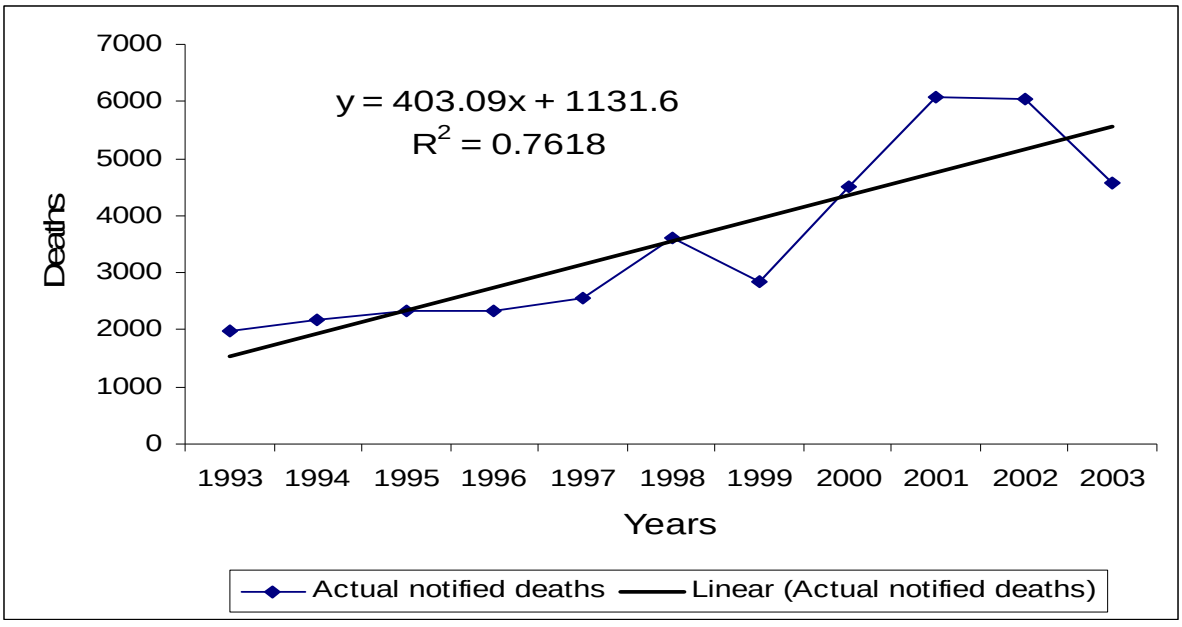

Figure 5: Actual and predicted numbers of notified deaths

As can be seen in Figure 6, the number of deaths notified varied between the provinces and fluctuated between the years. It was the highest for the years 1993 to 1996 in Western Cape and the highest for the years 1997 to 2003 in Eastern Cape. It was the lowest in Mpumalanga for the years 1993 to 1997 and the lowest in Limpopo for the years 1999 to 2003. The notification of TB deaths in Limpopo seemed to have almost grounded to a complete halt in the period 1999 to 2003 inclusively. No death was notified by that province during that period. Furthermore, a total of 8 deaths were notified in Mpumalanga in the years 1999 to 2003 and 1 death was notified in KwaZulu-Natal in the years 2002 to 2003.

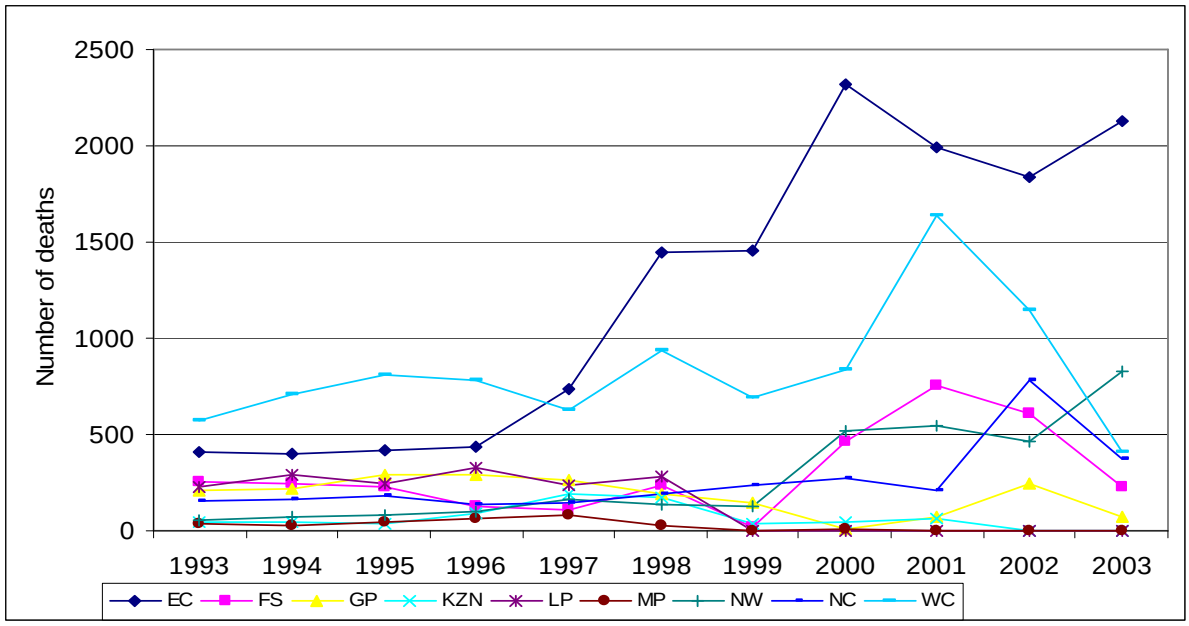

Figure 6: Annual number of notified deaths by province, 1993-2003

The annual number of deaths seems to show a steady increase between 1993 and 1997 and started to peak up in 1998 when a total of 3616 deaths were notified. As depicted in Figure 6 above, a steep peak in 1998 resulted from an increase in notified deaths mainly in the provinces of Eastern Cape (EC) and Western Cape (WC). In 1999 the annual number deaths had decreased to 2830, by 2001 it had reached a highest number of 6085 and decreased again to 4563 in 2003. The overall decrease in the notified deaths in 2003 resulted from the provinces of Limpopo, Free State, Gauteng, KwaZulu-Natal, Mpumalanga, Northern Cape and Western Cape.

5.2.4 Notified TB Cases per 100 000 Population

The number of cases per 100 000 population per year fluctuated during the 11 year period. Nationally, as can be seen in Table 3 the number per 100 000 population decreased gradually

Table 3: Number of notified TB cases per 100 000 population per province, 1993-2003

	EC	FS	GP	KZN	LP[2]	MP	NW	NC	WC	National
1993	138.15	231.19	79.61	52.257	41.996	63.226	68.67	255.05	297.77	111.37
1994	112.92	238.06	70.39	50.812	35.745	51.599	55.89	257.07	264.77	101.41
1995	89.06	192.96	74.44	53.61	40.47	60.75	88.74	251.92	272.83	99.19
1996	73.75	155.31	69.33	47.34	41.4	64.89	54.58	272.52	260.53	88.91
1997	129.96	160.1	79.92	66.98	35.76	78.7	107	281.96	342.83	116.87
1998	283.03	269.83	141.15	166.82	40.55	115.24	144.6	408.09	588.9	212.63
1999	231.92	28.12	82.56	82.28	0.11	19.67	120.92	404.15	475.42	140.3
2000	375.81	353.35	22.09	89.76	0.02	97.28	511.47	324.15	463.03	205.17
2001	326.58	663.59	109.5	102.48	0.04	22.64	323.27	159.59	768.06	258.04
2002	204.96	680.59	117.77	14.87	0.03	120.43	241.91	2841.85	583.01	267.84
2003	222.30	271.71	19.9	0.15	0.03	69.33	449.18	2193.94	430.23	190.17

from 111.37 in 1993 to 88.9 in 1996, increased from 116.87 in 1997 to reach 212.63 in 1998 and declined to 140.3 in 1999 and increased again from 205.17 in 2000 and reaching 267.84 in 2002 and then decreased to 190.17 in 2003. These fluctuations may be attributed to inconsistencies in reporting and under-reporting by certain provinces.

[2] As can be seen, the extremely low numbers of cases per 100 000 were from the Limpopo province in the period 1999 to 2003. Similarly these extreme values can be seen for KwaZulu-Natal in the year 2003. All these are due largely to a flaw was never identified and corrected during the data management process.

5.2.5 Notified TB Deaths per 100 000 Population

Table 4 shows a consistent increase in the national number of notified deaths per 100 000 population from 5.2 in 1993 to 6.63 in 1999, and then increased steeply to 10.3 in 2000 reaching 13.3 in 2002. The provinces of KwaZulu-Natal, Gauteng, Limpopo and Mpumalanga showed the lowest number of deaths per 100 000 in comparison to the provinces of Eastern Cape, Northern Cape and Western Cape. As can be seen in Table 4, there were nil deaths per 100 000 in Limpopo from 1999 to 2003. In KwaZulu-Natal , the number of deaths per 100 000 ranged between 0 and 2.26 in 11 year period, whilst a similar pattern can been observed in Gauteng and in Mpumalanga for the period 1999 to 2003.

Table 4: Number of deaths per 100 000 population per province, 1993-2003

	EC	FS	GP	KZN	LP[3]	MP	NW	NC	WC	National
1993	6.92	10.29	3	0.598	5.057	1.39	1.83	19.08	15.5	5.2
1994	6.6	9.73	3.13	0.56	6.278	0.98	2.35	20.16	18.62	5.61
1995	6.87	8.93	4.03	0.44	5.22	1.65	2.46	22.17	20.89	5.92
1996	6.93	4.8	3.99	1.08	6.65	2.15	2.86	16.37	19.76	5.78
1997	11.51	3.98	3.53	2.26	4.7	2.81	4.93	17.37	15.75	6.23
1998	22.12	8.67	2.58	2	5.4	0.79	3.93	21.88	23.07	6.75
1999	21.77	0.79	1.83	0.38	0	0	3.59	26.88	16.66	6.63
2000	33.9	16.71	0.06	0.52	0	0.17	14.44	31.1	20.03	10.32
2001	30.93	27.04	0.803	0.64	0	0	15.39	25.4	36.23	13.53
2002	25.59	21.71	3.06	0	0	0.03	12.51	87.78	26.53	13.32
2003	32.65	8.4	0.775	0	0	0.06	21.86	45.91	8.71	9.83

[3] Note the zero deaths /100 000 in the period 1999 to 2003 in Limpopo. Similarly there zero death/100 000 population for KwaZulu-Natal in 2002 and 2003 and for Mpumalanga in 1999 and 2001. All these are due largely to a flaw was never identified and corrected during the data management process.

5.2.6 Case Fatality Rate

Case fatality rates (CFR) were calculated for each of the years. The CRF was calculated as $\text{CFR} = \frac{deaths}{cases + deaths}$ X 100. As pointed out in Chapter 3 above that the notifiable disease surveillance's form GW17/5 is used to report occurrence of a case and death on two forms. This means that the total number of cases captured contains the total number of deaths. The denominator used to calculate the CRF is recorded as cases in the notification system. The recorded number of deaths in the numerator was not added to the number of cases in the denominator. Table 5 shows a trend for the period 1993-2003. The average CFR for the period 1993-2003 was 4.83. The lowest CFR was 3.9 in 1998 and the highest was 6.1 in 1996. The CFR gradually increased from 4.46 in 1993 and to 6.1 in 1996, then declined to 3.9 in 1998 and started to level off 4.51 in 2000 to 5.17 in 2003.

As can been seen in Table 5, the case fatality rates fluctuated between years within provinces and also varied between provinces. In Free State province, the case fatality rates decreased from 4.45 in 1993 to 2.49 in 1997 and then increased from 3.21 in 1998 to 4.18 in 2002.

In Gauteng, the case fatality rates increased from 3.78 in 1993 to 5.75 and then decreased from 4.49 in 1997 to 3.9 in 2003, however the rate was as low as 0.29 in 2000.

In Limpopo, as indicated in sections 4.2.1 and 4.2.2 above, the number of notified cases and deaths declined to 13 cases and nil death during the period 1999 to the quality of data 2003 inclusively.

Table 5: Case fatality rates

	EC	FS	GP	KZN	LP[4]	MP	NW	NC	WC	National
1993	5.009	4.45	3.78	1.04	12.04	2.2	2.66	7.48	5.54	4.46
1994	5.847	4.09	4.45	1.1	17.57	1.9	4.19	7.48	7.03	5.24
1995	9.057	4.63	5.42	0.81	12.9	2.72	2.77	8.8	7.73	5.63
1996	9.401	3.09	5.75	2.28	19.06	3.32	5.24	5.95	7.59	6.1
1997	8.858	2.49	4.49	3.37	13.16	3.57	4.6	6.16	4.58	5.06
1998	7.815	3.21	1.83	1.2	13.3	0.69	2.74	5.36	3.89	3.9
1999	9.386	2.86	2.25	0.46	0	0	2.97	5.93	3.46	4.51
2000	9.019	4.71	0.29	0.57	0	0.16	2.82	9.6	4.32	4.79
2001	9.471	4.18	0.73	0.62	0	0	4.63	15.91	4.72	5
2002	12.485	3.1	2.6	0.07	0	0.026	5.17	3.08	4.55	4.74
2003	14.684	3.09	3.9	0	0	0.09	4.87	2.09	2.02	5.17

In Mpumalanga province, the case fatality rates increased from 2.2 in 1993 to 3.57 in 1997 with the exception of 1.9 in 1994. From 1998 onwards the case fatality rates were decreasing.

In North West province, the annual case fatality rates show fluctuations but increased from 2.66 in 1993 to 4.87 in 2003.

In Northern Cape province, the annual case fatality rates fluctuated between 2.09 and 15.91.

In Western Cape province, the case fatality rates increased from 5.54 in 1993 to 7.73 in 1995 and decreased from 7.59 in 1996 to 3.46 in 1999. Thereafter the rates increased from 4.32 in 2000 to 4.55 in 2002 and were its lowest at 2.02 in 2003.

[4] Note the zero Case Fatality Rates for the period 1999-2003 in the Limpopo. Similarly, there were zero case fatality rates in provinces of Mpumalanga and KwaZulu-Natal. The zero Case Fatality Rates are due to the flaw in the data management process.

5.2.7 National and Provincial Trends of Notified TB Cases, by Sex

Figure 7 shows that nationally, the annual numbers of notified cases were consistently higher among males than females, and were lowest in 1999 and highest in 2002. The trend shows a steady decline in the years 1993 to 1996 but increased steeply in the years 1998, 2000 to 2002, and then decreased rapidly in 1999 and 2003.

The decline in 1999 resulted from sharp peak that occurred in 1998 due to increase in notified cases in six provinces as was noted in section 4.2.1 above. The decline in 2003 resulted from the decrease in notified cases by six provinces. The provincial distribution of notified cases by sex is presented in Annexure 7.

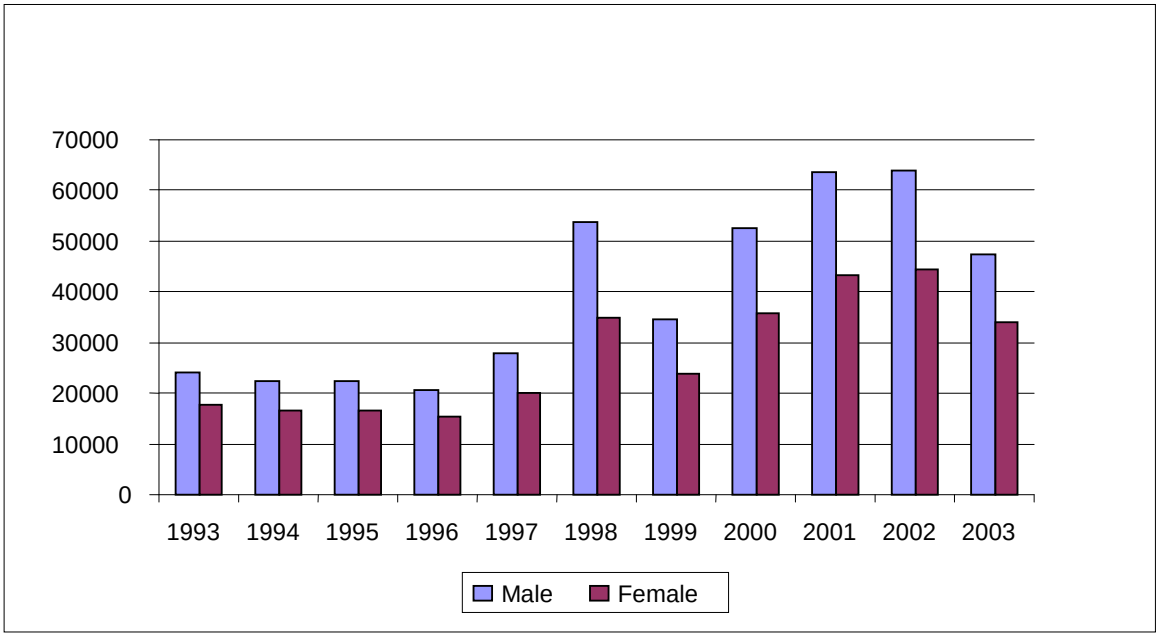

Figure 7: National number of notified cases by sex, 1993-2003

Table 6 below shows the Wilcoxon signed rank test to compare the medians of cases between male and female cases. The p-value of 0.003 indicated that the difference exists between the two medians.

Table 6: Wilcoxon signed rank test for male and female TB cases

. signrank mcases =fcases

Sign	Observations	Sum Ranks	Expected
Positive	11	66	33
Negative	0	0	33
Zero	0	0	0
ALL	11	66	66
Unadjusted Variance 126.50			
Adjustment for ties 0.00			
Adjustment for zeros 0.00			
Adjusted Variance 126.50			
Ho: mcases = fcases z = 2.934			
Prob > |z| = 0.0033			

In the Eastern Cape, a total of 80638 cases among males in comparison to a total of 62359 cases among female were notified in 11 year period. The median for cases among males was 8111 cases in comparison to the median among females of 6210. The Wilcoxon signed rank test was 0.0033 (Annexure 11.5).

In the Free State, a total of 53402 cases among males compared to a total of 34487 cases among female were notified in the 11 year period. The figures showed a decrease in the annual numbers of notified cases for both males and females in the 1993 to 1996 and then increased in the years 1997 and 2002 with the exception of 1999 when the numbers of notified cases and deaths were the lowest. The means of notified cases were 4855 and 3135 among males and females respectively and the medians were 3316 and 2670 among males and females respectively. The Wilcoxon signed-rank test showed a p-value of 0.0033 for the comparison of the medians of the male and female cases (Annexure 12.5).

In Gauteng, the notified cases for males showed an increase in years 1994 to 1998 and thereafter the numbers fluctuated. In comparison, the notified cases for females were between a lowest figure of 644 and highest of 3863. The means of notified cases were 3471 and 2294 among males and females respectively and the medians were 3258 and 2145 among males and

females respectively. The Wilcoxon signed-rank test showed a p-value of 0.0033 for the comparison of the medians of the male and female cases (Annexure 13.5).

In KwaZulu-Natal, a total of 36324 cases among males compared to a total of 26446 cases among females were notified in 11 year period. Although, the numbers were fluctuating, there was a general increase in the annual numbers of notified cases for both males and females. The number of numbers of notified cases for both males and females tripled in the 1998. The means of notified cases were 3302 and 2404 among males and females respectively compared to the medians of 2633 and 1842 among males and females respectively. The Wilcoxon signed-rank test showed a p-value of 0.0044 for the comparison of the medians between the male and female cases (Annexure 14.5).

In Limpopo province, a total of 7246 cases among males compared to a total of 4110 cases among females were notified in 11 year period. The notified cases fluctuated between 1108 cases in 1994 to 1328 cases in 1998. Thereafter the number of notified cases dropped drastically in 1999 to 2003, a total of 8 and 5 cases among males and females were notified respectively. A total of 5 cases in 1999, nil cases in 2000 and one case annually in 2001 to 2003 were notified among males. Only one case annually was notified among females in 1999 to 2003. The median numbers of notify cases were 1108 for males and 502 for females.

In Mpumalanga province, a total of 13801 cases among males compared to a total of 8785 cases among female were notified in 11 year period and more cases were notified for males than females in all the years. The annual numbers of notified cases show an increase for both males and females with the exception of decrease in notified cases in the years 1999, 2001 and 2003. The means of notified cases were 1255 and 799 among males and females respectively compared to the medians of 1120 and 671 among males and females respectively. The Wilcoxon signed-rank test shows a p-value of 0.0033 for the comparison of the medians between the male and female cases (Annexure 16.5).

In North West province, a total of 48382 cases among males compared to a total of 6469 cases among female were notified in 11 year period. Though the annual notified cases increased among both males and females, there were higher numbers of notified cases among males than there were among females in all the years. The means of notified cases were 4398 and 2679

among males and females respectively compared to the medians of 2717 and 1589 among males and females respectively. The Wilcoxon signed-rank test shows a p-value of 0.0033 for the comparison of the medians between the male and female cases (Annexure 17.5).

In Northern Cape province, a total of 36601 cases among males compared to a total of 28596 cases among female were notified in 11 year period and there more notified cases among males than there were among females for all the years. The annual numbers showed that notified cases for both males and females increased during the 11 year period. The notified cases for males increased from 1129 in 1993 to 9393 in 2003. However, the highest number of cases was 14668 in 2002. In comparison the notified cases among females increased from 915 in 1993 to 8123 in 2003. The means of notified cases were 3327 and 2600 among males and females respectively compared to the medians of 1311 and 1096 among males and females respectively. The Wilcoxon signed-rank test shows a p-value of 0.0191 for the comparison of the medians between the male and female cases (Annexure 18.5).

In Western Cape province, a total of 115007 cases among males in comparison to a total of 83357 cases among female were notified in 11 year period. The annual numbers showed a higher number of notified cases for males than for females for all the years. The number of notified cases for males increased from 5784 in 1993 to 12069 in 2003 whereas among females the notified cases increased from 4624 in 1993 to 8304 in 2003. However, the annual numbers showed a pattern of increase and decrease between the years. The means of notified cases were 10455 and 7578 among males and females respectively and the medians of 11228 and 8156 among males and females respectively. The Wilcoxon signed-rank test shows a p-value of 0.0191 for the comparison of the medians between the male and female cases (Annexure 19.5).

5.2.8 Notified TB Cases per 100 000 Population, by Sex

From Figure 8 it can be seen that notified cases per 100 000 population were consistently higher among males than among females for all the 11 year period.

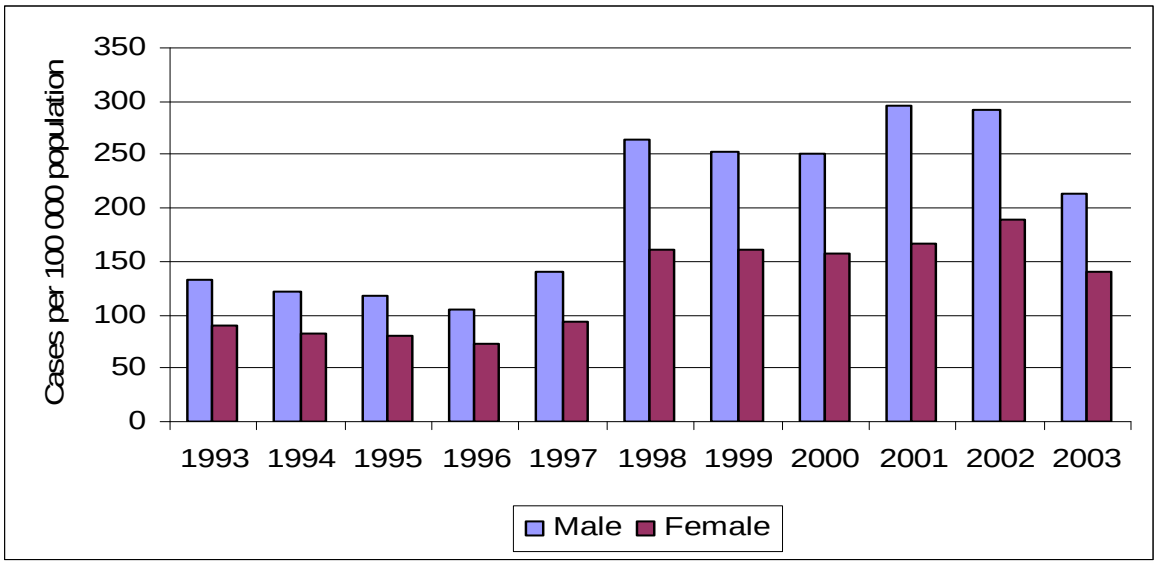

Figure 8: Notified cases per 100 000 population by sex

In the Eastern Cape province, there were more male cases per 100 000 population per year than female cases per 100 000 population for all the years. Both male and female cases per 100 000 population increased by two to three folds in the years 1998, 1999, 200, 2001 and 2002. In the year 2000, the male and female cases per 100 000 were the highest reaching 452.1 and 308.7 respectively.

In the Free State province, there were more male cases per 100 000 population per year than female cases per 100 000 population for all the years. The case fatality rates were high among males than females for all the years. The rates decreased for both males and females in the years 1993 to 1996 and increased in the years 1997 and 2002 with the exception of 1999.

In KwaZulu-Natal Province, the overall figures indicated that there were more male cases per 100 000 population per year than female cases per 100 000 population for all the years. The numbers of male and female cases per 100 000 population show increases over years with the exception of 2002 and 2003. In the year 2000, the male and female cases per 100 000 were the highest reaching 202.43 and 130.32 respectively.

In Mpumalanga province, the overall figures showed an increase in the number of cases per 100 000 population for both males and females with the exception of the years 1999 and 2001.

In North West province, the annual numbers of cases per 100 000 population increased from 82.21 to 304.14 for males and from 50.86 to 181.99 for females in 1993 to 2002. In 2000, the notified cases per 100 000 population reached highest rates of 647.53 for males and 379.364 for females.

In Western Cape province, the annual male cases per 100 000 male population decreased from 319.02 in 1993 to 297.96 in 1996 and thereafter increased from 400.26 in 1997 to 705.33 in 2002. The highest rate was 929.43 in 2001. In comparison the annual female cases per 100 000 female population decreased from 242.36 in 1993 to 224.25 in 1996 and thereafter increased from 287.01 in 1997 to 464.14 in 2002. The highest rate was 615.09 in 2001.

5.2.9 National and Provincial Trends of Notified TB Deaths by Sex

Nationally, notified deaths were consistently higher among more males in comparison to females in all the years as shown in Figure 9 below. Among both males and females, the trend shows a gradual increase for the years 1993 to 1997 and 1999 but increased steeply for the years 1998, 2000, 2001and 2002.

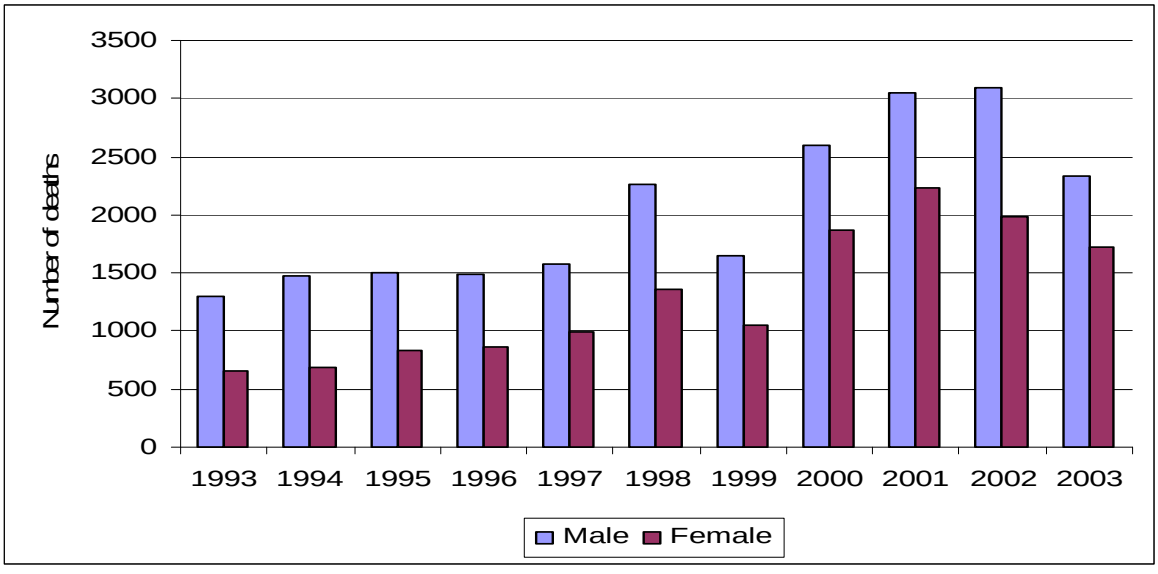

Figure 9: Number of notified deaths by sex, 1993-2003

Table 8 below shows the Wilcoxon signed rank test to compare the medians of the male and female deaths. The p-value of 0.003 indicated that the difference exist between the two medians.

Table 8: Wilcoxon signed rank test for male and female TB deaths

. signrank mdeaths=fdeaths

Sign	**Obs**	**sum ranks**	**Expected**
Positive	11	66	33
Negative	0	0	33
Zero	0	0	0
All	11	66	66
Unadjusted variance 126.50			
Adjustment for ties 0.00			
Adjustment for zeros 0.00			
Adjusted variance 126.50			
Ho: mdeaths = fdeaths z = 2.934			
Prob > |z| = 0.0033			

Table 9 below presents the mean, median, percentiles and standard deviation of all male TB deaths for the 1993 to 2003. The median was 1702 deaths, the mean was 2161 with a standard deviation of 853. Twenty five percent (25%) of the deaths were less or equal to 1481 and 75% of the deaths were less or equal to 2637 deaths.

Table 9: Median and percentiles for male TB deaths

sum mdeaths,detail

Percentiles	Smallest	
1%	1304	1304
5%	1304	1466
10%	1466	1481
25%	1481	1508
50%	1702	
	Largest	
75%	2637	2634
90%	3551	2637
95%	3653	3551
99%	3653	3653
Obs 11		
Mean 2160.636		
Sum of Wgt:11		
Std. Dev. 853.3438		
Variance 728195.7		
Skewness .7376457		
Kurtosis 2.101244		

Table 10 below presents the mean, median, percentiles and standard deviation of all female TB deaths for the 1993 to 2003. The median was 1082 deaths, the mean was 1380 with a standard deviation of 685. Twenty five percent (25%) of the deaths were less or equal to 834 and 75% of the deaths were less or equal to 1921.

Table 10: Median and percentiles for female TB deaths

. sum fdeaths,detail

Percentiles	Smallest	
1%	661	661
5%	661	692
10%	692	834
25%	834	860
50%	1082	
	Largest	
75%	1921	1873
90%	2393	1921
95%	2533	2393
99%	2533	2533
Obs 11		
Mean 1380.455		
Sum of Wgt:11		
Std. Dev. 685.1526		
Variance 469434.1		
Skewness .57266		
Kurtosis 1.820413		

5.2.10 Distribution of Notified Deaths per 100 000 Population by Sex

From Figure 10 it can be seen that notified deaths per 100 000 population were consistently higher among males than among females for all the 11 year period.

In the province of Eastern Cape, the overall figures showed more male deaths per 100 000 population per year than female cases per 100 000 population for all the years. Both male and

female deaths per 100 000 population also increased by approximately two folds in the years 1998, 1999, 2000, 2001 and 2002.

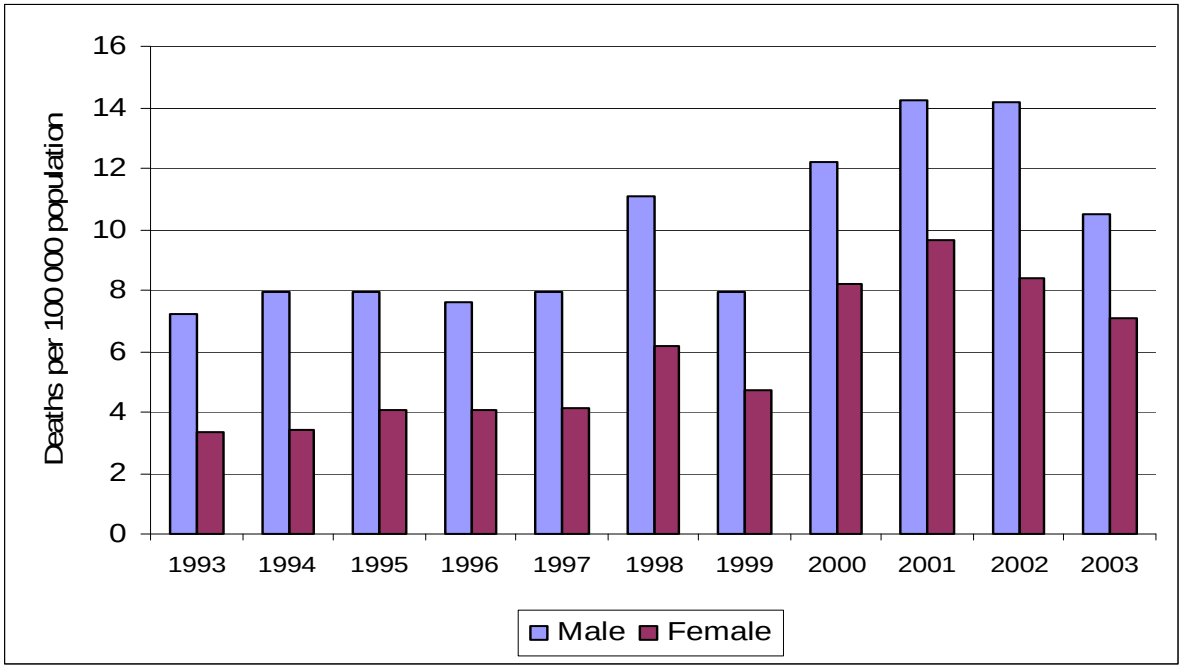

Figure 10: Notified deaths per 100 000 population by sex, 1993-2003

In the province of Free State, the overall figures showed more male deaths per 100 000 population per year than female cases per 100 000 population for all the years. The rates decreased for both males and females in the years 1993 to 1996 and increased in the years 1997 and 2002 with the exception of 1999.

In province of KwaZulu-Natal, the overall figures indicated that there were more male deaths per 100 000 population per year than female deaths per 100 000 population for all the years. Both male and female deaths per 100 000 population were decreasing over the years with the exception of 1996 to 1998.

In province of Northern Cape, there were more annual numbers of deaths per 100 000 population for males than there were for females for all the years. The number for male deaths per 100 000 male population increased from 23.42 in 1993 to 131.20 in 2003 but there were fluctuations resulting from the decreases in 1996 and 2001. In comparison the annual numbers of female deaths per 100 000 female population show a pattern towards increases during the 11

year period but there were fluctuations in between the years especially in 1994, 1996, 1997 and 2001.

In province of North West, the number deaths per 100 000 population increased from 2.54 to 14.10 for males and from 1.07 to 10.97 for females in 1993 to 2002. However, the rates were as high as 17.59 for males in 2000 and 13.15 for females in 2001.

In province of Western Cape, the annual numbers of male deaths per 100 000 male population increased from 20.63 in 1993 to 25.06 in 1996 and thereafter increased from 20.57 in 1997 to 33.28 in 2002. However the annual rates show a pattern of increase and decrease between the years. In comparison, the annual numbers of female deaths per 100 000 female population increased from 10.49 in 1993 to 14.69 in 1996 and was at 11.04 in 1997 increased to 19.88 in 2003. However the annual rates indicate a pattern of increase and decrease between years from 1997 to 2002.

5.2.11 Notified TB cases, by type of TB (ICD 9 codes)

As presented in Figure 11 below, Pulmonary TB accounted for highest number of notified cases which was 85% of the notified cases in the 11 year period (see Annexure 21). The percent of the pulmonary TB notified declined from 88.05% in 1993 to 83.90 in 2003.

Tuberculosis Primary accounted for 8% of notified cases during the 11 year period and percent of the cases of Tuberculosis Primary notified increased from 5.28 in 1993 to 8.23 in 2003. In years 1997 to 2001, the percent of notified cases of Tuberculosis Primary was 8.54 % in 1997, 9.67% in 1998, 10.88% in 1999, 9.16 in 2000 and 9.35 in 2001.

The Tuberculosis of Other Respiratory Organs accounted for 2.65% of the cases. The percent of notified cases of Tuberculosis of Other Respiratory Organs increased in some years, for example, it was 2.94% in 1994, 31.6% in 1996, 2.94% in 2000 and 3.09% in 2001.

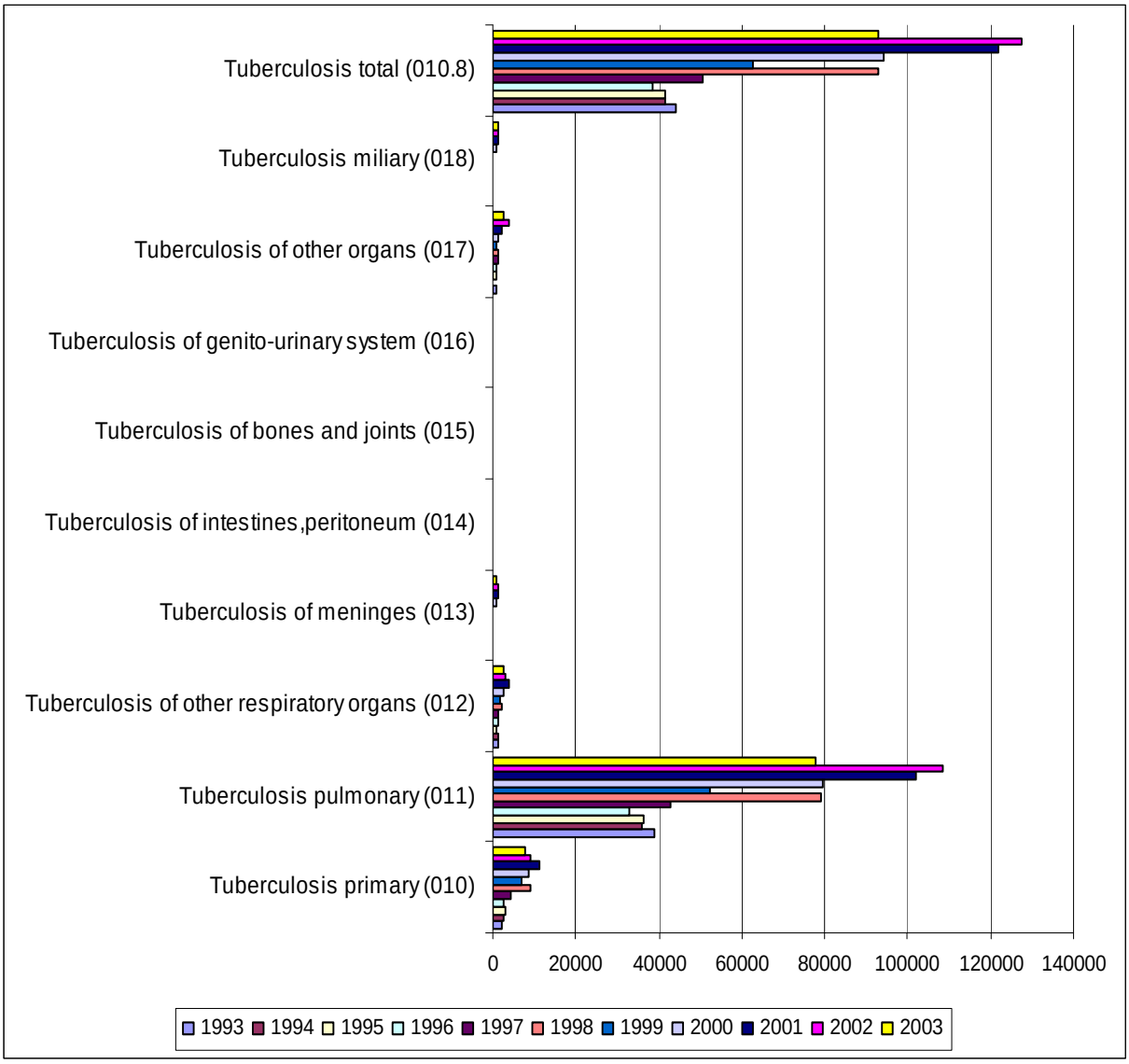

Figure 11: Number of reported TB cases by type of TB, 1993-2003

Tuberculosis of Meninges, Tuberculosis of Intestines, Peritoneum; Tuberculosis of Bones and Joints; Tuberculosis of Genito-Urinary System each accounted on average for 0.88%, 0.15%, 0.25%, and 0.09% respectively in the 11 year period. The 11 year trend shows a decrease in the percent of notified Tuberculosis of Bones and Joints; Tuberculosis of Genito-Urinary System.

5.3 Under-reporting of Tuberculosis Notification

This section presents results of analysis of the cases and deaths per 100 000 population by national and provincial levels.

5.3.1 Under-reporting of TB cases

The ETR was used as a reference to assess the degree of under-reporting of TB notifications annually. The annual numbers of notified TB cases from the disease notification systems and the annual numbers of registered cases of TB from the TBSYS and Electronic TB register were used to calculate cases per 100 000 population.

Table 11 shows that the annual number of both notified and registered cases per 100 000 population were increasing in the period 1996 to 2003. In all the years the annual numbers of electronic TB register. The percent difference between notified and registered cases ranged

Table 11: Number of notified and registered cases from three data sources, 1996 - 2003, national level

	Notified Cases	Registered cases (TBSYS96-01 & Etr.net 02-03)	% difference between notified and registered cases	Notified case per 100 000 population	Registered cases per 100 000 population (TBSYS96-01 & Etr.net 02-03)
1996	36081	115402	68.73%	88.905	284.36
1997	48076	125913	61.81%	116.872	306.06
1998	89111	142281	37.37%	212.625	339.49
1999	59909	148164	59.56%	140.302	246.99
2000	89628	151239	40.73%	205.165	346.19
2001	115652	161112	28.22%	258.037	359.47
2002	121561	170736	28.80%	267.436	375.62
2003	88295	191755	53.95%	190.169	412.99

between 28% in 2001 to 69% in 1996. The annual rates of notified cases per 100 000 population were lower in comparison to annual rates of registered cases for all the years. This is despite, that the registered patient data on electronic TB register was not available for provinces of Limpopo and Northern Cape for year 2002 and there were 89 and 8 registered

cases for Limpopo and Northern Cape respectively for year 2003. In addition, there were 62 cases in Eastern Cape for the year 2002 and 152 cases in North West for the year 2003 in the Etr.net.

5.3.2 Under-reporting of TB Deaths for years 1997 – 2003

The annual numbers of the notified TB deaths from the disease notification systems and annual numbers of TB as the leading underlying cause of death from the Statistics South Africa's metadata were used. The rates of deaths per 100 000 population were calculated using the mid-year population estimates and Census 2001.

Table 12: Number of Notified and Registered Deaths from two data sources 1997 -2003 at national level

	Notified deaths using GW17/4 notification form	Registered deaths using B1-1663 Form	% difference between notified and registered deaths	Notified deaths per 100 000 population(GW 17/4)	Registered deaths per 100 000 population (death notification B1-1663)
1997	2564	22071	88.38%	6.23	53.65
1998	3616	28532	87.33%	8.62	68.07
1999	2830	34250	91.73%	6.63	80.21
2000	4510	42246	89.32%	13.58	96.70
2001	6085	51098	88.09%	13.58	114.00
2002	6056	60311	89.95%	13.32	132.69
2003	4563	67609	93.25%	9.83	145.62

As can been seen in Table 12, the annual numbers and rates of registered deaths in the Statistics South Africa's metadata were higher for all the years in comparison to the notified deaths recorded in the disease notification system. The percent difference between notified and registered deaths ranged between 28% in 2001 to 69% in 1996.

CHAPTER 6: DISCUSSION

6.1 Description of TB Surveillance and Data Management Systems

TB is a communicable and infectious disease for which regular, frequent and timely data and information on occurrence and distribution of new cases and deaths in the population are necessary for the prevention and control of the TB in South Africa. The data and information on TB are reported through a separate systems and different reporting mechanisms and aggregated and compiled separately. The existence of various TB data systems provides an opportunity to compare the data that collected by separate systems.

There were two TB data systems which capture and report data on TB in South Africa. Firstly, TB is reported as part of the 33 notifiable conditions. Three set of forms are legally prescribed for the reporting of notifiable conditions. Weekly summaries are supposedly submitted to sub-districts or districts which are then aggregated at provincial for submission to the national office. At the provincial and national offices the data files are captured and merged using the Epi-Info files.

The second system is an Electronic TB register was introduced as first a pilot in 2000 for disease management tool rather a surveillance tool forming part of the DOTS. The TBSYS, a home grown system, was used as data collection tool for TB management by the National TB Control Programme before the gradual phasing of the Electronic TB register became widely applied in all provinces. The Electronic TB register seemed to have developed based on BOTUSA System and phased in gradually. BOTUSA was a TB management system used in Botswana. The Electronic TB register prescribed its set of forms, data tools, data flow and management procedures. The district TB/Communicable Diseases Coordinators are supposedly the key personnel to supervisor the Electronic TB register at district levels.

The disease notification system has not been evaluated as a whole or systematically reviewed regularly. The published literature suggested the evaluations of the disease notifications in South Africa have tended to focus on one or two disease conditions. It was also evident from the Department of Health publication that the prescribed notification forms that are currently in use were revised in 1970.

6.2 Descriptive Analysis of 11 Year Trends of Notified Cases and Deaths

A total of 768896 cases and 39052 deaths were recorded in the national disease surveillance system for the period 1993 to 2003. Pulmonary TB accounted for 85% of the notified cases in the 11 year period but declined from 88.05% in 1993 to 83.90 in 2003.

The eleven year trends of the annual cases and deaths, the annual case fatality rates and the incidence number of cases and deaths per 100 000 population in the period 1993-2003 were generally characterised by fluctuations, which tended to be very rapid in most instances, and lacked consistency for both the national and individual provinces. The trend data during 1993 to 2003 showed patterns of unstable and unpredictable fluctuations especially in the last 6 years of the 11 year period.

The unstable patterns of fluctuations were demonstrated in the national trends of annual cases and deaths, annual number of cases per 100 000 population, annual number of deaths per 100 000 population and the annual case fatality rates.

The annual numbers of notified cases nationally showed a steady decline for the first 4 year period namely 1993 to 1996. However, a pattern of both rapid increases and decreases in annual number of cases were observed in the subsequent years of 1997 to 2001. A total of 48076 cases were notified in 1997, which increased to 89111 for 1998 and thereafter decreased rapidly to 59909 for 1999. The annual numbers of cases increased rapidly from 89628 for 2000, to 115652 for 2001 and 121561 for 2002 and thereafter dropped rapidly to 88295 for 2003.

The trend of annual number of notified deaths in the 6 years from 1993 to 1998 showed a seemingly consistent pattern of gradual increase, but decreasing only in 1999 and increased sharply during 2000 and 2001 and thereafter decreasing again in the years 2002 and 2003.

The observed fluctuations found in the period 1993 to 2003 were different in comparison to the relatively stable patterns in the period 1985 to 1991. During the period 1985 to 1991 the various descriptive measures including the total annual case load, total new cases, estimates of

incidence and prevalence per 100 000 population and others tended to show a consistent gradual increase over the years.

In conclusion, the TB data captured nationally in the disease notification system showed varied fluctuations over the eleven year period under review, however during this period there was an a general increase in the number of notified cases and deaths, and rates of cases and deaths per 100 000 population.

6.2.1 TB Notfication by Years

The eleven year trends of notified cases and deaths in provinces were characterized by fluctuations and therefore lacked a consistent pattern in most instances. For example , in the province of Eastern Cape, the annual notified cases were decreasing in the first four years (1993-1996) however remained higher and fluctuating in the subsequent years (1998-2003). Similarly, the patterns of annual notified deaths were decreasing in the first three year 1993-1995) and increased but fluctuating in the subsequent years (1996-2003).

The reporting of cases and deaths for the provinces of Limpopo and Mpumalanga in certain years was extremely low. A total 13 cases and zero deaths were recorded for the province of Limpopo in the period 1999 to 2003, whereas a total of 10 deaths were recorded for the province of Mpumalanga in the same period. There was also 1 death in the 2002 and zero deaths in 2003 recorded for the province of KwaZulu-Natal. An effective surveillance system requires that nil notifications are also reported weekly. The extremely low of reported cases and deaths would have been identified and corrected prompt by the surveillance personnel at the provincial and national levels.

In conclusion, the patterns was characterised largely by unpredictable fluctuations in most provinces with very little evident signs of relatively stability in one and two provinces.

6.2.2 National Rates per 100 000 and Case Fatality Rates

The cases are notified as new in the notification system and the rates of cases per 100 000 population can be regarded as a measure of incidence rate. However, whether or not the surveillance system is sensitive to detect accurately a new, or a relapse, or a re-infected case and whether or not health professionals used the criteria for new cases properly remains unknown.

The trend results showed that the number of cases per 100 000 population tended to fluctuate as were the annual number of cases. For example, the cases per 100 000 population were 111.37 in 1993; 88.90 in 1996; 116.82 in 1997; 212.63 in 1998; 140 in 1999; 205.17 in 2000; 267.44 in 2002 and 190.17 in 2003.

The national rates of deaths were relatively stable between 5.2 deaths in 1993 to 6.627 deaths per 100 000 population in 1999. However, in the subsequent years the rates of deaths fluctuated. The rates increased to 10.32 deaths in 2000 reaching 13.53 deaths in 2001 and dropping to 9.83 deaths per 100 000 population in 2001.

The numbers of cases and deaths per 100 00 between 1999 to 2003 for the province of Limpopo were largely biased by the effect of extremely low numbers recorded for those years. Similarly, this effect was observed for deaths in the same period in Mpumalanga and in the years 2002 and 2003 in KwaZulu-Natal.

The case fatality rates are generally used as a measure of severity and ability to control and manage a disease. The trend showed that generally the case fatality rates in the 11 year period tended to fluctuate. For example, case fatality rates increased from 4.46 in 1993 to 6.1 in 1996, decreased to 3.9 in 1998 thereafter gradually increasing to 5 in 2001 and dropped slightly to 4.74 in 2002. The trend showed that case fatality rates tended to be marginally high during the years 1994 to 1997 in comparison to subsequent years.

6.2.3 Notification Trends and Sex Characteristics

National trends showed that higher number of cases and deaths were notified among males in comparison to females. The Wilcoxon signed rank test showed a significant difference (0.0033) between the medians for both cases and deaths among male and females.

The provincial trends showed that higher number of cases and deaths were notified among males in comparison to females for all the years in all provinces. The Wilcoxon signed-rank tests showed significant differences between the medians of cases and deaths among males and females in each province.

The differences in notifying patterns between males and females are disproportionately vast. This seems to suggest that a disproportionately large number of males in comparison to females were infected with and died of TB. Recent population surveys and estimates have showed that distribution of TB tend to be higher among males in comparison to females. The results of two South Africa Demographic and Health Surveys (1998 & 2003) found self-reported TB prevalences among adults 15 years and above of 2.9% for males and 2 % for females in 1998[44] and 3.5 % for males and 2.2% for females in 2003[45]. The South African Burden of Disease Study which analysed the cause-specific mortality rates based on the Statistics South Africa's 15% sample of death notifications in the period 1997 - 2000, found that TB mortality rates not related to HIV were consistently higher among males than females[46]. This study estimated TB mortality of about 120 per 100 000 male population in comparison to 40 per 100 000 female population.

6.2.4 Notification Trends by Population Groups

The trend showed that more cases and deaths were notified among Blacks in comparison to other population groups in seven provinces for all the years. In the province of Northern Cape, the results showed that more notified cases and deaths among Coloureds than there were among Blacks, followed by Whites and lastly Asians (Indians) for all years.

In conclusion, the trend of notified cases and deaths showed that more cases and deaths were notified among Blacks in seven provinces and among Coloureds in two provinces.

6.3 Degree of Completeness of the Data Sources

The disease notification system, electronic TB register and death notification system have varying gaps in data completeness and accuracy. The TB data contained in the disease notification systems seem to be affected by enormous data incompleteness due to huge data capturing backlogs, decline in notification of TB by health professionals in both public and private sectors, poor staffing levels for surveillance officers, rapid staff mobility within various units responsible for disease surveillance, poor communications between various administrative levels and introduction of the electronic TB register. Health professionals, surveillance managers and communicable disease managers in the public sector may have concentrated more efforts on building and maintaining the electronic TB register. Health professionals in public health facilities may have regarded the completion of various disease notification forms and the electronic TB register forms as an additional burden and even duplication.

The completeness of the electronic TB register shows a lesser degree of data incompleteness. The data incompleteness is mainly due to huge data entry backlogs in some sub-districts or districts in certain provinces. The completeness of electronic TB data may also vary from province to province and within each province. Some of the reasons for improved data completeness in the electronic TB register may be attributed to its utility to National TB Control Programme and as a source of information for the annual WHO- Global Country TB Reports. In addition, the availability of national and provincial data managers for Electronic TB register who are specifically responsible to maintain and update the dataset regularly may be contributing to improved levels of completeness.

The registration of deaths in the vital registration systems has been improving over the years since 1994, in particular since the introduction of the revised notification forms in 1998[47]. Statistics South Africa identified some limitations in the data including under-reporting of deaths particularly in the rural areas of South Africa; the absence of identification documents

in the age group 0 -18 years , which accounted for under-reporting when using the population register, inadequate reporting on underlying causes of deaths and contributing factors; and misreporting of deaths[47]. Demographic modelling has suggested that the percentage of all deaths registered improved from more than 50% in 1990 to 78% in 1995 and over 80% in 1996[48].

6.4 Levels of Under-reporting of Tuberculosis

Tuberculosis data on cases and deaths notified or registered in the same years during 1993 to 2003 were compared using Disease Notification System, TBSYS, Electronic TB register and Mortality as sources of data. The data from Disease Notification System was compared with data from other sources to estimate the levels of the underreporting using annual number of cases and deaths per 100 000 population.

The reporting of TB as a notifiable disease has continued to occur during 1993 - 2003 but has been declining and perhaps lesser used as a source of data by the National TB Control Programme.

6.4.1 Under-reporting of Notified and Registered Cases and Deaths in the Disease Notification System at National Level

The results showed that numbers of notified and registered per annum differed in the period 1996 to 2003. The results showed evidence during the period the disease notification grossly under-report TB cases and deaths and the disease notification dataset was incomplete. The numbers of notified cases were lower in comparison to those registered in all the years. Though, the annual rates of cases per 100 000 population increased for both notified and registered cases in the period 1996 to 2003, the annual rates of notified cases were lower in comparison to annual rates of registered cases for all the years in the same period. This was despite the incompleteness of the registered patient data as there were no records of registered patients on Etr.net for the provinces of Limpopo and Northern Cape in 2002 and that very low

numbers of registered patients were captured in Limpopo and Northern Cape in 2003, Eastern Cape in 2002 and North West in 2003.

The notified and registered deaths were also compared using the disease notification and mortality dataset. The results showed that deaths were grossly under-reported by the disease notification system in comparison to the death notification system where TB was reported as underlying cause of death. The results showed that the annual number of registered deaths per 100 000 population increased in the period 1997 to 2003. In comparison, the annual number of notified deaths per 100 000 population were not only very low but were not increasing.

6.4.2 Under-reporting of Notified and Registered Cases in Disease Notification System at Provincial Levels

The comparison of annual rates in the Eastern Cape showed that the annual rates of notified TB cases were lower in comparison to the annual rates of registered TB cases for the years 1999 and 2003; but annual rates of notified cases were higher for the years 2001 and 2002. The number of cases registered in Etr.net in 2002 was very small in comparison to the cases registered on TBSYS in 2001 and Etr.net is 2003. Overall, the annual rates of notified cases fluctuated during the period. In the Free State, the annual rates of notified and registered TB cases per 100 000 differed between 1998 and 2003. The annual rates of notified TB cases were lower in comparison to the annual rates of registered TB cases for all years with the exception of 2001 and 2002. In Gauteng the annual rates of notified TB cases per 100 000 were lower in comparison to the annual rates of registered TB cases for the years 1999 to 2003.

In KwaZulu-Natal the annual number of notified TB cases per 100 000 in the years 1999 to 2003 were lower in comparison to the annual rates of registered TB cases. In Limpopo, all annual rates of notified TB cases for years 1998 – 2001 were lower in comparison to the annual rates of registered TB cases. In Mpumalanga, results showed that all annual rates of registered cases were higher in comparison to the notified cases in the period 1998 to 2003 with the exception of 1998.

In Northern Cape, the results based on the notification system and TBSYS showed that the annual rates of notified TB cases in the period 1998 to 2001 were lower in comparison to the

annual rates of registered TB cases. In the North West, the results for the period 1998 to 2003 showed that all annual rates based on data of the notifications system were lower in comparison to the rates of registered cases in Electronic TB register with exception of the annual rates for the years 1998, 2000 and 2003. The 2003 data of the Electronic TB register were incomplete and most probably due to operational efficiency of the Electronic TB register in that year. In the Western Cape , the comparison of the annual rates of TB cases per 100 000 for years 1999 to 2003 based on the notification system differed in comparison to the rates based on data from the TBSYS 1999 -2001 and Electronic TB register 2002 to 2003. With exception of the rates for the years 2001 and 2002, all annual rates based on data of the notifications system are lower in comparison to rates based on both the TBSYS and Electronic TB register.

6.5 Study Limitations

6.5.1 Consistency of Under-reporting

One of the objectives of the study was to estimate levels and consistency of underreporting by collecting data from districts in three provinces and comparing these data with dataset captured at the national level. This objective was partly achieved as the consistency of under-reporting was not determined due to logistical and budgetary constraints. It was planned to conduct fieldwork in three provinces in order to collect completed notification forms submitted to the district offices by the local authorities. Various attempts were made with managers at provincial offices to obtain permission to collect the data. Only the province of Mpumalanga responded but then the contact manager took maternity leave. The study had no budget and fieldwork would have required additional resources including trained fieldworkers to be remunerated.

6.5.2 Data Entry Errors

The data of registered TB captured in the TB registered was used for comparison with data of notified TB cases captured in the disease notification system. It was presumed that data of

registered TB cases will be relatively complete and accurate than data in the notification system. However, the completeness and accuracy of the electronic TB register have not been established empirically. Corrections of duplicates and incorrectly entry of years were made. Other researchers have used laboratory based data in order to assess the completeness and under-reporting of the disease notification system.

6.5.3 Misclassification of TB Cases and Deaths

HIV or AIDS are not notifiable conditions and this affects the ability of disease surveillance system to accurately show the incidence of TB in the population. In the absence of this, persons with TB/HIV infections would be more likely to be notified as TB cases. Anecdotal evidence suggests that health workers are also reluctant to record HIV related disease as cause of death in the death notification forms. No adjustments were made during the analysis to correct for HIV/TB co-infection.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

7.1 Periodic Evaluation of Disease Surveillance

Periodic systematic evaluation of the disease surveillance system needs to be conducted at least once in every five period. The evaluations should be use both qualitative and quantitative methodologies focussing on (i) simplicity of the data collection instruments and tools; (ii) flexibility of the disease surveillance system to accommodate changes in operating conditions or information needs; (ii) acceptability by various role player to participate in the surveillance system; (iv) representativeness of the system to accurately show the health events in the population by person, place and time; and (iv) timely reporting and submission of data.

The aim and objectives of the evaluation should be developed jointly by the national and provincial Departments of Health in collaboration with Statistics South Africa, academic and research institutions.

7.2 Data Quality Improvement

This research showed that notification of TB cases and deaths through the disease notification system is affected by incompleteness, inaccuracy and lack of timeliness. These challenges may be due to inconsistent data cleaning and capturing, poor record keeping, decline in notification by health professionals, inadequate numbers of appropriately trained surveillance officials and poor communications between various administrative levels and inadequate supervision.

It is recommended that the challenges of data incompleteness, inaccuracy and lack of timeliness are addressed by i) reviewing the disease notification system regularly; ii) designing of continuous data quality improvement; and iii) building human capacity to manage and use disease surveillance system at all levels of the health systems.

Cleaning and data capturing should be done promptly at various reporting levels and data submitted to each reporting level should be checked weekly for accuracy and completeness and feedback given immediately. Data cleaning, capturing and recording keeping can be improved by designing of simplified facility-based tools for data quality verification and validation.

At the facility level, the facility information officer should ensure the creation of a central point at which all completed notification forms are filed and archived. All data on paper forms should be captured on computers by the data clerks/capturer. On a weekly basis, the facility information officer should compile the summary weekly numbers of notified cases which should be presented at facility weekly staff meetings. It is important that this information is discussed and presented in pictorial presentation and displayed at facility bulletin boards.

Data auditing should be implemented whereby facility information officers and data clerks are trained to conduct data quality assessment. Once every six month a trained data auditor can be assigned another facility to validate the information submitted to the sub-district against the recorded data in that facility in the past six month period. A simplify data auditing tool should be designed and tested by the Department of Health and Statistics South Africa supported by the Health Metrics Network partnership of South Africa. The data audits should be properly planned beforehand and coordinated by the district offices in all provinces. Data auditors should compile a report of the audit for the facility management and submit the copy of the report to the sub-district office. The reports should form the basis for each facility to develop a six monthly data improvement plan.

The district or the sub-district information officers should schedule regular support visits to facilities at least once in every month. Support visits should be used for training, sharing of best practices, discussing and resolving data challenges, and providing feedback to facility information officers. At district level, monthly notification reports should be compiled to include summary figures of notified diseases and commentary on quality of data covering completeness, accuracy and timeliness.

The role of the provincial information officers should ensure the standard tools are designed for use to conduct data audits, monitor the data audits are carried out in all districts and organize meetings where district reports of data audits can be presented.

7.3 Human Resources for Disease Surveillance

The right and appropriately trained personnel are required at all levels of the health system to ensure a functional disease surveillance system and to implement the roles and responsibilities of each level as shown in Figure 1. The national department should consult provinces and districts in developing a clearly costed policy on human resources for health information system, surveillance and monitoring and evaluation. A thorough work and organisational study should be conducted to inform the policy formulation. The policy should cover appropriate training and qualifications, duties of surveillance and information officers at each level of the health systems, minimum number of post categories required, staffing norms and reporting structure, and career paths.

It is critical that each district health office have at least one person with skills in epidemiology and surveillance. The field epidemiology training gives government an opportunity for production of a mass of epidemiologists from which to recruit. It is necessary that government create organisation structure and career paths that will absorb the trained field epidemiologists.

At district levels the following should be explored:

- Increasing human resources at facility sub-district and district level to manage data. The absolute minimum is for each sub-district to have information and surveillance officers.
- Each facility should have at least one data capturer and infection control officer depending on the size of the facility.
- Information officers to supervise data capturers, validate data, run reports and provide feedback to programme managers. Information officers to do dispatch and export of data to the district level. Information officers to ensure that data is the same in all health systems. If there are any gaps, corrective measures to be taken.

The training curricula for undergraduate and postgraduate studies in health should include health information and disease surveillance as part of the training. In addition, health science faculties and/or the public health schools should develop appropriate postgraduate diploma or degree on health information and surveillance for persons wishing specialise in health information.

It is imperative that officers performing surveillance, information and monitoring duties at levels of the health systems are not overburdened with administrative functions and that 90% of their functions is data management, data translation into information and information dissemination.

7.4 Electronic Disease Surveillance

The overall objective of electronic disease surveillance should be to improve accuracy, completeness and timeless of reporting at district, provincial and national levels. Guidelines and standard operating procedures on record management and archiving are needed for facilities.

The clinics and health centres should be provided with computers and have access to internet. This will enhance the capturing of data on computers and electronic dissemination of data within the facility and between the facility and sub-district office. The functionality of disease surveillance system requires that information technological infrastructure is improved and maintained to ensure internet access and web connection.

Efforts should be made to ensure that health professionals complete the medical and clinical aspects of patient forms. However, health professionals should not be over-burdened with data management tasks including record management, data validation and so forth. Health professionals should motivated incentives to use the information in the care of the patients.

The notification of TB cases as prescribed by law and the recording of cases on the electronic TB is duplication which increases the paper work for already overburdened health

professionals. In addition, the death notification forms capture causes of death. In pursuit of efficiency, a well coordinated data management system should seek to reduce redundancy and ensure sharing of data while preserving confidentiality of records. It recommended that the epidemiology and information units at national and provincial departments investigate the main causes of decline in notification levels of tuberculosis and seek the views of various role players on the need to continue require reporting of tuberculosis cases and deaths using the disease notification system. It may be that only certain types of tuberculosis (for example, multi-drug resistant and extensively drug resistant tuberculosis) can be required for public health surveillance system because of their public health importance.

REFERENCES

1. Heyman DL, editor. Control of Communicable Disease Manual, 18th ed. Washington: American Public Health Association; 2004.
2. The Tuberculosis Advisory Group to the Department of National Health and Population Development. The South African Tuberculosis Control Programme. Strategy and Policy manual. Sixth Draft. Pretoria:1 July 1992
3. Department of Health. The South African Tuberculosis Control Programme: Practical Guidelines. Pretoria: 2000.
4. Murray CJL, Lopez AD, editors. The Global Burden of Disease and Injury Series. World Health Organisation. Geneva, Switzerland.1996.
5. Dye C, Scheels S, Dolin P, Pathania V, Raviglione MC. Global Burden of Tuberculosis: estimated incidence, prevalence and mortality by country. JAMA 1999; 18(282): 677-86.
6. World Health Organisation. WHO Report Global Tuberculosis Control: Surveillance, Planning and Control. Geneva (WHO/HTM/TB/2005.349) 2005
7. Dye C, Watt CJ, Bleed DM, Hosseini SM, Raviglione MC. Evolution of tuberculosis control and prospects for reducing tuberculosis incidence, prevalence and deaths globally. JAMA 2005 June; 293(22): 2767-775.
8. SAMJ 1944 and De Beer 1980. In: Wilson F, Ramphele M. Uprooting poverty: The South African challenge. Cape Town & Johannesburg: David Phillip; 1989.
9. Wilson F, Ramphele M. Uprooting poverty: The South African challenge. Cape Town & Johannesburg: David Phillip; 1989.
10. Department of Health and Population Development. Tuberculosis Control Programme 1991, Epidemiological Comments. January 1993; 20(1):2-11.
11. African National Congress' Health Policy Document
12. African National Congress. The Reconstruction and Development Programme.
13. Department of Health. White Paper for Transformation of the National Health System for South Africa. Pretoria, 1997.
14. Department of Health. Five-Year Strategic Plans 2005-2009. Pretoria
15. The Presidency. Government Programme of Action. Available from: URL: http://www.gov.za.

16. Department of Health. Report of a joint WHO/IUATLD/KNCV Monitoring and Supervision Mission to the National Tuberculosis Control Programme of South Africa, 13-24 October 2003. Pretoria. 2003.

17. Department of Health. The South African Tuberculosis Control Programme Practical Guidelines. Pretoria. 2000.

18. Department of Health. Draft Surveillance Strategy (unpublished). Pretoria. 2004.

19. Department of Health. Editorial Note. Epidemiological Comments, June 2000 April-June;2(2):1.

20. Centres for Disease Control and Prevention. Updated Guidelines for Evaluating Surveillance System: recommendation from the Guidelines working Group. MMWR 2001;50(13):1-35.

21. Doyle L, Glynn MK, Groseclose SL. Completeness of notifiable infectious disease reporting in the United States: An analytical literature review. American Journal of Epidemiology 2002;155(9):866-70.

22. Jajosky RA, Groseclose SL. Evaluation of reporting timelines of public health surveillance systems for infectious diseases. BMC Public Health 2004;4(29):1-9.

23. Pillaye J, Clarke A. An evaluation of completeness of tuberculosis notification in the United Kingdom. BioMed Central Public Health. 3 October 2003. Available from: URL: http://biomedicalcentral.com/1471-2458/3/31.

24. Evans, Feldman HA, eds. Bacterial Infections of Humans: Epidemiology and control. New York : Plenum, 1982.

25. Abdool Karim SS, Dilraj A. Reasons for under-reporting of notifiable conditions. S Afr Med J 1996 July; 86:834-6.

26. Kironde S. Chapter 17: Tuberculosis in South African Health Review

27. World Health Organisation. WHO Tuberculosis Programme: Framework for Effective TB Control. Geneva, Switzerland: World Health Organisation; WHO/TB/94.179l. 1994.

28. Department of Health. Report on TB recording and Reporting 1997-2003. Unpublished report prepared by Carina Idema 12 January 2004.

29. World Health Organisation. Tuberculosis Monitoring and Evaluation. WHO TB Epidemiology and Surveillance-Virtual Workshop. Available from: URL: http://stb.tbpdev.net/default.htm.

30. Department of Health. Notifiable Medical Conditions. Epidemiological Comments 2000 April-June;2(2):2.

31. World Health Organisation. Tuberculosis Handbook, 1998. WHO/TB/98.253, 79-104.

32. Vranken P. Coulombier D, Kenyon T et al. Use of a computerised tuberculosis register automated generation of case finding, sputum conversion, and treatment outcome reports. 2000.

33. McCarty DJ, Tull ES, Moy CS, Kwoh CK, LaPorte RE. Ascertainment corrected rates: applications of capture-recapture methods. Int J Epidemiol 1993; 22(3):559-65.

34. Nardone, A. et al. Repeat capture-recapture studies as part of the evaluation of the surveillance of Legionnaires' disease in France. Epidemiol Infect 2003; 131: 647-54.

35. Statistics South Africa. Mortality and causes of death from death notification, South Africa 1997-2004 (CD-Rom). Pretoria, Statistics South Africa, 2006.

36. Statistics South Africa. Midyear estimates 1991-1998. Publication No. P0302. Pretoria, Statistics South Africa, 1998.

37. Statistics South Africa. Midyear estimates 1999. Publication No. P0302. Pretoria, Statistics South Africa, 1999.

38. Statistics South Africa. Midyear estimates 2000. Publication No. P0302. Pretoria, Statistics South Africa, 2000.

39. Statistics South Africa. Midyear estimates 2002. Publication No. P0302. Pretoria, Statistics South Africa, 2002.

40. Statistics South Africa. Midyear estimates 2003. Publication No. P0302. Pretoria, Statistics South Africa, 2003.

41. Statistics South Africa. Population census 1996. Pretoria, Statistics South Africa. 1996.

42. Statistics South Africa. Population census 2001. Pretoria, Statistics South Africa. 2003.

43. Dawson R, Trapp RG. Basic and Clinical Biostatistics. 3rd ed. United States of America: McGraw-Hill: 2001.

44. Department of Health, Medical Research Council, Measure DHS+. South Africa Demographic and Health Survey 1998. Pretoria: Department of Health, 2000.

45. Department of Health, Medical Research Council, OrcMacro (unpublished). South Africa Demographic and Health Survey 2003. Pretoria: Department of Health, 2007.

46. Brashaw D, Nannan N, Laubscher R, Groenewald P, Joubert J, Nojilana B, Norman R, Pieterse D, Schneider M. South African National Burden of Disease Study 2000. Estimates of Provincial Mortality Summary Report. Cape Town, Medical Research Council. March 2006.

47. Statistics South Africa. Causes of death in South Africa 1997-2001: Advance Release of recorded causes of death. Publication No. P0309. 2. Pretoria, Statistics South Africa, 2000.

48. Dorrington R, Bourne D, Bradshaw D, Laubscher R, Timaeus IM. The impact of HIV/AIDS on adult mortality in South Africa. Technical Report. Cape Town: South African Medical Research Council, 2001.

ANNEXURES

Annexure 1: GW17/5 Form

Please print. Where appropriate, mark the correct box with a tick (√). Complete in duplicate. Original to be sent to Local Municipality where patient was diagnosed: copy to remain in book.

DETAILS OF PATIENT

Surname

First Names

_____

_

Identity No.

Date of birth:

Age:

Sex

☐ Male

☐ ***Female***

Race

☐ African ☐ Coloured

☐ ☐

White Indian/Asian

Residential Address

If resident on a farm, state farmer's name as well as name and number of farm. In other rural areas, give names of chiefs, induna, village, nearest hill, nearest school or clinic

……
……..……
……
District Municipality……
……
Tel.No……..……..……..……
……

Name and address of employer, school, crèche or other institution where patient spends much of the day

……
……..……
……
District Municipality……
…….
Tel.No……..……..……..……
……

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

DETAILS OF MEDICAL CONDITION

Medical Condition

Date of onset: dd/mm/yyyy

Date of death (if applicable): dd/mm/yyyy

Possible place of infection

Diagnosis was based on *Clinical history and Examination only* ☐

Clinical and other investigations ☐

RESULTS OF INVESTIGATIONS

Investigation- please specify (excluding TB sputum)	**Results**	
	Awaiting result	☐
	Awaiting result	☐
	Awaiting result	☐
If TB, give sputum results →	**Microscopy** Positive	☐
	Negative	☐
	Awaiting results	☐
	Culture Positive	☐
	Negative	☐
	Awaiting results	☐

REFERRED TO

Name of hospital or clinic

Patient Registration No. **date of death**

(if applicable)

Address

……..……Tel No. ( )

Profession **Medical officer**

Nurse

Other (specify)……. **Signature**

……..

Date

Local Municipality: If a copy of this notification is to be sent to another Local Municipality, please confirm whether you will include this in your weekly summaries (GW17/3 or GW17/4)	**Yes** **No**
REPLY BY LOCAL MUNICIPALITY	
Reply to referring doctor/nurse with brief report of further findings and management	

Signature **Date** **Tel No. ( )**

Annexure 2: GW17/3 Form

WEEKLY RETURN OF ALL NOTIFIABLE MEDICAL CONDITIONS

Instructions

1. To be completed in duplicate
2. N.B! Deaths from infectious diseases should be reported on form GW 17/4

TO THE DISTRICT DIRECTOR OF HEALTH SERVICES

Name of Local Authority……
……

Notifiable medical conditions notified during the week ended Saturday ……20……..

Name of person	Age	Sex	Address where the patient got sick	Disease	Onset date	Date notified	Any other cases on same premises	Full details of action taken by Local Authority

…….

Date…… Place……..

Signature

Annexure 3: GW17/4 Form

WEEKLY RETURN OF ALL DEATHS FROM NOTIFIABLE MEDICAL CONDITIONS

Instructions

3. To be completed in duplicate
4. N.B! Cases of infectious diseases should be reported on form GW 17/3
5. This form should be filled in and sent to the District Director of Health services no later than the Monday following the week to which it refers

---

Return of deaths from Notifiable diseases reported to the ……of ……during the week ended Saturday ……20……

Name of person	Age	Sex	Residential Address	Disease causing death	Duration of illness	Date of death	Any other deaths/cases on same premises

Place ……..

Signature……

Town Clerk, Secretary or Magistrate

Date……

Annexure 4: Types of Tuberculosis Notifiable in South Africa

ICD09 Code	ICD10 Code	Name
010	A16.7	Tuberculosis primary
011	A16.2	Tuberculosis pulmonary
012	A16.9	Tuberculosis of other respiratory organs
013	A17.0	Tuberculosis of meninges
014	A18.3	Tuberculosis of intestines,peritoneum
015	A18.0	Tuberculosis of bones and joints
016	A18.1	Tuberculosis of genito-urinary system
017	A18.8	Tuberculosis of other organs
018	A18.9	Tuberculosis military
010.8		Tuberculosis total

Annexure 5: Midyear Population Estimates for 1993 -1995, 1997- 2000, 2002-2003 and Census Population For 1996 And 2001

	EC	FS	GP	KZN	LP	MP	NC	NW	WC
1993	5910400	2468500	6845500	7859300	4488500	2579600	801800	3060900	3720900
1994	6027400	2517800	6995500	8025600	4618800	2645400	813400	3195100	3791500
1995	6131694	2586055	7190019	8195400	4746578	2727176	825000	3290475	3843400
1996	6302525	2623198	7348423	8417021	4889350	2784684	840321	3354825	3956875
1997	6401787	2660874	7440056	8545700	5036462	2843407	849000	3407300	4011000
1998	6541286	2699091	7568533	8726300	5188048	2903396	861400	3481200	4086900
1999	6683840	2714654	7698850	8787898	5344247	2964593	875222	3562280	4170971
2000	6829517	2790733	7831627	8986857	5505198	3077111	871193	3566777	4190656
2001	6436763	2706775	8837178	9426017	5273642	3122991	872866	3669350	4524335
2002	7158843	2878993	8170386	9308565	5875622	3181041	890864	3686053	4321843
2003	6503201	2738231	9415231	9761032	5413586	3246729	818848	3791984	4740981

Annexure 6: Number of Cases per Province By Sex

	EC		FS		GP		KZN		LP		MP		NW		NC		WC		National	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1993	4450	3692	3216	2483	3258	2145	2623	1842	1179	705	1065	556	1260	811	1129	915	5784	4624	23964	17773
1994	3686	3097	3316	2670	2957	1936	2418	1624	1108	542	1034	576	1034	730	1201	991	5593	4445	22347	16611
1995	2946	2489	2852	2131	3135	2163	2588	1787	1201	714	1061	563	1724	1160	1153	933	5780	4700	22440	16640
1996	2485	2152	2223	1835	3064	1998	2260	1687	1290	702	1120	671	1094	726	1288	991	5767	4533	20591	15295
1997	4680	3625	2375	1873	3652	2264	3182	2459	1132	667	1406	819	2170	1471	1311	1063	7860	5876	27768	20117
1998	10858	7632	4552	2725	7080	3540	8328	6011	1328	775	2164	1175	3259	1773	2005	1479	14131	9862	53705	34972
1999	8841	6643	502	267	4313	2028	4180	3038	5	1	386	195	2717	1589	2106	1796	11585	8215	34635	23772
2000	14334	11295	6657	3204	1080	644	4514	3185	0	1	1803	1233	11339	6888	1583	1231	11228	8156	52538	35837
2001	11799	9198	11447	6517	5797	3863	5483	4162	1	1	395	311	7433	4429	764	549	20376	14344	63495	43374
2002	8446	6210	11834	7770	5669	3936	742	642	1	1	2161	1645	5499	3418	14668	10525	14834	10298	63895	44445
2003	8111	6326	4428	3012	1144	712	6	9	1	1	1206	1041	10853	6469	9393	8123	12069	8304	47211	33997
25th percentile	3686	3097	2375	1873	2957	1936	2260	1642	1	1	1034	556	1260	811	1153	933	5780	4624		
median	8111	6210	3316	2670	3258	2145	2623	1842	1108	542	1120	671	2717	1589	1311	1063	11228	8156		
75th percentile	10858	7632	6657	3204	5669	3540	4514	3185	1201	705	1803	1175	7433	4429	2106	1796	14131	9862		

Annexure 7: Number of Deaths per Province By Sex

	EC		FS		GP		KZN		LP		MP		NW		NC		WC		National	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1993	251	157	170	83	151	55	31	16	175	52	19	17	39	17	92	61	374	203	1302	661
1994	242	154	164	81	159	59	32	13	210	73	22	4	56	19	106	58	475	231	1466	692
1995	251	170	131	100	199	89	27	9	173	74	32	13	51	29	115	68	529	282	1508	834
1996	250	187	68	57	204	86	52	39	240	84	41	19	60	36	81	55	485	297	1481	860
1997	407	328	63	43	167	99	114	76	165	72	60	20	101	67	91	56	404	226	1572	987
1998	863	584	142	92	132	63	97	73	195	81	17	5	86	52	112	75	613	324	2257	1349
1999	860	595	18	4	95	47	20	13	0	0	0	0	83	45	147	85	429	258	1652	1047
2000	1291	1021	261	203	3	2	27	19	0	0	5	0	308	207	163	108	539	300	2597	1860
2001	1056	935	473	278	46	25	36	24	0	0	0	0	306	243	119	90	1010	629	3046	2224
2002	1027	803	395	212	144	104	0	1	0	0	1	0	255	206	570	212	700	441	3092	1979
2003	1189	930	154	76	40	33	0	0	0	0	0	2	488	341	201	175	255	157	2327	1714
25th percentile	251	170	68	57	46	33	20	9	0	0	0	0	56	29	92	58	404	226	1302	661
median	860	584	154	83	144	59	31	16	165	52	17	4	86	52	115	75	485	282		
75th percentile	1056	930	261	203	167	89	52	39	195	74	32	17	306	207	163	108	613	324		

Annexure 8: Cases per 100 000 by Sex per Province

	EC		FS		GP		KZN		LP		MP		NW		NC		WC	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1993	164.9	114.9	265.2	197.7	93.25	63.99	71.72	43.84	58.27	28.6	85.30	41.77	82.21	50.86	287.50	223.66	319.02	242.36
1994	133.5	94.8	267.8	208.6	86.33	56.52	64.57	37.94	52.99	21.44	80.64	42.25	65.96	44.85	301.23	238.97	302.39	228.9
1995	104.4	76.2	225.6	163.5	85.27	61.56	67.5	40.97	53.30	27.55	80.57	40.33	107.53	69.93	284.90	221.98	309.60	237.79
1996	85.5	63.4	171.2	137.4	81.69	55.53	57.2	37.77	57.26	26.23	82.23	45.07	66.31	42.58	312.11	231.74	297.96	224.25
1997	158.3	105.2	180.2	138.4	96.26	62.09	79.58	54.32	49.06	24.47	101.26	55.96	129.41	85.01	314.24	246.18	400.26	287.01
1998	358.7	217.2	338.2	197.6	190.60	91.86	202.43	130.32	55.70	27.73	151.79	78.40	190.02	100.39	473.21	337.90	705.46	473.27
1999	285.4	185.3	37.2	19.216	110.17	53.59	98.92	64.65	0.20	0.03	26.28	12.71	154.39	88.16	488.02	404.79	565.07	387.35
2000	452.1	308.7	486.9	214.49	27.16	28.01	107.02	66.8	0	0.03	121.90	78.86	647.53	379.36	370.98	275.57	549.59	379.76
2001	396.5	265.7	882.2	462.47	130.43	87.95	124.36	82.96	0.04	0.03	26.38	19.13	408.06	239.69	190.44	130.23	929.43	615.09
2002	253.4	220.8	883.2	530.79	137.18	97.58	16.98	13.0	0.04	0.03	139.77	100.61	304.14	181.99	3376.31	2305.96	705.33	464.14
2003																		

Annexure 9: Deaths per 100 000 by Sex per Province

	EC		FS		GP		KZN		LP		MP		NW		NC		WC		National	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1993	9.3	4.89	14.02	6.6	4.32	1.64	0.85	0.38	8.65	2.10	1.52	1.28	2.54	1.07	23.42	15.16	20.63	10.40		
1994	8.76	4.71	13.25	6.32	4.45	1.72	0.85	0.3	10.04	2.88	1.72	0.29	3.57	1.17	26.59	13.99	25.68	11.90		
1995	8. 9	5.14	10.36	7.67	5.41	2.53	0.7	0.2	8.01	2.85	2.43	0.93	3.18	1.75	28.42	16.18	28.34	14.27		
1996	8.6	5.51	5.24	4.27	5.43	2.39	1.32	0.87	10.65	3.13	3.01	1.32	3.64	2.11	19.63	12.86	25.06	14.69		
1997	13.76	9.52	4.77	3.18	4.4	2.71	2.84	1.67	7.15	2.64	4.32	1.37	6.02	3.87	21.81	12.97	20.57	11.04		
1998	28.51	16.62	10.55	6.67	3.42	1.69	2.36	1.58	8.18	2.90	1.19	0.33	5.01	2.94	26.43	17.14	30.60	15.55		
1999	27.76	16.59	1.33	0.28	2.43	1.24	0.47	0.28	0	0	0	0	4.71	2.50	34.06	19.16	20.93	12.17		
2000	40.71	27.90	19.09	14.4	0.07	0.05	0.64	0.4	0	0	0.33	0	17.59	11.40	38.20	24.18	26.38	13.97		
2001	35.49	27.01	36.45	19.72	1.03	0.57	0.82	0.48	0	0	0	0	16.80	13.15	29.67	21.35	46.07	26.97		
2002	30.81	20.99	27.91	14.48	3.48	2.58	0	0.02	0	0	0.06	0	14.10	10.97	131.20	50.29	33.28	19.88		
2003																				

Annexure 10: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths by Sex and Population Group Nationally

Annexure 10.1: Median and percentiles for all TB cases

. sum cases,detail

	Percentiles	Smallest		
1%	36081	36081		
5%	36081	39172		
10%	39172	39312	Obs	11
25%	39312	42099	Sum of Wgt.	11
50%	59909		Mean	69899.64
		Largest	Std. Dev.	31986.4
75%	89628	89111		
90%	115652	89628	Variance	1.02e+09
95%	121561	115652	Skewness	.4020685
99%	121561	121561	Kurtosis	1.661994

Annexure 10.2: Mean, median and percentiles for all TB deaths

. sum deaths,detail

	Percentiles	Smallest		
1%	1967	1967		
5%	1967	2168		
10%	2168	2346	Obs	11
25%	2346	2347	Sum of Wgt.	11
50%	2830		Mean	3550.182
		Largest	Std. Dev.	1531.719
75%	4563	4510		

90%	6056	4563	Variance	2346162
95%	6085	6056	Skewness	.6571139
99%	6085	6085	Kurtosis	1.957571

Annexure 10.3 : Mean, median and percentiles for male TB cases

. sum mcases,detail

	Percentiles	Smallest		
1%	20608	20608		
5%	20608	22385		
10%	22385	22449	Obs	11
25%	22449	24098	Sum of Wgt.	11
50%	35506		Mean	40976.09
		Largest	Std. Dev.	19185.63
75%	53829	53044		
90%	68480	53829	Variance	3.68e+08
95%	71203	68480	Skewness	.3700857
99%	71203	71203	Kurtosis	1.614616

Annexure 10.4 : Median and percentiles for female TB cases

. sum fcases,detail

	Percentiles	Smallest		
1%	15302	15302		
5%	15302	16634		
10%	16634	16643	Obs	11

25%	16643	17843	Sum of Wgt.	11
50%	24305		Mean	28725.18
		Largest	Std. Dev.	12796.17
75%	36778	36177		
90%	47074	36778	Variance	1.64e+08
95%	50091	47074	Skewness	.4581656
99%	50091	50091	Kurtosis	1.746242

Annexure 11: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in Eastern Cape Province

Annexure 11.1: Mean, median, percentiles and standard deviation for TB cases in Eastern Cape

. sum cases, detail

Cases

	Percentiles	Smallest			
1%	4648	4648			
5%	4648	5461			
10%	5461	6806		Obs	11
25%	6806	8165		Sum of Wgt.	11
50%	14457			Mean	13021.09
		Largest		Std. Dev.	6903.461
75%	18514	15501			
90%	21021	18514	Variance	4.77e+07	
95%	25666	21021	Skewness	.3967804	
99%	25666	25666	Kurtosis	2.002155	

Annexure 11.2 : Mean, median, percentiles and standard deviation for TB deaths in Eastern Cape

. sum deaths, detail

Deaths

	Percentiles	Smallest		
1%	398	398		
5%	398	409		
10%	409	421	Obs	11
25%	421	437	Sum of Wgt.	11
50%	1447		Mean	1233.182
		Largest	Std. Dev.	768.534
75%	1991	1832		
90%	2123	1991	Variance	590644.6
95%	2315	2123	Skewness	.0776849
99%	2315	2315	Kurtosis	1.357423

Annexure 11.3: Mean, median, percentiles and standard deviation for TB cases amongst males in the Eastern Cape

. sum mcases, detail

mcases

	Percentiles	Smallest		
1%	2485	2485		
5%	2485	2946		
10%	2946	3686	Obs	11
25%	3686	4450	Sum of Wgt.	11
50%	8111		Mean	7330.545
		Largest	Std. Dev.	3961.091
75%	10858	8841		
90%	11799	10858	Variance	1.57e+07
95%	14334	11799	Skewness	.3255918
99%	14334	14334	Kurtosis	1.868544

Annexure 11.4:Mean, median, percentiles and standard deviation for TB cases amongst females in the Eastern Cape

.sum fcases, detail

fcases

Percentiles		Smallest		
1%	2152	2152		
5%	2152	2489		
10%	2489	3097	Obs	11
25%	3097	3625	Sum of Wgt.	11
50%	6210		Mean	5669
		Largest	Std. Dev.	2946.446
75%	7632	6643		
90%	9198	7632	Variance	8681543
95%	11295	9198	Skewness	.5002682
99%	11295	11295	Kurtosis	2.196101

Annexure 11.5 :Wilcoxon signed-rank test: male and female cases in Eastern Cape

. signrank mcases=fcases

Wilcoxon signed-rank test

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50

Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 11.6: Mean, median, percentiles and standard deviation for TB deaths cases amongst males in the Eastern Cape

.sum mdeaths,detail

mdeaths

	Percentiles	Smallest		
1%	242	242		
5%	242	250		
10%	250	251	Obs	11
25%	251	251	Sum of Wgt.	11
50%	860		Mean	698.8182
		Largest	Std. Dev.	421.3711
75%	1056	1027		
90%	1189	1056	Variance	177553.6
95%	1291	1189	Skewness	.0347274
99%	1291	1291	Kurtosis	1.332196

Annexure 11.7: Mean, median, percentiles and standard deviation for TB deaths cases amongst females in the Eastern Cape

. sum fdeaths,detail

fdeaths

	Percentiles	Smallest		
1%	154	154		
5%	154	157		
10%	157	170	Obs	11
25%	170	187	Sum of Wgt.	11
50%	584		Mean	533.0909
	Largest		Std. Dev.	348.6013
75%	930	803		
90%	935	930	Variance	121522.9
95%	1021	935	Skewness	.1436094
99%	1021	1021	Kurtosis	1.393377

Annexure 11.8: Wilcoxon signed-rank test: deaths amongst males and females in Eastern Cape

```
. signrank mdeaths=fdeaths
      sign |      obs   sum ranks    expected
-----------+---------------------------------
  positive |       11          66          33
  negative |        0           0          33
      zero |        0           0           0
-----------+---------------------------------
       all |       11          66          66

unadjusted variance      126.50
adjustment for ties        0.00
adjustment for zeros       0.00
                    ----------
adjusted variance        126.50

Ho: mdeaths = fdeaths
            z =   2.934
   Prob > |z| =   0.0033
```

Annexure 11.9: Mean, median, percentiles and standard deviation for TB cases amongst blacks in the Eastern Cape

. sum bcases,detail

bcases

	Percentiles	Smallest		
1%	2799	2799		
5%	2799	3444		
10%	3444	4572	Obs	11
25%	4572	6093	Sum of Wgt.	11
50%	10166		Mean	9778.091
	Largest		Std. Dev.	5655.173
75%	14368	11990		
90%	17122	14368	Variance	3.20e+07
95%	19471	17122	Skewness	.3385524
99%	19471	19471	Kurtosis	1.860171

Annexure 11.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in the Eastern Cape

. sum ccases, detail

ccases

	Percentiles	Smallest		
1%	1664	1664		
5%	1664	1814		
10%	1814	1879	Obs	11
25%	1879	2042	Sum of Wgt.	11
50%	3082		Mean	3019.727
		Largest	Std. Dev.	1275.791
75%	3907	3681		
90%	4092	3907	Variance	1627642
95%	5727	4092	Skewness	.7319537
99%	5727	5727	Kurtosis	2.693026

Annexure 11.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in the Eastern Cape

. sum acases, detail

aCases

	Percentiles	Smallest		
1%	11	11		
5%	11	13		
10%	13	14	Obs	11
25%	14	16	Sum of Wgt.	11
50%	21		Mean	27
		Largest	Std. Dev.	18.56879
75%	33	28		
90%	43	33	Variance	344.8
95%	75	43	Skewness	1.700073
99%	75	75	Kurtosis	5.114656

Annexure 11.12: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in the Eastern Cape

. sum bdeaths,detail

bdeaths

	Percentiles	Smallest		
1%	293	293		
5%	293	293		
10%	293	303	Obs	11
25%	303	307	Sum of Wgt.	11
50%	1230		Mean	1043
		Largest	Std. Dev.	696.6076
75%	1731	1665		
90%	1869	1731	Variance	485262.2
95%	1949	1869	Skewness	.046362
99%	1949	1949	Kurtosis	1.299777

Annexure 11.13: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in the Eastern Cape

. sum cdeaths,detail

cdeaths

	Percentiles	Smallest		
1%	82	82		
5%	82	94		
10%	94	123	Obs	11
25%	123	133	Sum of Wgt.	11
50%	144		Mean	177.0909
		Largest	Std. Dev.	79.92678
75%	232	212		
90%	234	232	Variance	6388.291
95%	357	234	Skewness	.9139548
99%	357	357	Kurtosis	3.27365

Annexure 11.14: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in the Eastern Cape

. sum adeaths,detail

adeaths

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.3636364
		Largest	Std. Dev.	.6741999
75%	1	0		
90%	1	1	Variance	.4545455
95%	2	1	Skewness	1.544321
99%	2	2	Kurtosis	4.0664

Annexure 11.15: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in the Eastern Cape

. sum wdeaths,detail

wdeaths

	Percentiles	Smallest		
1%	3	3		
5%	3	6		
10%	6	7	Obs	11
25%	7	8	Sum of Wgt.	11
50%	10		Mean	11.63636
		Largest	Std. Dev.	7.074924
75%	15	11		
90%	20	15	Variance	50.05455
95%	28	20	Skewness	1.187786
99%	28	28	Kurtosis	3.687345

Annexure 12: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in the Free State Province

Annexure 12.1: Mean, median, percentiles and standard deviation for TB cases in the Free State province

. sum cases,detail

	Percentiles	Smallest		
1%	770	770		
5%	770	4074		
10%	4074	4260	Obs	11
25%	4260	4990	Sum of Wgt.	11
50%	5994		Mean	7994.091
		Largest	Std. Dev.	5813.509
75%	9861	7440		
90%	17962	9861	Variance	3.38e+07
95%	19594	17962	Skewness	1.078737
99%	19594	19594	Kurtosis	3.011342

Annexure 12.2: Mean, median, percentiles and standard deviation for TB deaths in the Free State province

. sum deaths, detail

	Percentiles	Smallest		
1%	22	22		
5%	22	106		
10%	106	126	Obs	11
25%	126	230	Sum of Wgt.	11
50%	234		Mean	297.2727
		Largest	Std. Dev.	221.0923
75%	464	254		
90%	607	464	Variance	48881.82
95%	751	607	Skewness	.9103041
99%	751	751	Kurtosis	2.778962

Annexure 12.3: Mean, median, percentiles and standard deviation for TB cases amongst males in the Free State province

. sum mcases,detail

mcases

Percentiles		Smallest		
1%	502	502		
5%	502	2223		
10%	2223	2375	Obs	11
25%	2375	2852	Sum of Wgt.	11
50%	3316		Mean	4854.727
		Largest	Std. Dev.	3698.318
75%	6657	4552		
90%	11447	6657	Variance	1.37e+07
95%	11834	11447	Skewness	1.037071
99%	11834	11834	Kurtosis	2.790361

Annexure 12.4: Mean, median, percentiles and standard deviation for TB cases amongst females in the Free State province

. sum fcases,detail

fcases

Percentiles		Smallest		
1%	267	267		
5%	267	1835		
10%	1835	1873	Obs	11
25%	1873	2131	Sum of Wgt.	11
50%	2670		Mean	3135.182
		Largest	Std. Dev.	2150.966
75%	3204	3012		
90%	6517	3204	Variance	4626655
95%	7770	6517	Skewness	1.148477
99%	7770	7770	Kurtosis	3.425488

Annexure 12.5: Wilcoxon signed-rank test: cases between male and females in the Free State province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50

Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 12.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in the Free State province

. sum mdeaths,detail

mdeaths

Percentiles		Smallest		
1%	18	18		
5%	18	63		
10%	63	68	Obs	11
25%	68	131	Sum of Wgt.	11
50%	154		Mean	185.3636
		Largest	Std. Dev.	139.883
75%	261	170		
90%	395	261	Variance	19567.25
95%	473	395	Skewness	.9587159
99%	473	473	Kurtosis	2.879055

Annexure 12.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in the Free State province

. sum fdeaths,detail

fdeaths

	Percentiles	Smallest		
1%	4	4		
5%	4	43		
10%	43	57	Obs	11
25%	57	76	Sum of Wgt.	11
50%	83		Mean	111.7273
		Largest	Std. Dev.	83.023
75%	203	100		
90%	212	203	Variance	6892.818
95%	278	212	Skewness	.8282346
99%	278	278	Kurtosis	2.556425

Annexure 12.8: Wilcoxon signed-rank test: deaths between male and females in the Free State province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50

Ho: mdeaths = fdeaths
z = 2.934
Prob > |z| = 0.0033

Annexure 12.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in the Free State province

. sum bcases,detail

bcases

	Percentiles	Smallest		
1%	736	736		
5%	736	3724		
10%	3724	3915	Obs	11
25%	3915	4496	Sum of Wgt.	11
50%	5388		Mean	7560.091
		Largest	Std. Dev.	5663.503
75%	9454	7188		
90%	17314	9454	Variance	3.21e+07
95%	18836	17314	Skewness	1.092912
99%	18836	18836	Kurtosis	2.986741

Annexure 12.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in the Free State province

. sum ccases,detail

ccases

Percentiles		Smallest		
1%	30	30		
5%	30	199		
10%	199	230	Obs	11
25%	230	274	Sum of Wgt.	11
50%	328		Mean	339.0909
		Largest	Std. Dev.	167.1068
75%	406	404		
90%	549	406	Variance	27924.69
95%	645	549	Skewness	.1026308
99%	645	645	Kurtosis	2.879113

Annexure 12.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in the Free State province

. sum acases,detail

acases

	Percentiles	Smallest		
1%	0	0		
5%	0	4		
10%	4	4	Obs	11
25%	4	4	Sum of Wgt.	11
50%	15		Mean	20.45455
		Largest	Std. Dev.	23.20932
75%	29	25		
90%	36	29	Variance	538.6727
95%	80	36	Skewness	1.592583
99%	80	80	Kurtosis	4.961843

Annexure 12.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in the Free State province

. sum wcases,detail

wcases

Percentiles		Smallest		
1%	3	3		
5%	3	30		
10%	30	40	Obs	11
25%	40	43	Sum of Wgt.	11
50%	51		Mean	66.27273
		Largest	Std. Dev.	42.29442
75%	96	89		
90%	108	96	Variance	1788.818
95%	154	108	Skewness	.6185151
99%	154	154	Kurtosis	2.817555

Annexure 12.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in the Free State province

. sum bdeaths,detail

bdeaths

Percentiles		Smallest		
1%	22	22		
5%	22	99		
10%	99	119	Obs	11
25%	119	224	Sum of Wgt.	11
50%	226		Mean	287.6364
		Largest	Std. Dev.	216.9831
75%	452	245		
90%	582	452	Variance	47081.65
95%	741	582	Skewness	.9430917
99%	741	741	Kurtosis	2.858302

Annexure 12.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in the Free State province

. sum cdeaths,detail

deaths among coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	4		
10%	4	5	Obs	11
25%	5	6	Sum of Wgt.	11
50%	7		Mean	7.909091
		Largest	Std. Dev.	5.521857
75%	9	8		
90%	14	9	Variance	30.49091
95%	21	14	Skewness	1.168724
99%	21	21	Kurtosis	4.140209

Annexure 12.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in the Free State province

. sum adeaths,detail

Deaths among Asians

Percentiles		Smallest			
1%	0	0			
5%	0	0			
10%	0	0		Obs	11
25%	0	0		Sum of Wgt.	11
50%	0			Mean	.5454545
		Largest		Std. Dev.	1.035725
75%	1	0			
90%	2	1		Variance	1.072727
95%	3	2		Skewness	1.572778
99%	3	3	Kurtosis		3.969405

Annexure 12.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in the Free State province

. sum wdeaths,detail

Deaths among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.9090909
		Largest	Std. Dev.	1.578261
75%	2	1		
90%	2	2	Variance	2.490909
95%	5	2	Skewness	1.755482
99%	5	5	Kurtosis	5.100405

Annexure 13: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths by Sex and Population Group in Gauteng Province

Annexure 13.1: Mean, median, percentiles and standard deviation for TB cases in Gauteng province

. sum cases,detail

cases

	Percentiles	Smallest		
1%	1730	1730		
5%	1730	1874		
10%	1874	4924	Obs	11
25%	4924	5095	Sum of Wgt.	11
50%	5450		Mean	6064.455
		Largest	Std. Dev.	2942.952
75%	9622	6356		
90%	9677	9622	Variance	8660964
95%	10683	9677	Skewness	.134577
99%	10683	10683	Kurtosis	2.126033

Annexure 13.2: Mean, median, percentiles and standard deviation for TB deaths in Gauteng province

. sum death, detail

deaths

Percentiles		Smallest		
1%	5	5		
5%	5	71		
10%	71	73	Obs	11
25%	73	143	Sum of Wgt.	11
50%	206		Mean	182.9091
		Largest	Std. Dev.	97.46328
75%	267	250		
90%	290	267	Variance	9499.091
95%	293	290	Skewness	-.5555182
99%	293	293	Kurtosis	2.020996

Annexure 13.3: Mean, median, percentiles and standard deviation for TB cases amongst males in Gauteng province

. sum mcases,detail

Cases among males

Percentiles		Smallest		
1%	1080	1080		
5%	1080	1144		
10%	1144	2957	Obs	11
25%	2957	3064	Sum of Wgt.	11
50%	3258		Mean	3740.818
		Largest	Std. Dev.	1868.882
75%	5669	4313		
90%	5797	5669	Variance	3492719
95%	7080	5797	Skewness	.2539404
99%	7080	7080	Kurtosis	2.276872

Annexure 13.4: Mean, median, percentiles and standard deviation for TB cases amongst females in Gauteng province

. sum fcases,detail

Cases among females

Percentiles		Smallest		
1%	644	644		
5%	644	712		
10%	712	1936	Obs	11
25%	1936	1998	Sum of Wgt.	11
50%	2145		Mean	2293.545
		Largest	Std. Dev.	1107.36
75%	3540	2264		
90%	3863	3540	Variance	1226246
95%	3936	3863	Skewness	.1307717
99%	3936	3936	Kurtosis	2.15427

Annexure 13.5: Wilcoxon signed-rank test: cases between males and females in the Gauteng province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50
Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 13.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in Gauteng province

. sum mdeaths,detail

mdeaths

Percentiles		Smallest		
1%	3	3		
5%	3	40		
10%	40	46	Obs	11
25%	46	95	Sum of Wgt.	11
50%	144		Mean	121.8182
		Largest	Std. Dev.	66.97883
75%	167	159		
90%	199	167	Variance	4486.164
95%	204	199	Skewness	-.5183345
99%	204	204	Kurtosis	1.999569

Annexure 13.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in Gauteng province

. sum fdeaths,detail

Deaths among females

Percentiles		Smallest		
1%	2	2		
5%	2	25		
10%	25	33	Obs	11
25%	33	47	Sum of Wgt.	11
50%	59		Mean	60.18182
		Largest	Std. Dev.	32.39697
75%	89	86		
90%	99	89	Variance	1049.564
95%	104	99	Skewness	-.2443623
99%	104	104	Kurtosis	2.062946

Annexure 13.8: Wilcoxon signed-rank test: deaths between males and females in the Gauteng province

```
. signrank mdeaths=fdeaths
      sign |      obs   sum ranks    expected
-----------+---------------------------------
  positive |       11          66          33
  negative |        0           0          33
      zero |        0           0           0
-----------+---------------------------------
       all |       11          66          66

unadjusted variance      126.50
adjustment for ties        0.00
adjustment for zeros       0.00
                    ----------
adjusted variance        126.50
Ho: mdeaths = fdeaths
            z =   2.934
   Prob > |z| =   0.0033
```

Annexure 13.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Gauteng province

. sum bcases,detail

Cases among Blacks

Percentiles		Smallest		
1%	1677	1677		
5%	1677	1780		
10%	1780	3867	Obs	11
25%	3867	4179	Sum of Wgt.	11
50%	4326		Mean	5344.545
		Largest	Std. Dev.	2818.318
75%	9130	5737		
90%	9232	9130	Variance	7942915
95%	9561	9232	Skewness	.4034799
99%	9561	9561	Kurtosis	1.920391

Annexure 13.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Gauteng province

. sum ccases,detail

Cases among Coloureds

Percentiles		Smallest		
1%	28	28		
5%	28	38		
10%	38	112	Obs	11
25%	112	156	Sum of Wgt.	11
50%	178		Mean	168.8182
		Largest	Std. Dev.	82.70891
75%	249	217		
90%	250	249	Variance	6840.764
95%	280	250	Skewness	-.4958693
99%	280	280	Kurtosis	2.208588

Annexure 13.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Gauteng province

. sum acases,detail

Cases among Asians

Percentiles		Smallest		
1%	4	4		
5%	4	5		
10%	5	23	Obs	11
25%	23	23	Sum of Wgt.	11
50%	37		Mean	45.45455
		Largest	Std. Dev.	35.03816
75%	73	65		
90%	73	73	Variance	1227.673
95%	119	73	Skewness	.6756909
99%	119	119	Kurtosis	2.694292

Annexure 13.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Gauteng province

. sum wcases, detail

Cases among Whites

Percentiles		Smallest		
1%	17	17		
5%	17	41		
10%	41	73	Obs	11
25%	73	133	Sum of Wgt.	11
50%	161		Mean	147.7273
		Largest	Std. Dev.	74.94277
75%	212	203		
90%	215	212	Variance	5616.418
95%	231	215	Skewness	-.5962876
99%	231	231	Kurtosis	1.941376

Annexure 13.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Gauteng province

. sum bdeaths,detail

Deaths among Blacks

Percentiles		Smallest		
1%	5	5		
5%	5	63		
10%	63	66	Obs	11
25%	66	134	Sum of Wgt.	11
50%	185		Mean	168.3636
		Largest	Std. Dev.	91.02227
75%	246	230		
90%	271	246	Variance	8285.055
95%	278	271	Skewness	-.4897127
99%	278	278	Kurtosis	2.008438

Annexure 13.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Gauteng province

. sum cdeaths,detail

Deaths among Coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	1		
10%	1	2	Obs	11
25%	2	2	Sum of Wgt.	11
50%	3		Mean	4.363636
		Largest	Std. Dev.	3.640679
75%	7	5		
90%	9	7	Variance	13.25455
95%	12	9	Skewness	.8930173
99%	12	12	Kurtosis	2.799424

Annexure 13.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Gauteng province

. sum adeaths, detail

Deaths among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	1		Mean	.6363636
		Largest	Std. Dev.	.6741999
75%	1	1		
90%	1	1	Variance	.4545455
95%	2	1	Skewness	.5091169
99%	2	2	Kurtosis	2.324

Annexure 13.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in Gauteng province

. sum wdeaths, detail

Deaths among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	2		
10%	2	5	Obs	11
25%	5	6	Sum of Wgt.	11
50%	7		Mean	7.727273
		Largest	Std. Dev.	5.041645
75%	14	8		
90%	14	14	Variance	25.41818
95%	16	14	Skewness	.3103392
99%	16	16	Kurtosis	2.127383

. clear

Annexure 14: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in Kwazulu-Natal Province

. use "C:\Documents and Settings\user\My Documents\kzn1.dta", clear

Annexure 14.1: Mean, median, percentiles and standard deviation for TB cases in KwaZulu-Natal province

. sum cases, detail

cases

Percentiles		Smallest		
1%	15	15		
5%	15	1384		
10%	1384	3985	Obs	11
25%	3985	4078	Sum of Wgt.	11
50%	4500		Mean	5765.636
		Largest	Std. Dev.	3989.212
75%	8014	7231		
90%	9660	8014	Variance	1.59e+07
95%	14430	9660	Skewness	.7183614
99%	14430	14430	Kurtosis	3.206427

Annexure 14.1: Mean, median, percentiles and standard deviation for TB deaths in KwaZulu-Natal province

. sum deaths, detail

Deaths

Percentiles		Smallest		
1%	0	0		
5%	0	1		
10%	1	33	Obs	11
25%	33	36	Sum of Wgt.	11
50%	46		Mean	65.81818
		Largest	Std. Dev.	63.05366
75%	91	60		
90%	173	91	Variance	3975.764
95%	192	173	Skewness	1.093354
99%	192	192	Kurtosis	2.955643

Annexure 14.3: Mean, median, percentiles and standard deviation for TB cases amongst males in KwaZulu-Natal province

. sum mcases, detail

Cases among males

Percentiles		Smallest		
1%	6	6		
5%	6	742		
10%	742	2260	Obs	11
25%	2260	2418	Sum of Wgt.	11
50%	2623		Mean	3302.182
		Largest	Std. Dev.	2291.876
75%	4514	4180		
90%	5483	4514	Variance	5252694
95%	8328	5483	Skewness	.7377287
99%	8328	8328	Kurtosis	3.295715

Annexure 14.4: Mean, median, percentiles and standard deviation for TB cases amongst females in KwaZulu-Natal province

. sum fcases, detail

Cases among Females

Percentiles		Smallest		
1%	9	9		
5%	9	642		
10%	642	1624	Obs	11
25%	1624	1687	Sum of Wgt.	11
50%	1842		Mean	2404.182
		Largest	Std. Dev.	1666.603
75%	3185	3038		
90%	4162	3185	Variance	2777565
95%	6011	4162	Skewness	.7389412
99%	6011	6011	Kurtosis	3.176057

Annexure 14.5: Wilcoxon signed-rank test: cases between males and females in the KwaZulu-Natal province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	10	65	33
negative	1	1	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50
Ho: mcases = fcases
z = 2.845
Prob > |z| = 0.0044

Annexure 14.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in KwaZulu-Natal province

. sum mdeaths, detail

Deaths among males

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	20	Obs	11
25%	20	27	Sum of Wgt.	11
50%	31		Mean	39.63636
		Largest	Std. Dev.	36.00909
75%	52	36		
90%	97	52	Variance	1296.655
95%	114	97	Skewness	1.043594
99%	114	114	Kurtosis	3.047292

Annexure 14.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in KwaZulu-Natal province

. sum fdeaths, detail

Deaths among females

Percentiles		Smallest				
1%	0	0				
5%	0	1				
10%	1	9			Obs	11
25%	9	13			Sum of Wgt.	11
50%	16				Mean	25.72727
		Largest			Std. Dev.	26.37837
75%	39	24				
90%	73	39	Variance	695.8182		
95%	76	73	Skewness	1.102001		
99%	76	76	Kurtosis	2.809551		

Annexure 14.8: Wilcoxon signed-rank test: deaths between amongst males and females in the KwaZulu-Natal province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	9	63	32.5
negative	1	2	32.5
zero	1	1	1
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros -0.25
---
adjusted variance 126.25
Ho: mdeaths = fdeaths
z = 2.714
Prob > |z| = 0.0066

Annexure 14.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in KwaZulu-Natal province

. sum bcases, detail

Cases among blacks

Percentiles		Smallest		
1%	15	15		
5%	15	1306		
10%	1306	3414	Obs	11
25%	3414	3549	Sum of Wgt.	11
50%	3962		Mean	5344.182
		Largest	Std. Dev.	3882.269
75%	7698	6998		
90%	9290	7698	Variance	1.51e+07
95%	13756	9290	Skewness	.7842486
99%	13756	13756	Kurtosis	3.09604

Annexure 14.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in KwaZulu-Natal province

. sum ccases, detail

Cases among coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	11		
10%	11	71	Obs	11
25%	71	96	Sum of Wgt.	11
50%	130		Mean	102.2727
		Largest	Std. Dev.	54.19057
75%	138	137		
90%	150	138	Variance	2936.618
95%	156	150	Skewness	-.9556229
99%	156	156	Kurtosis	2.528835

Annexure 14.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in KwaZulu-Natal province

. sum acases, detail

Cases among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	53		
10%	53	143	Obs	11
25%	143	177	Sum of Wgt.	11
50%	285		Mean	244.3636
		Largest	Std. Dev.	141.297
75%	339	337		
90%	421	339	Variance	19964.85
95%	427	421	Skewness	-.3536934
99%	427	427	Kurtosis	2.011334

Annexure 14.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in KwaZulu-Natal province

. sum wcases,detail

Cases among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.4545455
		Largest	Std. Dev.	.522233
75%	1	1		
90%	1	1	Variance	.2727273
95%	1	1	Skewness	.1825742
99%	1	1	Kurtosis	1.033333

. clear

Annexure 15: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in Limpopo Province

. use "C:\Documents and Settings\user\My Documents\limpopo.dta", clear

Annexure 15.1: Mean, median, percentiles and standard deviation for TB cases in Limpopo province

. sum cases,detail

cases

Percentiles		Smallest		
1%	1	1		
5%	1	2		
10%	2	2	Obs	11
25%	2	2	Sum of Wgt.	11
50%	1651		Mean	1036.273
		Largest	Std. Dev.	996.1845
75%	1921	1885		
90%	2024	1921	Variance	992383.6
95%	2104	2024	Skewness	-.1440763
99%	2104	2104	Kurtosis	1.069614

Annexure 15.2: Mean, median, percentiles and standard deviation for TB deaths in Limpopo province

. sum deaths, detail

deaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	227		Mean	146.0909
		Largest	Std. Dev.	142.3232
75%	280	248		
90%	290	280	Variance	20255.89
95%	325	290	Skewness	-.0779372
99%	325	325	Kurtosis	1.145176

Annexure 15.3: Mean, median, percentiles and standard deviation for TB cases amongst males in Limpopo province

. sum mcases, detail

Cases among males

Percentiles		Smallest		
1%	0	0		
5%	0	1		
10%	1	1	Obs	11
25%	1	1	Sum of Wgt.	11
50%	1108		Mean	658.7273
		Largest	Std. Dev.	632.1475
75%	1201	1179		
90%	1290	1201	Variance	399610.4
95%	1328	1290	Skewness	-.1538218
99%	1328	1328	Kurtosis	1.062512

Annexure 15.4: Mean, median, percentiles and standard deviation for TB cases amongst females in Limpopo province

. sum fcases,detail

fcases

Percentiles		Smallest		
1%	1	1		
5%	1	1		
10%	1	1	Obs	11
25%	1	1	Sum of Wgt.	11
50%	542		Mean	373.6364
		Largest	Std. Dev.	361.0073
75%	705	702		
90%	714	705	Variance	130326.3
95%	775	714	Skewness	-.1177484
99%	775	775	Kurtosis	1.085895

Annexure 15.5: Wilcoxon signed-rank test: cases between males and females in the Limpopo province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	7	56	30
negative	1	4	30
zero	3	6	6
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros -3.50
---
adjusted variance 123.00
Ho: mcases = fcases
z = 2.344
Prob > |z| = 0.0191

Annexure 15.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in Limpopo province

. sum mdeaths,detail

Deaths among males

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	165		Mean	105.2727
		Largest	Std. Dev.	102.761
75%	195	175		
90%	210	195	Variance	10559.82
95%	240	210	Skewness	-.0632194
99%	240	240	Kurtosis	1.170023

Annexure 15.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in Limpopo province

. sum fdeaths,detail

Deaths among females

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	52		Mean	39.63636
		Largest	Std. Dev.	38.76667
75%	74	73		
90%	81	74	Variance	1502.855
95%	84	81	Skewness	-.0715808
99%	84	84	Kurtosis	1.115095

Annexure 15.8: Wilcoxon signed-rank test: deaths between males and females in the Limpopo province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	6	51	25.5
negative	0	0	25.5
zero	5	15	15
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros -13.75
---
adjusted variance 112.75
Ho: mdeaths = fdeaths
z = 2.401
Prob > |z| = 0.0163

Annexure 15.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Limpopo province

. sum bcases, detail

Cases among blacks

Percentiles		Smallest		
1%	1	1		
5%	1	2		
10%	2	2	Obs	11
25%	2	2	Sum of Wgt.	11
50%	1620		Mean	1026.091
		Largest	Std. Dev.	986.9695
75%	1903	1865		
90%	2007	1903	Variance	974108.9
95%	2093	2007	Skewness	-.1406673
99%	2093	2093	Kurtosis	1.072623

Annexure 15.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Limpopo province

. sum ccases,detail

Cases among coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	1		Mean	2.454545
		Largest	Std. Dev.	3.751363
75%	4	3		
90%	6	4	Variance	14.07273
95%	12	6	Skewness	1.664973
99%	12	12	Kurtosis	4.808054

Annexure 15.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Limpopo province

. sum acases,detail

Cases among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	1.181818
		Largest	Std. Dev.	2.136267
75%	3	0		
90%	4	3	Variance	4.563636
95%	6	4	Skewness	1.366705
99%	6	6	Kurtosis	3.319749

Annexure 15.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Limpopo province

. sum wcases,detail

Cases among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	4		Mean	4.909091
		Largest	Std. Dev.	5.521857
75%	12	6		
90%	13	12	Variance	30.49091
95%	13	13	Skewness	.514645
99%	13	13	Kurtosis	1.657202

Annexure 15.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Limpopo province

. sum bdeaths, detail

Deaths among Blacks

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	223		Mean	144.5455
		Largest	Std. Dev.	140.9307
75%	276	247		
90%	286	276	Variance	19861.47
95%	324	286	Skewness	-.0728749
99%	324	324	Kurtosis	1.151886

Annexure 15.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Limpopo province

. sum cdeaths,detail

Deaths among Coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.3636364
		Largest	Std. Dev.	.6741999
75%	1	0		
90%	1	1	Variance	.4545455
95%	2	1	Skewness	1.544321
99%	2	2	Kurtosis	4.0664

Annexure 15.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Limpopo province

. sum adeaths,detail

Deaths among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.3636364
		Largest	Std. Dev.	.6741999
75%	1	0		
90%	1	1	Variance	.4545455
95%	2	1	Skewness	1.544321
99%	2	2	Kurtosis	4.0664

Annexure 15.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in Limpopo province

. sum wdeaths,detail

Deaths among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.6363636
		Largest	Std. Dev.	1.026911
75%	1	1		
90%	2	1	Variance	1.054545
95%	3	2	Skewness	1.359098
99%	3	3	Kurtosis	3.546373

. clear

Annexure 16: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in Mpumalanga Province

. use "C:\Documents and Settings\user\My Documents\mplanga.dta", clear

Annexure 16.1: Mean, median, percentiles and standard deviation for TB cases in Mpumalanga province

. sum cases, detail

Cases

Percentiles		Smallest		
1%	583	583		
5%	583	707		
10%	707	1365	Obs	11
25%	1365	1631	Sum of Wgt.	11
50%	1807		Mean	2041.273
		Largest	Std. Dev.	1035.213
75%	3038	2251		
90%	3346	3038	Variance	1071665
95%	3831	3346	Skewness	.2870549
99%	3831	3831	Kurtosis	2.116953

Annexure 16.2: Mean, median, percentiles and standard deviation for TB deaths in Mpumalanga province

. sum deaths,detail

deaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	1	Obs	11
25%	1	2	Sum of Wgt.	11
50%	23		Mean	25.27273
		Largest	Std. Dev.	27.44118
75%	45	36		
90%	60	45	Variance	753.0182
95%	80	60	Skewness	.7469861
99%	80	80	Kurtosis	2.369575

Annexure 16.3: Mean, median, percentiles and standard deviation for TB cases amongst males in Mpumalanga province

. sum mcases,detail

Cases among Males

Percentiles		Smallest		
1%	386	386		
5%	386	395		
10%	395	1034	Obs	11
25%	1034	1061	Sum of Wgt.	11
50%	1120		Mean	1254.636
		Largest	Std. Dev.	600.6817
75%	1803	1406		
90%	2161	1803	Variance	360818.5
95%	2164	2161	Skewness	.1678627
99%	2164	2164	Kurtosis	2.17181

Annexure 16.4: Mean, median, percentiles and standard deviation for TB cases amongst females in Mpumalanga province

. sum fcases,detail

Cases among females

Percentiles		Smallest		
1%	195	195		
5%	195	311		
10%	311	556	Obs	11
25%	556	563	Sum of Wgt.	11
50%	671		Mean	798.6364
		Largest	Std. Dev.	434.5375
75%	1175	1041		
90%	1233	1175	Variance	188822.9
95%	1645	1233	Skewness	.4849627
99%	1645	1645	Kurtosis	2.378161

Annexure 16.5: Wilcoxon signed-rank test: cases between males and females in the Mpumalanga province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50
Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 16.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in Mpumalanga province

. sum mdeaths,detail

Deaths among males

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	1	Sum of Wgt.	11
50%	17		Mean	17.90909
		Largest	Std. Dev.	19.84165
75%	32	22		
90%	41	32	Variance	393.6909
95%	60	41	Skewness	.879849
99%	60	60	Kurtosis	2.754288

Annexure 16.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in Mpumalanga province

. sum fdeaths,detail

fdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	4		Mean	7.272727
		Largest	Std. Dev.	8.25943
75%	17	13		
90%	19	17	Variance	68.21818
95%	20	19	Skewness	.5678523
99%	20	20	Kurtosis	1.590452

Annexure 16.8: Wilcoxon signed-rank test: deaths between males and females in the Mpumalanga province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	8	58.5	31.5
negative	1	4.5	31.5
zero	2	3	3
all	11	66	66

unadjusted variance 126.50
adjustment for ties -0.13
adjustment for zeros -1.25
---
adjusted variance 125.13
Ho: mdeaths = fdeaths
z = 2.414
Prob > |z| = 0.0158

Annexure 16.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Mpumalanga province

. sum bcases,detail

Cases among Blacks

Percentiles		Smallest		
1%	573	573		
5%	573	698		
10%	698	1539	Obs	11
25%	1539	1581	Sum of Wgt.	11
50%	1748		Mean	2019.364
		Largest	Std. Dev.	1015.27
75%	3002	2229		
90%	3284	3002	Variance	1030774
95%	3796	3284	Skewness	.2971461
99%	3796	3796	Kurtosis	2.175176

Annexure 16.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Mpumalanga province

. sum ccases,detail

Cases among Coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	5		
10%	5	6	Obs	11
25%	6	7	Sum of Wgt.	11
50%	20		Mean	17.63636
		Largest	Std. Dev.	11.58683
75%	29	26		
90%	29	29	Variance	134.2545
95%	34	29	Skewness	-.154321
99%	34	34	Kurtosis	1.609459

Annexure 16.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Mpumalanga province

. sum acases,detail

Cases among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	2	Obs	11
25%	2	2	Sum of Wgt.	11
50%	3		Mean	3.454545
		Largest	Std. Dev.	2.696799
75%	5	5		
90%	6	5	Variance	7.272727
95%	9	6	Skewness	.5496871
99%	9	9	Kurtosis	2.698344

Annexure 16.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Mpumalanga province

. sum wcases, detail

Cases among White

Percentiles		Smallest		
1%	0	0		
5%	0	1		
10%	1	3	Obs	11
25%	3	6	Sum of Wgt.	11
50%	15		Mean	15.09091
		Largest	Std. Dev.	13.13358
75%	22	21		
90%	24	22	Variance	172.4909
95%	44	24	Skewness	.7699348
99%	44	44	Kurtosis	3.069829

Annexure 16.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Mpumalanga province

. sum bdeaths,detail

Deaths among Blacks

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	1	Obs	11
25%	1	2	Sum of Wgt.	11
50%	22		Mean	24.54545
		Largest	Std. Dev.	27.13066
75%	45	34		
90%	58	45	Variance	736.0727
95%	80	58	Skewness	.8182616
99%	80	80	Kurtosis	2.503354

Annexure 16.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Mpumalanga province

. sum cdeaths,detail

Deaths among Coloureds

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.2727273
		Largest	Std. Dev.	.6466698
75%	0	0		
90%	1	0	Variance	.4181818
95%	2	1	Skewness	2.077008
99%	2	2	Kurtosis	5.806238

Annexure 16.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Mpumalanga province

. sum adeaths,detail

Deaths among Asians

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	0
		Largest	Std. Dev.	0
75%	0	0		
90%	0	0	Variance	0
95%	0	0	Skewness	.
99%	0	0	Kurtosis	.

Annexure 16.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in Mpumalanga province

. sum wdeaths,detail

Deaths among Whites

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.3636364
		Largest	Std. Dev.	.6741999
75%	1	0		
90%	1	1	Variance	.4545455
95%	2	1	Skewness	1.544321
99%	2	2	Kurtosis	4.0664

Annexure 17: Mean, Median, Percentiles and Standard Deviation For TB Cases and Deaths in North West

. use "C:\Documents and Settings\user\My Documents\nwest1.dta", clear

Annexure 17.1: Mean, median, percentiles and standard deviation for TB cases in North West province

. sum cases,detail

Cases

Percentiles		Smallest		
1%	1786	1786		
5%	1786	1831		
10%	1831	2102	Obs	11
25%	2102	2920	Sum of Wgt.	11
50%	4314		Mean	7062.545
		Largest	Std. Dev.	6092.678
75%	11862	8917		
90%	17033	11862	Variance	3.71e+07
95%	18243	17033	Skewness	.9058836
99%	18243	18243	Kurtosis	2.289882

Annexure 17.2: Mean, median, percentiles and standard deviation for TB deaths in North West province

. sum deaths, detail

Deaths

Percentiles		Smallest		
1%	56	56		
5%	56	75		
10%	75	81	Obs	11
25%	81	96	Sum of Wgt.	11
50%	138		Mean	281.4545
		Largest	Std. Dev.	261.3799
75%	515	461		
90%	549	515	Variance	68319.47
95%	829	549	Skewness	.9345301
99%	829	829	Kurtosis	2.530226

Annexure 17.3: Mean, median, percentiles and standard deviation for TB cases amongst males in North West province

. sum mcases, detail

Cases among males

Percentiles		Smallest		
1%	1034	1034		
5%	1034	1094		
10%	1094	1260	Obs	11
25%	1260	1724	Sum of Wgt.	11
50%	2717		Mean	4398.364
		Largest	Std. Dev.	3854.675
75%	7433	5499		
90%	10853	7433	Variance	1.49e+07
95%	11339	10853	Skewness	.8991961
99%	11339	11339	Kurtosis	2.278189

Annexure 17.4: Mean, median, percentiles and standard deviation for TB cases amongst females in North West province

. sum fcases,detail

Cases among females

Percentiles		Smallest		
1%	726	726		
5%	726	730		
10%	730	811	Obs	11
25%	811	1160	Sum of Wgt.	11
50%	1589		Mean	2678.545
		Largest	Std. Dev.	2292.732
75%	4429	3418		
90%	6469	4429	Variance	5256619
95%	6888	6469	Skewness	.9238644
99%	6888	6888	Kurtosis	2.31184

Annexure 17.5: Wilcoxon signed-rank test: cases between males and females in the North West province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50
Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 17.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in North West province

. sum mdeaths, detail

Deaths among males

Percentiles		Smallest		
1%	39	39		
5%	39	51		
10%	51	56	Obs	11
25%	56	60	Sum of Wgt.	11
50%	86		Mean	166.6364
		Largest	Std. Dev.	148.8518
75%	306	255		
90%	308	306	Variance	22156.85
95%	488	308	Skewness	1.012078
99%	488	488	Kurtosis	2.764145

Annexure 17.7: Mean, median, percentiles and standard deviation for TB deaths amongst females males in North West province

. sum fdeaths,detail

Deaths among females

Percentiles		Smallest		
1%	17	17		
5%	17	19		
10%	19	29	Obs	11
25%	29	36	Sum of Wgt.	11
50%	52		Mean	114.7273
		Largest	Std. Dev.	113.0638
75%	207	206		
90%	243	207	Variance	12783.42
95%	341	243	Skewness	.8430951
99%	341	341	Kurtosis	2.252237

Annexure 17.8: Wilcoxon signed-rank test: deaths between males and females in the North West province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties -0.25
adjustment for zeros 0.00
---
adjusted variance 126.25
Ho: mdeaths = fdeaths
z = 2.937
Prob > |z| = 0.0033

Annexure 17.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in North West province

. sum bcases,detail

bcases

Percentiles		Smallest		
1%	1671	1671		
5%	1671	1742		
10%	1742	1930	Obs	11
25%	1930	2720	Sum of Wgt.	11
50%	4202		Mean	6563
		Largest	Std. Dev.	5430.09
75%	11683	8790		
90%	14163	11683	Variance	2.95e+07
95%	16816	14163	Skewness	.8066435
99%	16816	16816	Kurtosis	2.152582

Annexure 17.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in North West province

. sum ccases,detail

ccases

Percentiles		Smallest		
1%	54	54		
5%	54	70		
10%	70	74	Obs	11
25%	74	75	Sum of Wgt.	11
50%	80		Mean	102.6364
		Largest	Std. Dev.	52.75656
75%	119	93		
90%	189	119	Variance	2783.255
95%	218	189	Skewness	1.391388
99%	218	218	Kurtosis	3.43364

Annexure 17.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in North West province

. sum acases, detail

acases

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	4.545455
		Largest	Std. Dev.	9.532719
75%	3	1		
90%	15	3	Variance	90.87273
95%	30	15	Skewness	2.055717
99%	30	30	Kurtosis	5.789786

Annexure 17.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in North West province

. sum wcases,detail

wcases

Percentiles		Smallest		
1%	10	10		
5%	10	14		
10%	14	22	Obs	11
25%	22	26	Sum of Wgt.	11
50%	33		Mean	379
		Largest	Std. Dev.	1148.326
75%	55	48		
90%	60	55	Variance	1318652
95%	3841	60	Skewness	2.845048
99%	3841	3841	Kurtosis	9.096618

Annexure 17.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in North West province

. sum bdeaths,detail

bdeaths

Percentiles		Smallest		
1%	51	51		
5%	51	72		
10%	72	79	Obs	11
25%	79	93	Sum of Wgt.	11
50%	137		Mean	272.4545
		Largest	Std. Dev.	254.8958
75%	464	450		
90%	540	464	Variance	64971.87
95%	820	540	Skewness	.9952922
99%	820	820	Kurtosis	2.728988

Annexure 17.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in North West province

. sum cdeaths, detail

cdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	1	Obs	11
25%	1	2	Sum of Wgt.	11
50%	2		Mean	3.545455
		Largest	Std. Dev.	3.531675
75%	5	4		
90%	7	5	Variance	12.47273
95%	12	7	Skewness	1.266952
99%	12	12	Kurtosis	3.981857

Annexure 17.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in North West province

. sum adeaths,detail

adeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.6363636
		Largest	Std. Dev.	2.110579
75%	0	0		
90%	0	0	Variance	4.454545
95%	7	0	Skewness	2.84605
99%	7	7	Kurtosis	9.1

Annexure 17.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in North West province

. sum wdeaths, detail

wdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	1	Obs	11
25%	1	1	Sum of Wgt.	11
50%	1		Mean	4.727273
		Largest	Std. Dev.	11.42008
75%	2	2		
90%	4	2	Variance	130.4182
95%	39	4	Skewness	2.798889
99%	39	39	Kurtosis	8.936421

. clear

Annexure 18: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in Northern Cape

. use "C:\Documents and Settings\user\My Documents\ncape.dta", clear

Annexure 18.1: Mean, median, percentiles and standard deviation for TB cases in Northern Cape province

. sum cases, detail

cases

	Percentiles	Smallest		
1%	1313	1313		
5%	1313	2045		
10%	2045	2091	Obs	11
25%	2091	2199	Sum of Wgt.	11
50%	2386		Mean	5984.182
		Largest	Std. Dev.	7945.199
75%	3915	3487		
90%	17965	3915	Variance	6.31e+07
95%	25317	17965	Skewness	1.780809
99%	25317	25317	Kurtosis	4.470832

Annexure 18.2: Mean, median, percentiles and standard deviation for TB deaths in Northern Cape province

. sum deaths,detail

deaths

Percentiles		Smallest		
1%	136	136		
5%	136	147		
10%	147	153	Obs	11
25%	153	164	Sum of Wgt.	11
50%	187		Mean	258.2727
		Largest	Std. Dev.	186.9032
75%	271	232		
90%	376	271	Variance	34932.82
95%	782	376	Skewness	2.235542
99%	782	782	Kurtosis	6.856939

Annexure 18.3: Mean, median, percentiles and standard deviation for TB cases amongst males in Northern Cape province

. sum mcases,detail

mcases

Percentiles		Smallest		
1%	764	764		
5%	764	1129		
10%	1129	1153	Obs	11
25%	1153	1201	Sum of Wgt.	11
50%	1311		Mean	3327.364
		Largest	Std. Dev.	4478.424
75%	2106	2005		
90%	9393	2106	Variance	2.01e+07
95%	14668	9393	Skewness	1.877853
99%	14668	14668	Kurtosis	4.936447

Annexure 18.4: Mean, median, percentiles and standard deviation for TB cases amongst females in Northern Cape province

. sum fcases,detail

fcases

Percentiles		Smallest		
1%	549	549		
5%	549	915		
10%	915	933	Obs	11
25%	933	991	Sum of Wgt.	11
50%	1063		Mean	2599.636
		Largest	Std. Dev.	3383.064
75%	1796	1479		
90%	8123	1796	Variance	1.14e+07
95%	10525	8123	Skewness	1.711457
99%	10525	10525	Kurtosis	4.143264

Annexure 18.5: Wilcoxon signed-rank test: cases between males and females in the Northern Cape province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50
Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 18.6: Mean, median, percentiles and standard deviation for TB deaths amongst males in Northern Cape province

. sum mdeaths, detail

mdeaths

Percentiles		Smallest		
1%	81	81		
5%	81	91		
10%	91	92	Obs	11
25%	92	106	Sum of Wgt.	11
50%	115		Mean	163.3636
	Largest		Std. Dev.	139.4226
75%	163	147		
90%	201	163	Variance	19438.65
95%	570	201	Skewness	2.533287
99%	570	570	Kurtosis	7.996921

Annexure 18.7: Mean, median, percentiles and standard deviation for TB deaths amongst females in Northern Cape province

. sum fdeaths, detail

fdeaths

Percentiles		Smallest		
1%	55	55		
5%	55	56		
10%	56	58	Obs	11
25%	58	61	Sum of Wgt.	11
50%	75		Mean	94.81818
		Largest	Std. Dev.	52.11299
75%	108	90		
90%	175	108	Variance	2715.764
95%	212	175	Skewness	1.399537
99%	212	212	Kurtosis	3.557577

Annexure 18.8: Wilcoxon signed-rank test: deaths between males and females in the Northern Cape province

```
. signrank mdeaths=fdeaths
      sign |      obs   sum ranks    expected
-----------+---------------------------------
  positive |       11          66          33
  negative |        0           0          33
      zero |        0           0           0
-----------+---------------------------------
       all |       11          66          66

unadjusted variance      126.50
adjustment for ties       -0.13
adjustment for zeros       0.00
                    ----------
adjusted variance        126.38
Ho: mdeaths = fdeaths
           z =   2.936
  Prob > |z| =   0.0033
```

Annexure 18.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Northern Cape province

. sum bcases,detail

bcases

Percentiles		Smallest		
1%	318	318		
5%	318	681		
10%	681	730	Obs	11
25%	730	760	Sum of Wgt.	11
50%	880		Mean	1645.091
		Largest	Std. Dev.	1709.174
75%	1533	1258		
90%	4281	1533	Variance	2921275
95%	5680	4281	Skewness	1.640902
99%	5680	5680	Kurtosis	4.118398

Annexure 18.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Northern Cape province

. sum ccases,detail

ccases

Percentiles		Smallest		
1%	1281	1281		
5%	1281	1375		
10%	1375	1380	Obs	11
25%	1380	1418	Sum of Wgt.	11
50%	1612		Mean	4464.545
		Largest	Std. Dev.	5103.809
75%	9611	2511		
90%	11047	9611	Variance	2.60e+07
95%	15607	11047	Skewness	1.269264
99%	15607	15607	Kurtosis	3.011394

Annexure 18.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Northern Cape province

. sum acases,detail

acases

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	1		Mean	2.909091
		Largest	Std. Dev.	4.369314
75%	6	2		
90%	11	6	Variance	19.09091
95%	11	11	Skewness	1.195834
99%	11	11	Kurtosis	2.730626

Annexure 18.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Northern Cape province

. sum wcases,detail

wcases

Percentiles		Smallest		
1%	5	5		
5%	5	8		
10%	8	9	Obs	11
25%	9	14	Sum of Wgt.	11
50%	23		Mean	21.90909
		Largest	Std. Dev.	12.58932
75%	30	30		
90%	35	30	Variance	158.4909
95%	43	35	Skewness	.1339995
99%	43	43	Kurtosis	1.729169

Annexure 18.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Northern Cape province

. sum bdeaths, detail

bdeaths

Percentiles		Smallest		
1%	29	29		
5%	29	42		
10%	42	55	Obs	11
25%	55	56	Sum of Wgt.	11
50%	66		Mean	73.72727
	Largest		Std. Dev.	33.2358
75%	104	81		
90%	109	104	Variance	1104.618
95%	143	109	Skewness	.7588516
99%	143	143	Kurtosis	2.771023

Annexure 18.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Northern Cape province

. sum cdeaths,detail

cdeaths

Percentiles		Smallest		
1%	81	81		
5%	81	84		
10%	84	86	Obs	11
25%	86	93	Sum of Wgt.	11
50%	126		Mean	157.4545
		Largest	Std. Dev.	101.0805
75%	180	159		
90%	250	180	Variance	10217.27
95%	420	250	Skewness	1.753264
99%	420	420	Kurtosis	5.204353

Annexure 18.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Northern Cape province

. sum adeaths,detail

adeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.1818182
		Largest	Std. Dev.	.4045199
75%	0	0		
90%	1	0	Variance	.1636364
95%	1	1	Skewness	1.649916
99%	1	1	Kurtosis	3.722222

Annexure 18.16: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Northern Cape province

. sum wdeaths,detail

wdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.5454545
		Largest	Std. Dev.	1.035725
75%	1	0		
90%	2	1	Variance	1.072727
95%	3	2	Skewness	1.572778
99%	3	3	Kurtosis	3.969405

. clear

Annexure 19: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in the Western Cape Province

. use "C:\Documents and Settings\user\My Documents\wcape1.dta", clear

Annexure 19.1: Mean, median, percentiles and standard deviation for TB cases in Western Cape province

. sum cases, detail

cases

Percentiles		Smallest		
1%	10039	10039		
5%	10039	10309		
10%	10309	10410	Obs	11
25%	10410	10486	Sum of Wgt.	11
50%	19404		Mean	18058.27
		Largest	Std. Dev.	7967.808
75%	24068	20397		
90%	25197	24068	Variance	6.35e+07
95%	34750	25197	Skewness	.6862137
99%	34750	34750	Kurtosis	2.630025

Annexure 19.2: Mean, median, percentiles and standard deviation for TB deaths in Western Cape province

. sum deaths,detail

deaths

Percentiles		Smallest		
1%	413	413		
5%	413	577		
10%	577	630	Obs	11
25%	630	687	Sum of Wgt.	11
50%	782		Mean	833.4545
		Largest	Std. Dev.	329.0527
75%	937	839		
90%	1147	937	Variance	108275.7
95%	1639	1147	Skewness	1.323742
99%	1639	1639	Kurtosis	4.399371

Annexure 19.3: Mean, median, percentiles and standard deviation for TB cases amongst male in Western Cape province

. sum mcases,detail

mcases

Percentiles		Smallest		
1%	5593	5593		
5%	5593	5767		
10%	5767	5780	Obs	11
25%	5780	5784	Sum of Wgt.	11
50%	11228		Mean	10455.18
		Largest	Std. Dev.	4812.677
75%	14131	12069		
90%	14834	14131	Variance	2.32e+07
95%	20376	14834	Skewness	.636591
99%	20376	20376	Kurtosis	2.519404

Annexure 19.4: Mean, median, percentiles and standard deviation for TB cases amongst female in Western Cape province

. sum fcases,detail

fcases

Percentiles		Smallest		
1%	4445	4445		
5%	4445	4533		
10%	4533	4624	Obs	11
25%	4624	4700	Sum of Wgt.	11
50%	8156		Mean	7577.909
		Largest	Std. Dev.	3140.928
75%	9862	8304		
90%	10298	9862	Variance	9865426
95%	14344	10298	Skewness	.775464
99%	14344	14344	Kurtosis	2.841069

Annexure 19.5: Wilcoxon signed-rank test: cases between males and females in the Western Cape province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50

Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 19.6: Mean, median, percentiles and standard deviation for TB deaths amongst male in Western Cape province

. sum mdeaths,detail

mdeaths

Percentiles		Smallest		
1%	255	255		
5%	255	374		
10%	374	404	Obs	11
25%	404	429	Sum of Wgt.	11
50%	485		Mean	528.4545
		Largest	Std. Dev.	199.3321
75%	613	539		
90%	700	613	Variance	39733.27
95%	1010	700	Skewness	1.192318
99%	1010	1010	Kurtosis	4.264073

Annexure 19.7: Mean, median, percentiles and standard deviation for TB deaths amongst female in Western Cape province

. sum fdeaths, detail

fdeaths

Percentiles		Smallest		
1%	157	157		
5%	157	203		
10%	203	226	Obs	11
25%	226	231	Sum of Wgt.	11
50%	282		Mean	304.3636
		Largest	Std. Dev.	130.6448
75%	324	300		
90%	441	324	Variance	17068.05
95%	629	441	Skewness	1.483598
99%	629	629	Kurtosis	4.570468

Annexure 19.8: Wilcoxon signed-rank test: cases between males and females in the Western Cape province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties -0.13
adjustment for zeros 0.00
---
adjusted variance 126.38

Ho: mdeaths = fdeaths
z = 2.936
Prob > |z| = 0.0033

Annexure 19.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Western Cape province

. sum bcases,detail

bcases

Percentiles		Smallest		
1%	2582	2582		
5%	2582	2700		
10%	2700	2706	Obs	11
25%	2706	2878	Sum of Wgt.	11
50%	4412		Mean	5324.909
		Largest	Std. Dev.	2689.893
75%	6948	6733		
90%	7853	6948	Variance	7235523
95%	10884	7853	Skewness	.6667183
99%	10884	10884	Kurtosis	2.515662

Annexure 19.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Western Cape province

. sum ccases,detail

ccases

Percentiles		Smallest		
1%	7096	7096		
5%	7096	7190		
10%	7190	7416	Obs	11
25%	7416	7432	Sum of Wgt.	11
50%	12247		Mean	12307.45
		Largest	Std. Dev.	5310.562
75%	15822	15663		
90%	16968	15822	Variance	2.82e+07
95%	23481	16968	Skewness	.7254686
99%	23481	23481	Kurtosis	2.628632

Annexure 19.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Western Cape province

. sum acases,detail

acases

Percentiles		Smallest		
1%	4	4		
5%	4	5		
10%	5	7	Obs	11
25%	7	9	Sum of Wgt.	11
50%	10		Mean	12.45455
		Largest	Std. Dev.	6.424385
75%	19	19		
90%	21	19	Variance	41.27273
95%	21	21	Skewness	.2203836
99%	21	21	Kurtosis	1.526164

Annexure 19.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Western Cape province

. sum wcases,detail

wcases

Percentiles		Smallest		
1%	99	99		
5%	99	175		
10%	175	179	Obs	11
25%	179	180	Sum of Wgt.	11
50%	219		Mean	216.5455
		Largest	Std. Dev.	59.71493
75%	276	246		
90%	282	276	Variance	3565.873
95%	299	282	Skewness	-.3634358
99%	299	299	Kurtosis	2.399051

Annexure 19.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Western Cape province

. sum bdeaths,detail

bdeaths

Percentiles		Smallest		
1%	127	127		
5%	127	139		
10%	139	178	Obs	11
25%	178	219	Sum of Wgt.	11
50%	276		Mean	345.6364
		Largest	Std. Dev.	223.5251
75%	473	379		
90%	614	473	Variance	49963.45
95%	855	614	Skewness	1.18662
99%	855	855	Kurtosis	3.437616

Annexure 19.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Western Cape province

. sum cdeaths,detail

cdeaths

Percentiles		Smallest		
1%	274	274		
5%	274	299		
10%	299	337	Obs	11
25%	337	353	Sum of Wgt.	11
50%	387		Mean	430.4545
		Largest	Std. Dev.	138.114
75%	495	484		
90%	507	495	Variance	19075.47
95%	765	507	Skewness	1.216321
99%	765	765	Kurtosis	4.121464

Annexure 19.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Western Cape province

. sum adeaths,detail

adeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.0909091
		Largest	Std. Dev.	.3015113
75%	0	0		
90%	0	0	Variance	.0909091
95%	1	0	Skewness	2.84605
99%	1	1	Kurtosis	9.1

Annexure 18.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in Western Cape province

. sum wdeaths,detail

wdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	4		
10%	4	5	Obs	11
25%	5	8	Sum of Wgt.	11
50%	9		Mean	8.727273

Annexure 19: Mean, Median, Percentiles and Standard Deviation for TB Cases and Deaths in the Western Cape Province

. use "C:\Documents and Settings\user\My Documents\wcape1.dta", clear

Annexure 19.1: Mean, median, percentiles and standard deviation for TB cases in Western Cape province

. sum cases, detail

cases

Percentiles		Smallest		
1%	10039	10039		
5%	10039	10309		
10%	10309	10410	Obs	11
25%	10410	10486	Sum of Wgt.	11
50%	19404		Mean	18058.27
		Largest	Std. Dev.	7967.808
75%	24068	20397		
90%	25197	24068	Variance	6.35e+07
95%	34750	25197	Skewness	.6862137
99%	34750	34750	Kurtosis	2.630025

Annexure 19.2: Mean, median, percentiles and standard deviation for TB deaths in Western Cape province

. sum deaths,detail

deaths

Percentiles		Smallest		
1%	413	413		
5%	413	577		
10%	577	630	Obs	11
25%	630	687	Sum of Wgt.	11
50%	782		Mean	833.4545
		Largest	Std. Dev.	329.0527
75%	937	839		
90%	1147	937	Variance	108275.7
95%	1639	1147	Skewness	1.323742
99%	1639	1639	Kurtosis	4.399371

Annexure 19.3: Mean, median, percentiles and standard deviation for TB cases amongst male in Western Cape province

. sum mcases,detail

mcases

Percentiles		Smallest		
1%	5593	5593		
5%	5593	5767		
10%	5767	5780	Obs	11
25%	5780	5784	Sum of Wgt.	11
50%	11228		Mean	10455.18
		Largest	Std. Dev.	4812.677
75%	14131	12069		
90%	14834	14131	Variance	2.32e+07
95%	20376	14834	Skewness	.636591
99%	20376	20376	Kurtosis	2.519404

Annexure 19.4: Mean, median, percentiles and standard deviation for TB cases amongst female in Western Cape province

. sum fcases,detail

fcases

Percentiles		Smallest		
1%	4445	4445		
5%	4445	4533		
10%	4533	4624	Obs	11
25%	4624	4700	Sum of Wgt.	11
50%	8156		Mean	7577.909
		Largest	Std. Dev.	3140.928
75%	9862	8304		
90%	10298	9862	Variance	9865426
95%	14344	10298	Skewness	.775464
99%	14344	14344	Kurtosis	2.841069

Annexure 19.5: Wilcoxon signed-rank test: cases between males and females in the Western Cape province

. signrank mcases=fcases

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties 0.00
adjustment for zeros 0.00
---
adjusted variance 126.50

Ho: mcases = fcases
z = 2.934
Prob > |z| = 0.0033

Annexure 19.6: Mean, median, percentiles and standard deviation for TB deaths amongst male in Western Cape province

. sum mdeaths,detail

mdeaths

Percentiles		Smallest		
1%	255	255		
5%	255	374		
10%	374	404	Obs	11
25%	404	429	Sum of Wgt.	11
50%	485		Mean	528.4545
		Largest	Std. Dev.	199.3321
75%	613	539		
90%	700	613	Variance	39733.27
95%	1010	700	Skewness	1.192318
99%	1010	1010	Kurtosis	4.264073

Annexure 19.7: Mean, median, percentiles and standard deviation for TB deaths amongst female in Western Cape province

. sum fdeaths, detail

fdeaths

Percentiles		Smallest		
1%	157	157		
5%	157	203		
10%	203	226	Obs	11
25%	226	231	Sum of Wgt.	11
50%	282		Mean	304.3636
		Largest	Std. Dev.	130.6448
75%	324	300		
90%	441	324	Variance	17068.05
95%	629	441	Skewness	1.48359
99%	629	629	Kurtosis	4.570468

Annexure 19.8: Wilcoxon signed-rank test: cases between males and females in the Western Cape province

. signrank mdeaths=fdeaths

sign	obs	sum ranks	expected
positive	11	66	33
negative	0	0	33
zero	0	0	0
all	11	66	66

unadjusted variance 126.50
adjustment for ties -0.13
adjustment for zeros 0.00
---
adjusted variance 126.38

Ho: mdeaths = fdeaths
z = 2.936
Prob > |z| = 0.0033

Annexure 19.9: Mean, median, percentiles and standard deviation for TB cases amongst Blacks in Western Cape province

. sum bcases,detail

bcases

Percentiles		Smallest		
1%	2582	2582		
5%	2582	2700		
10%	2700	2706	Obs	11
25%	2706	2878	Sum of Wgt.	11
50%	4412		Mean	5324.909
		Largest	Std. Dev.	2689.893
75%	6948	6733		
90%	7853	6948	Variance	7235523
95%	10884	7853	Skewness	.6667183
99%	10884	10884	Kurtosis	2.515662

Annexure 19.10: Mean, median, percentiles and standard deviation for TB cases amongst Coloureds in Western Cape province

. sum ccases,detail

ccases

Percentiles		Smallest		
1%	7096	7096		
5%	7096	7190		
10%	7190	7416	Obs	11
25%	7416	7432	Sum of Wgt.	11
50%	12247		Mean	12307.45
		Largest	Std. Dev.	5310.562
75%	15822	15663		
90%	16968	15822	Variance	2.82e+07
95%	23481	16968	Skewness	.7254686
99%	23481	23481	Kurtosis	2.628632

Annexure 19.11: Mean, median, percentiles and standard deviation for TB cases amongst Indians in Western Cape province

. sum acases,detail

acases

Percentiles		Smallest		
1%	4	4		
5%	4	5		
10%	5	7	Obs	11
25%	7	9	Sum of Wgt.	11
50%	10		Mean	12.45455
		Largest	Std. Dev.	6.424385
75%	19	19		
90%	21	19	Variance	41.27273
95%	21	21	Skewness	.2203836
99%	21	21	Kurtosis	1.526164

Annexure 19.12: Mean, median, percentiles and standard deviation for TB cases amongst Whites in Western Cape province

. sum wcases,detail

wcases

Percentiles		Smallest		
1%	99	99		
5%	99	175		
10%	175	179	Obs	11
25%	179	180	Sum of Wgt.	11
50%	219		Mean	216.5455
		Largest	Std. Dev.	59.71493
75%	276	246		
90%	282	276	Variance	3565.873
95%	299	282	Skewness	-.3634358
99%	299	299	Kurtosis	2.399051

Annexure 19.13: Mean, median, percentiles and standard deviation for TB deaths amongst Blacks in Western Cape province

. sum bdeaths,detail

bdeaths

Percentiles		Smallest		
1%	127	127		
5%	127	139		
10%	139	178	Obs	11
25%	178	219	Sum of Wgt.	11
50%	276		Mean	345.6364
		Largest	Std. Dev.	223.5251
75%	473	379		
90%	614	473	Variance	49963.45
95%	855	614	Skewness	1.18662
99%	855	855	Kurtosis	3.437616

Annexure 19.14: Mean, median, percentiles and standard deviation for TB deaths amongst Coloureds in Western Cape province

. sum cdeaths,detail

cdeaths

Percentiles		Smallest		
1%	274	274		
5%	274	299		
10%	299	337	Obs	11
25%	337	353	Sum of Wgt.	11
50%	387		Mean	430.4545
		Largest	Std. Dev.	138.114
75%	495	484		
90%	507	495	Variance	19075.47
95%	765	507	Skewness	1.216321
99%	765	765	Kurtosis	4.121464

Annexure 19.15: Mean, median, percentiles and standard deviation for TB deaths amongst Indians in Western Cape province

. sum adeaths,detail

adeaths

Percentiles		Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	11
25%	0	0	Sum of Wgt.	11
50%	0		Mean	.0909091
		Largest	Std. Dev.	.3015113
75%	0	0		
90%	0	0	Variance	.0909091
95%	1	0	Skewness	2.84605
99%	1	1	Kurtosis	9.1

Annexure 18.16: Mean, median, percentiles and standard deviation for TB deaths amongst Whites in Western Cape province

. sum wdeaths,detail

wdeaths

Percentiles		Smallest		
1%	0	0		
5%	0	4		
10%	4	5	Obs	11
25%	5	8	Sum of Wgt.	11
50%	9		Mean	8.727273
		Largest	Std. Dev.	4.649536
75%	12	11		
90%	13	12	Variance	21.61818
95%	17	13	Skewness	-.1376306
99%	17	17	Kurtosis	2.742686

Annexure 20: Number and Percentage of Reported TB Cases, By Type of TB (ICD 9 Codes), 1993-2003

Name (ICD09 Code)		**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**Average % 1993-2003**
Tuberculosis primary (010)	N	2327	2649	2809	2614	4326	8970	6827	8625	11384	8966	7650	
	%	***5.28***	***6.40***	***6.74***	***6.80***	***8.54***	***9.67***	***10.88***	***9.16***	***9.35***	***7.02***	***8.23***	***8***
Tuberculosis pulmonary (011)	N	38802	35865	36093	33050	42689	79033	52447	79511	101767	108446	77920	
	%	***88.05***	***86.75***	***86.64***	***86.00***	***84.29***	***85.23***	***83.59***	***84.46***	***83.59***	***84.94***	***83.90***	***85.22***
Tuberculosis of other respiratory organs (012)	N	1084	1203	1080	1215	1212	2032	1643	2770	3769	3142	2655	
	%	***2.45***	***2.91***	***2.59***	***3.16***	***2.39***	***2.19***	***2.18***	***2.94***	***3.09***	***2.46***	***2.85***	***2.65***
Tuberculosis of meninges (013)	N	393	423	401	371	463	557	432	837	1183	1344	734	
	%	***0.89***	***1.02***	***0.96***	***0.96***	***0.91***	***0.60***	***0.68***	***0.88***	***0.97***	***1.05***	***0.79***	***0.88***
Tuberculosis of intestines,peritoneum (014)	N	89	83	108	80	114	110	78	133	199	112	53	
	%	***0.20***	***0.20***	***0.25***	***0.20***	***0.22***	***0.11***	***0.12***	***0.14***	***0.16***	***0.08***	***0.05***	***0.15***
Tuberculosis of bones and joints (015)	N	144	135	134	120	198	203	148	154	262	266	142	
	%	***0.32***	***0.33***	***0.32***	***0.31***	***0.39***	***0.21***	***0.23***	***0.16***	***0.21***	***0.20***	***0.15***	***0.25***
Tuberculosis of genito-urinary system (016)	N	87	79	68	61	61	60	43	34	65	42	5	
	%	***0.19***	***0.19***	***0.16***	***0.15***	***0.12***	***0.06***	***0.06***	***0.03***	***0.05***	***0.03***	***0.005***	***0.09***
Tuberculosis of other organs (017)	N	859	646	682	662	1180	1203	791	1422	1991	3909	2592	
	%	***1.88***	***1.56***	***1.94***	***1.72***	***2.33***	***1.29***	***1.26***	***1.51***	***1.63***	***3.06***	***2.79***	***1.19***
Tuberculosis military (018)	N	281	257	284	294	397	559	330	652	1117	1444	1120	
	%	***0.63***	***6.22***	***0.68***	***0.76***	***0.78***	***0.60***	***0.52***	***0.69***	***0.91***	***1.13***	***1.20***	***1.28***
Tuberculosis total (010.8)		44066	41340	41659	38427	50640	92727	62739	94138	121737	127671	92871	

Annexure 21: Comparison of Notified and Registered Cases per 100 000 by Provinces

	EC		FS		GP		KZN		LP		MP		NC		NW		WC	
	Notified cases per 100 000 population	Registered cases per 100 000 population (TBSYS 99-01 & Etr.net 02-03)	Notified cases per 100 000 population	Registered cases per 100 000 population (TBSYS 99-01 & Etr.net 02-03)	Notified case per 100 000 population	Registered cases per 100 000 population (TBSYS 99-01 and Etr.net 02-03)	Notified case per 100 000 population	Registered cases per 100 000 population (TBSYS 99-01 & Etr.net 02-03)	Notified case per 100 000 population	Registered cases per 100 000 population (TBSYS 1998-2001)	Notified case per 100 000 population	Registered cases per 100 000 population (Etr.net 1998-2003)	Notified case per 100 000 population	Registered Cases per 100 000 population (TBSYS 1998-2001)	Notified case per 100 000 population	Registered cases per 100 000 population (Etr.net)	Notified case per 100 000 population	Registered cases per 100 000 population (TBSYS 1999-2001 & Etr.net 2002-2003)
1998			269.83	402.32					40.55	106.01	115. 24	1.55	408.09	516.48	144.6	15.94		
1999	231.81	474.59	28.12	327.33	82.56	223.67	82.28	392.37	0.11	108.99	19.67	131.69	404.15	536.78	120.92	202.37	475.42	753.16
2000	375.81	375.80	355.07	379.50	22.09	317.47	89.76	385.80	0.02	88.00	97.28	281.19	324.15	559.58	511.47	443.31	463.03	807.82
2001	326.58	294.28	663.59	343.62	109.5	130.08	102.48	280.21	0.04	97.52	22.64	335.48	159.59	271.18	323.27	555.14	768.06	386.09
2002	204.96	0.87	680.59	269.19	117.77	510.78	14.87	674.98			120.43	431.87	2841.85	-	241.91	581.16	583.01	536.81
2003	222.3	485.76	271.71	609.66	19.9	198.93	0.15	698.33			69.33	450.58	2193.94	-	449.18	4.00	430.23	879.54