



2017

Careers in Statistics

The South African Statistical Association

What are the **hottest skills** that can get you hired in South Africa?

According to a 2016 survey by LinkedIn, the answer is **Statistical Analysis** and **Data Mining**.

What are the **best graduate degrees** for jobs in 2016?

According to Fortune Magazine, a Masters in **Biostatistics**, or **Statistics**.

Deciding on a career?

What are the **best jobs** to have in **2016**?

Data scientist and **Statistician** – according to CareerCast.com

According to the Data Science Association, data science is the **scientific study** of the creation, validation and transformation of **data** to create meaning.

Harvard Business Review recently referred to **data science** as the “**sexiest job in the 21st century**”.

“**Statistics** has been the **most successful information science**. Those who ignore statistics are condemned to reinvent it”.

- Bradley Efron

What is Statistics?

Essentially, the discipline of Statistics involves anything that enables someone to **make sense of data** – techniques that help us to extract useful information from a collection of numbers.

We often make statistical statements in everyday life:

"I spend, on **average**, R1000 a month on my cellphone contract"

"Depending on the time of day, the **average** time it takes to drive home, is between 30 and 45 minutes."

"You are more **likely** to pass the exam if you study longer"

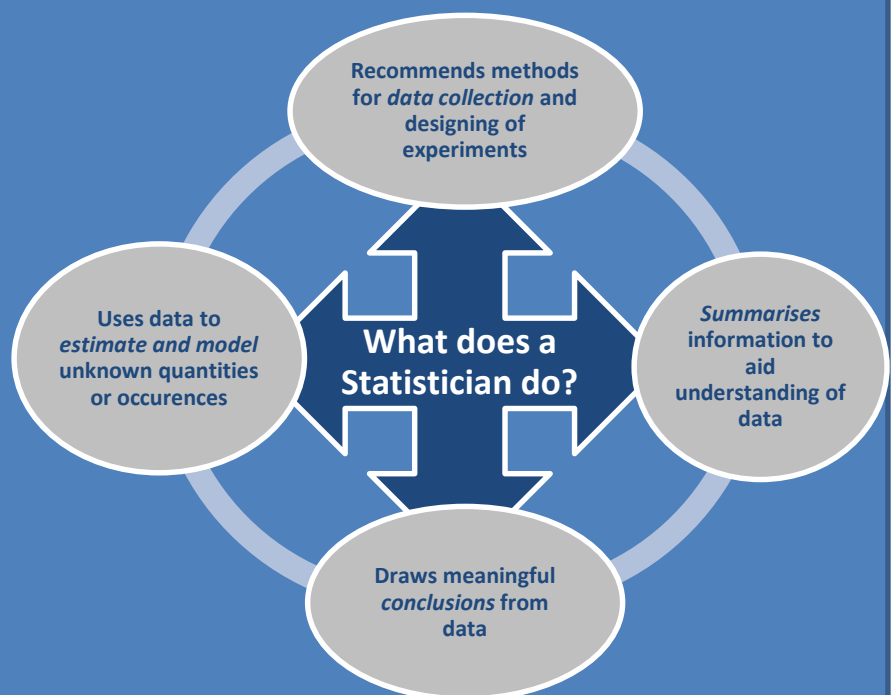
These statements, (which are based on **data** collected by measurement or experience), **help us make decisions** about, for example, *the number of hours we should study, or how much money we should budget for our phones, or what time we should drive in traffic.*

What do Statisticians do?

Statisticians make use of *mathematical* and *probabilistic* models to **collect, analyse, and interpret** data.

This leads to improved **decision making.**

Modern society is *driven by data*, making the role of a Statistician more and more of a **necessity!**



Who should consider a career as a Statistician ?

Individuals with a strong aptitude for **Mathematics** often find that the science of Statistics can lead to a **challenging career**, providing **job satisfaction** and **excellent opportunities**.

If you think you might enjoy the following activities, a career in statistics may be right for you!

- Obtain data, develop mathematical and statistical techniques, and **solve important problems** in social, economic, medical, political, and ecological **sciences** (to name a few).
- Advance the frontiers of *statistics, mathematics, and probability* through **research**.

Statistics is prevalent in almost all fields of science, technology or business (in fact, it is used in any field where data is collected).

Which fields employ Statisticians ?

This includes, but is not restricted to, the following fields:

Agriculture	Insurance	Biology
Law	Chemistry	Manufacturing
Computer Science	Marketing	Economics
Public Health	Education	Sports
Engineering	Telecommunications	Epidemiology
Finance	Genetics	Health Science

If you are searching for a job online, you would rarely find positions simply labelled "Statistician". The following **job titles** require expertise in the field of Statistics:

What job title might I have other than "Statistician" ?

Job titles (positions) that are typically filled by individuals with Statistical training, in one form or another, include:

Business Analyst	Forensic Investigator	Professor
Environmental Scientist	Economist	Pharmaceutical Engineer
Software Engineer	Researcher	Mathematician
Data Analyst	Risk Analyst	Project Manager
Quality Analyst	Manager	Biostatistician

Areas of Specialisation

Awareness of the value of Statistics has grown and large companies are increasingly employing people with some degree of **statistical training**.

Places where people with statistical training are to be found range from organizations where Statistics is applied sporadically to organizations with well structured divisions for statistical consultation and research.

In this brochure information is supplied concerning a few sectors that should give the reader a good idea of the variety of employment possibilities available to statisticians.

Since Statistics is applied in so many fields of interest, a career in Statistics often requires additional areas of **specialisation**. A selection of some career paths are:

Data Science:

may require skills in **computer programming** and **modelling**.

Banking:

will likely require an additional specialisation in **Economic** and **Financial** sciences.

Mining Industry:

additional specialisations in **geology** and **spacial statistics** are required.

Naval Operations Research:

may require knowledge of **Engineering**.

Education:

a possible background in **Education** may be required.

Biological Sciences:

will require some specialisation in **biological fields** of study.

Government Statistics:

a background in **census and survey planning**, **Economics**, and, possibly, **Law**, may be required.

Data Scientist

Data science involves **the extraction of knowledge from data**. According to the Data Science Association a Data Scientist is a professional who uses **scientific methods** to liberate and **create meaning from raw data**.

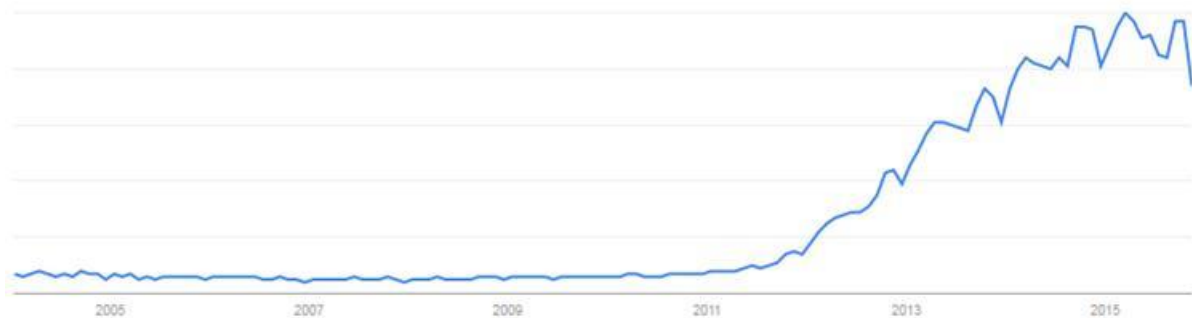
In modern times massive amounts of data are available. Large companies have a desperate need of people who can make sense of this data.

Defining big data science:

Data Science is a multi-disciplinary field containing elements from:

- Statistics**
- Information technology
- Operational research
- Optimisation
- Mathematics

Data Scientists have been called the **“magicians of the big data era”**.



This is a graph from Google Trends illustrating how often the term “big data” is searched for as a proportion of all searches over time (starting from 2004).



Statistics in the Banking Industry

Statistics forms an **integral part** of decision making in the **banking sector**. The reason for this is that banks operate with in competitive markets and aim to **increase profitability** through **informed decision making** – decisions based on statistical analysis of consumer and market data.



Some application areas of statistical techniques are:

- ❑ *Customer Relationship Management* - includes **Customer Retention** and Customer Acquisition, Market Segmentation and Cross-Selling, Application (Credit) and Performance (Behavioural) Scorecards Development, Development of Loyalty Programs, **Credit-related and Risk Assessment** of Commercial Bodies and Industries, Analysis of Various Customer Questionnaires and Marketing Campaigns.
- ❑ *Risk Management* - includes Credit Risk Management, Limits Development and Assessment, Contribution and Profitability Analysis, **Fraud Detection**.

Financial Markets Operations - include Securities Trading and other Treasury Operations, Pricing Strategies, **Forecasting of Financial Markets Trends** and Volatility, Development and Marketing of New Products, Portfolio Management.

Biostatistics and Medical Statistics



Biostatisticians are statisticians working in the **field of health and health research**. In South Africa you will find biostatisticians working in the National and Provincial Departments of Health, in Medical Schools at Universities, at research institutions such as the **Medical Research Council (MRC)**, at private companies in the pharmaceutical, health care and health insurance industries. There are two main areas of application with biostatisticians working on clinical research projects and public health research projects.

Statistical analysis can vary greatly in complexity. Some projects can be handled through standard statistical methods and software. Other projects may require methodological development and **research** on the part of the statistician and the development of **computer programs**.

The Medical Research Council (MRC) employs biostatisticians to support medical and health research in South Africa. Further information can be found at MRC's website www.mrc.ac.za.

Statisticians in Industry

Statisticians working in the manufacturing industry and retail environment provide valuable assistance in

- ❑ **designing** the best possible product, ensuring customer satisfaction and retention
- ❑ **analysis** of warranty issues and identification of corrective actions
- ❑ the **reduction of variability** in the transition from design to manufacturing in order to deliver robust products
- ❑ supply-chain **optimization solutions** and part scheduling coordination
- ❑ **quality control** to ensure a consistently excellent product
- ❑ **market research** and customer satisfaction surveys
- ❑ financial forecasting, planning, **risk assessment** and pricing
- ❑ analysis of vehicle maintenance costs and **part life duration**
- ❑ **data mining** of production, warranty and used parts data



Working in Industry as a Statistician entails many **challenges and rewards**. Researchers and Developers rely on the Statistician for **making recommendations**. In the Process Industry, decisions have to be made regarding the significance of new products, significance of process **improvements and optimization** of products and processes. The Statistician also needs to **understand the process** in order to negotiate the physical restrictions of experimentation. Statisticians are involved in evaluating data from production plants and needs to recommend operating conditions for the **improvement of the process**.

Statisticians in the Mining Industry and Earth Sciences

Statistics and probability play a valuable role in the mining industry. Establishing new mines, or expanding production into unexplored areas of a mineral deposit, can be very **costly and risky**, particularly in the developmental stages – statistical techniques are used to manage these risks and make decisions that reduce costs.

Statisticians in a mining environment are often called upon for advice on a **sampling strategy** to provide information about the characteristics of the deposits (geology, grade, depth, quality) and the rock (density, size and hardness), which ultimately translate into money the mining company will make if it embarks on the new project.



Statistics plays a critical role again when it comes to the **analysis of the sampling results** – a wide variety of techniques are employed to analyse these data.

Geostatistics: Mining and Beyond

Geostatistics or **spatial statistics** is necessary in addition to classical statistics to account for the spatial continuity that is present in many natural phenomena.

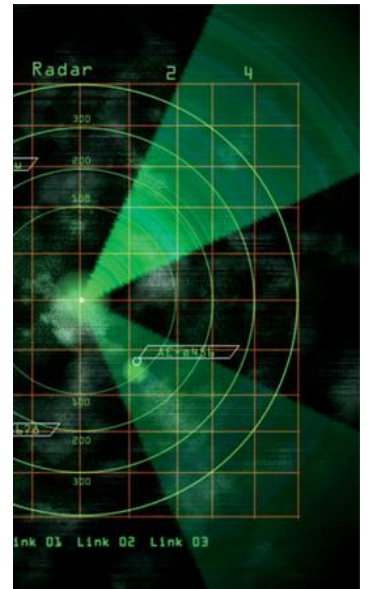
Information on the *Geostatistical Association of Southern Africa*, and the *South African Institute of Mining and Metallurgy* can be found on the Web at <http://www.gasa.org.za/> and <http://www.saimm.co.za> respectively.

Graduates with a solid background in practical and theoretical statistics and related mathematical sciences can add value to mining companies through their expertise and specialised knowledge of the field, and of statistical software packages.

Statisticians in Naval Operations Research

At the **Institute for Maritime Technology (IMT)** a statistician has some freedom to build his/her own career around one or more of a wide spectrum of naval decision problems. Typical broad areas are:

- ❑ **Data mining:** Various large databases within the naval environment require analyses. These databases mainly come from the following fields:
 - Engineering: radar, sonar, infrared
 - Oceanography
 - Logistics
 - Intelligence
- ❑ **Modelling and Simulation:** Rising costs of naval exercises and diminished defence budgets means that modelling and simulation has become an extremely important tool for providing answers to various questions.
- ❑ Operational test and evaluation (OT&E) of naval weapon systems.
- ❑ **General statistical assistance** for engineers, oceanographers and others working on problems relating to strategic decision making.



Statistics Education: A Career Choice

Qualified school teacher with a **background in Statistics** is in great demand with the introduction of the new school syllabus in South Africa.

The **new school curriculum** has vast amounts of basic statistical principles integrated into the various learning areas. In

fact, statistical principles are taught in the **Data Handling section of Mathematics**, at all levels creating a desperate need for teachers with knowledge of statistics.



Statistics in the Biological Sciences

A **Biometrician** differs from the traditional Statistician in that they are confronted by a wide range of problems dealing with all the phenomena that affect **animal** nutrition and breeding, **plant** breeding and crop production, as well as diseases and pests on both plants, animals and the **environment**.



Biometricians typically perform the following tasks:

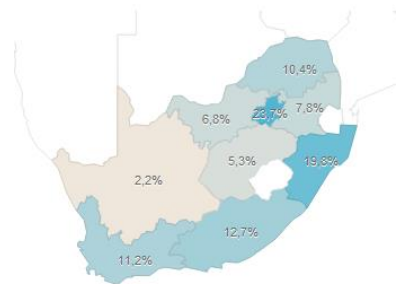
- advise** researchers in the design and planning of biological experiments to ensure that useful data are obtained,
- analyse data** in order to determine if certain treatments applied to subjects have different results,
- determine** trends and **underlying relationships** in biological processes,
- forecast future conditions** of resources like forests or watersheds.

Essential attributes are an **inquisitive mind**, an ability to **think quantitatively**, an interest in applying statistical methods to **biological problems** and the will to learn about related **biological sciences**.

Government Statistics

South African **Government**, or **official**, statistics are statistics published by government agencies to describe, in a quantitative or qualitative manner, information used by the government to aid it in decisions concerning

- the **environment**,
- economic** and social development,
- health**,
- education** and
- infrastructure**.



Becoming a Statistician: Getting started

Recruitment to the profession of Statistician is usually at graduate level, so for most people the first step towards the profession is to get a **degree in Statistics** or in a joint subject such as *Mathematics and Statistics* which has a high statistical content.

Admission to these degree courses nearly always have **high mathematics requirements** for entry.

Some joint degrees, like *Economics and Statistics*, or *Statistics and Business Studies*, may have less demanding mathematical requirements.

Check with the specific educational institute for the requirements for enrolment.

U of Cape Town	www.stats.uct.ac.za
U of Fort Hare	www.ufh.ac.za/faculties/science/departments/statistics
U of the Free State	www.ufs.ac.za/natagri/departments-and-divisions/mathematical-statistics-and-actuarial-science-home
U of Johannesburg	www.uj.ac.za/statistics
U of KwaZulu-Natal	statsactsci.ukzn.ac.za/Homepage.aspx
U of Limpopo	www.ul.ac.za
Nelson Mandela Metropolitan U	scsmmps.nmmu.ac.za
North West U	www.nwu.ac.za/statistics
U of Pretoria	www.up.ac.za/statistics
Rhodes U	www.ru.ac.za/statistics
U of South Africa	www.unisa.ac.za/Default.asp?Cmd=ViewContent&ContentID=224
Stellenbosch U	www.sun.ac.za/statistics
U of Venda	www.univen.ac.za/index.php?Entity=Statistics&Sch=8
Walter Sisulu U	www.wsu.ac.za
U of the Western Cape	www.uwc.ac.za/Faculties/NS/Population_Studies/Pages/default.aspx
U of the Witwatersrand	www.wits.ac.za/stats
U of Zululand	www.unizulu.ac.za/faculties/faculty-of-science/3about-us
Cape Peninsula U of T	www.cput.ac.za
Central U of T	www.cut.ac.za
Durban U of T	www.dut.ac.za/faculty/applied_sciences/maths_stats_physics
Mangosuthu U of T	www.mut.ac.za
Tshwane U of T	www.tut.ac.za
Vaal U of T	www.vut.ac.za
U of Botswana	www.ub.bw
Eduardo Mondlane U	www.uem.mz
National U of Lesotho	www.nul.ls
U of Namibia	www.unam.edu.na/faculty-of-science/statistics-and-population-studies
U of Swaziland	www.uniswa.sz/academics/socscience/statsdem
U of Zimbabwe	www.uz.ac.zw
Medical Research Council	www.mrc.ac.za/biostatistics/biostatistics.htm
Statistics South Africa	www.statssa.gov.za

KEY: U= University

U of T=University of Technology