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The South African Statistical Association and its role in science in South Africa

Significance:

The South African Statistical Association (SASA) turned 70 years old in 2023, having made huge impacts in South Africa and beyond. Through SASA, the statistics community in South Africa has made significant strides in the field, both locally and internationally, ensuring the importance of the discipline is concreted into the academic and industry playing fields. The statistics community continues to grow and remains passionate about growth and development of school learners, undergraduate and postgraduate students, academics and statisticians in industry. The opportunities for statisticians in South Africa are endless, and important to the economic sustainability of South Africa. This paper provides an historical overview of the impacts of the South African Statistical Association and statistics in South Africa.

Introduction

The South African Statistical Association (SASA) was founded in 1953, specifically on 28 October 1953. The formation of the association occurred at a gathering at the University of the Witwatersrand when Gertrude M. Cox was visiting from the University of North Carolina, on invitation from John Kerrich. Present were founding members Cox, de Loor, Kerrich, Sichel, Arbous, Maritz, Abraham, Cristensen, Adelstein, Krige, Armsen, Lutz, and Steyn.[2] The first Secretary was Maritz, with President de Loor, Vice-President Kerrich, Honorary President Cox and other Executive Members Sichel, Arbous and Steyn.[2]

On the occasion of the 25th anniversary of SASA, Prof. H.S. Steyn provided an overview of the founding years of statistics in South Africa.[2] Already in the 1930s, statistics began its growth through four South African doctoral students who studied in the UK, all having previously studied at Stellenbosch University, namely Muller, Pretorius, le Roux and Gonin. However, most statistics occurred in the Mathematics departments up to the 1950s, with the first Department of Statistics founded at the University of Pretoria by Prof. B. de Loor who obtained his doctorate in algebra under Bouwer.[2] Figures 1 and 2 are extracts from the first Vice-President and first Secretary of SASA, presented in the 2003 SASA conference 50th celebration booklet.[3]

In the first public meeting of SASA on 18 May 1954, a significant growth towards statistics as a field was discussed by de Loor[2]:

> A comparatively new branch of scientific method has come into its own, and is permeating all phases of research, industry and organisation. This new branch, which is the scientific expression of logical induction, is the statistical method. Its development has been phenomenal, especially during the last two decades. To express it in terms of modern physics, a chain reaction has been set up and is making its influence felt in nearly every sphere of human activity.
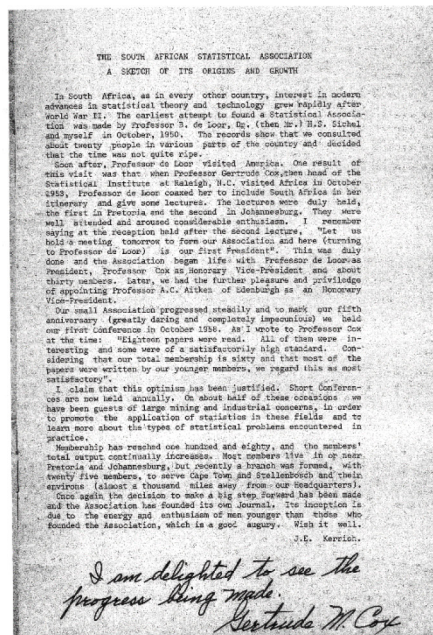
Professor Gertrude M Cox was a visitor to South Africa, and it was in part the enthusiasm sparked by her visit that precipitated the first meeting; she was elected Honourary President.

Figure 1: Message from John Kerrich, the first SASA President, and Gertrude Cox, Honorary President.[3]

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Message from a Founding Member

Prof JS Maritz

My recollections of the founding and early days of the Association are offered with some diffidence because I lost contact with it in 1960. They are hazy. After all, it did happen 50 years ago! Fortunately I can refer to the excellent review, by Professor H S Steyn, of the early history of Statistics in South Africa and especially of the founding of the Association. Its title is "When the South African Statistical Association was founded", appearing in the SASJ of 1979.

I recall the formation meeting of the Association as quite small, and it is perhaps of interest to list again the names of those present, in alphabetical order: G Abraham, A M Adelstein, A G Arbous, P Armsen, P Christensen, Gertrude M Cox, B de Loor, J E Kerrich, D G Krige, W Lutz, J S Maritz, H S Sichel, H S Steyn. Professor Gertrude M Cox was a visitor to South Africa, and it was in part the enthusiasm sparked by her visit that precipitated the first meeting; she was elected Honourary President. The first President was B de Loor, Vice-President J E Kerrich.

I was the first Secretary/Treasurer, and despite my total lack of experience and competence for the job, the Association survived. A happy circumstance, for me, was that Committee meetings were held alternately at my home, and at Halfway House. This is, of course, a subjective impression, but the list of South African names above says something about the flavour of the Association, and about the emphasis of Statistics in South Africa at the time. I think it would be fair to say that none of those persons was concerned only with the Mathematics of Statistics, all of them were with the applications of Statistics; at least two of them were not Statisticians at all, but very serious users of statistical techniques. I am tempted to put D G Krige in this latter category, but he has become perhaps the most famous of all South African statisticians. I think we were enthused by the potential for application of statistical thinking in so many diverse areas. And the insight of many scientists, engineers and other professionals who understood the need for statistical expertise must be acknowledged.

On a personal note, Kerrich and Sichel were my introduction to Statistics as a discipline, Dr C H Wyndham, Head of the Applied Physiology Laboratory of the Chamber of Mines greatly influential for my appreciation of the worth of applied statistics.

From a small beginning the association has flourished to become a vigorous representative of statistical activity in SA. It has encouraged both theoretical developments and professional application of statistical methods. May it continue to do so for many years.

Figure 2: Message from J.S. Maritz, the first SASA secretary.[3]

From these strong beginnings, SASA has continued to grow, and, in 2023, was 70 years old. The current membership of SASA sits at 856, including students. The mission of SASA is to foster the study and knowledge of statistical theory and its application towards improving the quality of life of all South Africans. The statistical community in South Africa has a rich history and a strong sense of community.

SASA's recognition of the community

Fellows and Honorary Members

SASA recognises exceptional contributions to the advancement of statistics in the profession and academia through honorary appointments and awards. Each year, SASA Members can be nominated for an Honorary Member appointment and/or a Fellow appointment. Nominated Honorary Members are retired members and are awarded life-long membership based on their exceptional contributions to the overall knowledge base of statistics or the advancement of the Association. Any enfranchised SASA Member can be nominated and appointed as a Fellow by means of outstanding contributions to the field. Each year, both the Honorary Member(s) and Fellow(s) are selected by the Fellowship Committee, which is composed of the last six available Past Presidents.

Nomination for an Honorary President of SASA can be made for a Member who has made exceptional contributions to the advancement of the profession of statisticians in South Africa. This appointment is made by a unanimous decision of the SASA Executive Committee. At the 2007 50th Annual Conference, the (then) Statistician-General, Mr Pali Lehohla, was awarded the position of Honorary President of the Association. This award was given in recognition of his efforts to promote a broad appreciation of statistics among government, business, civil society, and the general public.

In 2013, the inaugural SAS Thought Leader award, sponsored by SAS South Africa, was awarded. This annual award is given to someone who has significantly influenced the South African statistical community through a variety of activities and has made notable contributions in academia, industry, government, and other sectors. The criteria for this recognition include contributions to and impacts in leadership, knowledge generation, and human capital development; the impact of their work and research; and success in attracting funding. The list of Honorary Members, Fellows, and Thought Leaders is available on the SASA website (www.sastat.org).

The Herbert Sichel Medal

The Herbert Sichel Medal was first instituted by SASA in 1997 in memory of Prof. Herbert Sichel, one of South Africa's statistical pioneers, who made seminal contributions to statistics in fields ranging from mining to statistical linguistics, including a distribution named after him. A special edition of the *South African Statistical Journal* (Vol.31 No.1) in memory of H.S. Sichel appeared in 1997.

Except for one year (2001), the Medal has been awarded annually to a member (or members) of the Association whose paper appeared (in print or online) during the previous calendar year and was judged best by a panel of judges appointed by the Association. A list of winners of the Award since its inception in 1997 appears on the SASA website. In evaluating the papers for the Medal, the panel uses the following set of criteria: (1) the impact of

the paper in its specific field; (2) how innovative the ideas or techniques used in the paper are; (3) the relevance of the problem being addressed; and (4) how well written the paper is.

The South African Statistical Journal

The *South African Statistical Journal* (SASJ) is the official journal of SASA and was founded during the mid-1960s, following the formation of SASA in 1953. Under the editorship of Prof. D.J. Stoker, assisted by Prof. H.S. Steyn and Prof. C.F. Crouse, the first issue of the SASJ was published in 1967. This issue also contains a narrative on the establishment of SASA, written by the SASA President at the time, Prof. J.E. Kerrich. SASJ quickly attracted international attention, with the first article by an author from abroad being published in the second issue.

SASJ publishes biannually, in March and September, with the aim of providing a platform for innovative contributions to the theory and application of statistics. The journal employs a double-anonymous peer-review process, where reviews are conducted by local or international, independent and anonymous experts. The founding of SASJ not only provided the South African statistics community with a local platform for publishing, but also with possible career advancement opportunities in terms of editorial and peer review duties.

SASJ is accredited by the Department of Higher Education and Training of South Africa. The journal is currently indexed on Scopus and in the Web of Science Emerging Sources Citation Index. Some of the most recent developments for SASJ include the journal becoming a free-of-charge, fully open access journal from 2022 and moving to a paperless publication model from 2024.

The Statistical Dictionary

The translation of statistics terminology from English to Afrikaans has been a significant project for the South African statistics community. The first edition of the *Statistical Dictionary* was published in 1961 by de Loor, one of SASA's founders, and *a 2nd edition* was published in 1965 under the Suid-Afrikaanse Akademie vir Wetenskap en Kuns.[4] A *revised and enlarged version* was published under the leadership of Prof. H.S. Schoeman with the Department of National Education's Translation Bureau in 1984 (Figure 3).[5] A further *update* was published in 2009 by Faans Steyn, Chris Smit and Corna Vorster, and made available online.

The list of statistical terms currently consists of approximately 7200 entries. It is not only an English–Afrikaans glossary but also contains contexts or sentences in which the terms occur, sometimes with brief definitions. A division was made into subfields within the subject field in the context, and an adapted list of codes from Statistical Theory and Methods Abstracts was used. The existing *Statistical Dictionary* was integrated with the list and is given as such under "Source publication". Future endeavours by SASA involve translating statistical terms into all South African languages. A publication by Stats SA in 2013 has set this plan into action. This dictionary covers terms used in reporting statistics.

Connections in the statistics community

Statistics South Africa

Statistics South Africa (Stats SA) is the national statistical agency responsible for collecting, producing, and disseminating official statistics in South Africa. Its history dates to the Central Statistical Service, which was transformed into Stats SA, with the name change occurring in 1998. The Central Statistical Service was initially the statutory agency responsible for national statistics in South Africa, but after the 1994 elections, the new government inherited a significant void in statistical information, particularly amongst the previously disenfranchised majority, making it difficult to benchmark progress or make informed decisions.

To address this void, the Central Statistical Service underwent a transformation, reviewing and re-engineering its statistical series, as well as transforming its human capacity and statistical infrastructure. This transformation led to the creation of Stats SA, a national government department with a new mandate and role derived from the *Statistics Act (Act No.6 of 1999)*.

Since then, Stats SA has been responsible for producing official statistics, as well as coordinating other statistics produced in South Africa by market research companies, parastatal bodies, government departments, universities, research institutions, and the private sector, amongst others.

Stats SA has also been actively involved in various African initiatives aimed at improving the relevance and quality of statistics on the continent, such as the African Charter on Statistics and the Strategy for the Harmonisation of Statistics in Africa (SHaSA), as well as broader
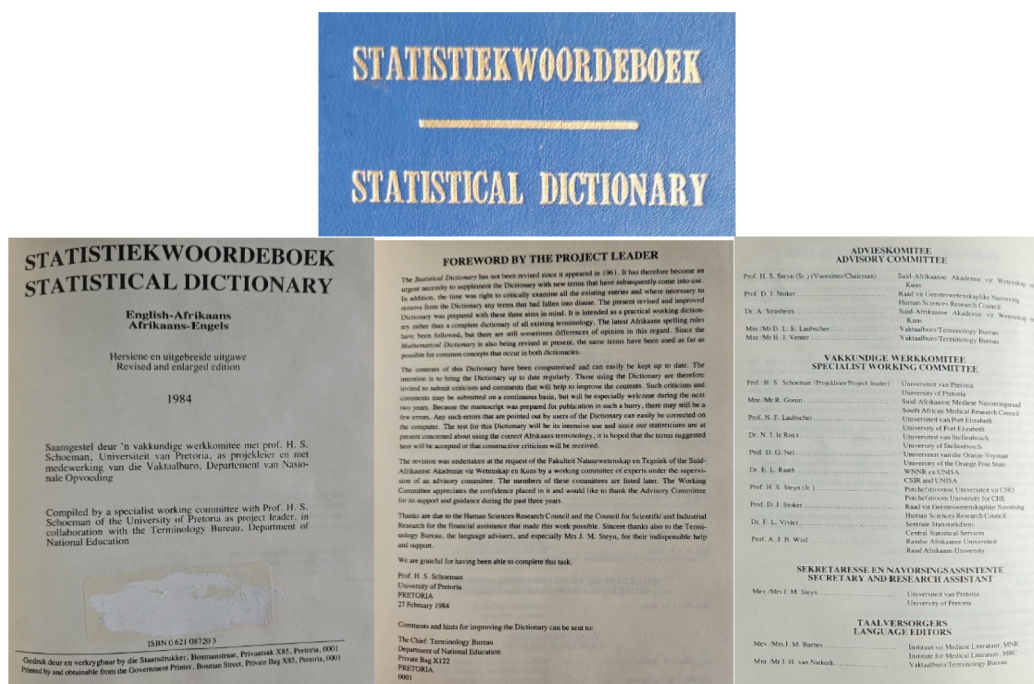

Figure 3: The *Statistical Dictionary*.[5]

initiatives within the United Nations, which included hosting the very first UN World Data Forum in 2017 as well as leading the UN Committee on experts on big data and data science for the production of official statistics.

The organisation has also been pursuing an Integrated Development Framework, with the aim of reporting on global, continental, regional, and national development agendas and serving as a tool to identify data gaps, eliminate duplication of data, prioritise strategic statistical needs, and ensure the quality of data for evidence-based decision-making.

The following history is extracted from an unpublished conference booklet[3]: Statistics in South Africa has a number of significant milestones. From the early beginnings, covering the census data from 1910 to 1914, the collection of official statistics in South Africa dates back to the pre-Union period when the four former colonies collected data for administrative purposes. The *South Africa Act of 1909* provided for a census of the white population, for election planning, at four-year intervals. The *Census Act of 1910* provided that a census be held in 1911, and thereafter at such intervals as decided on by the government. For this purpose, a Census Office was established in 1910. It was directed by J.B. Moffat from its inception in 1910 to 1914.

Into the census and statistics from 1917 to 1939, the scope of statistical data collection saw the *Statistics Act 38 of 1914* passed. The Act provided for the collection and publication of a wide range of social and economic statistics and the establishment of an Advisory Statistical Council. The Statistics Council provided important input to the production of statistics before the establishment of the first fully fledged statistical agency in the country. The outbreak of World War I prevented promulgation of *Act 38 of 1914* until 1 April 1917, on which date the Office of Census and Statistics was established as a division in the Department of the Interior. C.W. Cousins was the first director of the Office, a position he held until 1924.

Dr J.E. Holloway succeeded Cousins in 1925 and remained in office until 1933 when he was succeeded by A.W. Curruthers (1934–1939). During this period, a number of interesting 'firsts' took place: the country's annual agricultural production was assessed; the country's international balance of payments and its national income were calculated; improved statistics were collected in respect of employment, unemployment, wages and trade unions (after the establishment of the Department of Labour in 1924); statistics on road vehicle accidents were first collected in 1934; and, in 1936, family expenditure was collected – thus laying the foundation for the calculation of the consumer price index.

From World War II and the immediate post-war period, 1939–1950, the agency was directed by Dr E.G. Malherbe (1939–1945). He was succeeded by E.P. Pearce (1945–1946). Initially, the War restricted the extension and improvement of statistical services. Towards the end of the War, conditions had improved and statistics on new areas were being collected. However, by the early 1950s, government called for a thorough assessment of statistical production, and, in 1951, a Report of the Committee of Inquiry into Public Statistical Services in the Union reported "that in many respects the present Statistical Service does not differ materially from that of a quarter century ago, and that the Service of 1926 cannot cope with the requirements of 1951". At that time, the agency consisted of nine departments ("administration, population, industries and agriculture, social, machine tabulation, calculation work, publications and library, distribution and national accounts"). It had 161 permanent and 367 temporary staff members. It indicates that two of the temporary staff members were "natives".

One of the main problems identified by the commission was "the lack of coordination between the Bureau and the different Government departments and semi-government bodies which collect statistics. This lack of coordination is closely bound up with the lack of status and trained statistical personnel in the Bureau itself, which has considerably hampered the development of the statistical services." The Committee recommended that the professional level of the agency be raised and that it be granted independent status under the Minister of the Interior.

An interesting publication relating to the period 1951 to 1994 was Union Statistics for Fifty Years, a jubilee issue presenting tables on about 50 years of statistics. This period corresponds with the coming to power of the National Party and the application of its apartheid policies. In the field of statistics, these policies were particularly noticeable in the fragmentation of data collection in the country due to the establishment of ten homelands for Africans. During this period, the agency had the following heads: J.I. Raats (1946–1956), H.M. Stoker (1956–1965), J.J. Botha (1966–1971), T. du Plessis (1972–1980), A. Louw (1981–1984), Dr S. Thirion (acting 1984) and T. du Toit (1985–1995).

The period from 1995 to 2003 was marked by a dramatic reorganisation of the agency and the reinstatement of country-wide data collection. In this regard, the biggest challenge was Census '96 which was planned and implemented under the leadership of F.M. Orkin who became the first head of the agency in the post-apartheid era, and he prepared for a modern Statistics Act. The Census of 1996 was headed by Pali Lehohla, who later became the Statistician-General under the new Act.

Orkin was succeeded by the first Statistician-General, and the first black person to head the agency in 90 years, when Pali Lehohla took over the reins in November 2000. Lehohla set himself the task of improving the body of data collected by the agency; creating a spatial frame for the data (geography); creating an infrastructure and architecture for the collation, management and dissemination of information; and establishing the institutional framework within which the collection and production of that data and information could take place (the National Statistics System). Furthermore, during Lehohla's period in office, staff appointments, particularly at senior management level, reached levels which approximately represented the demographics of the population of the country.

The Council for Scientific and Industrial Research

Constituted by an Act of Parliament in 1945 (*Act 33 of 1945, Act 46 of 1988 as amended by Act 71 of 1990*), the Council for Scientific and Industrial Research (CSIR) is one of the leading scientific and technology research, development and implementation organisations in Africa. With a track record spanning more than 80 years, the organisation is committed to serving the development objectives of South Africa and improving the quality of life of its people.

The CSIR was established post World War II and therefore initially focused more on warfare, radar technology and security and defence for the country. Acting Prime Minister Hofmeyr was quoted as saying[6]: "A nation which neglects research is at the same time impairing its prospects of material welfare and weakening its status and dignity among the civilised nations of the world." Hence fields such as Operations Research was one that first blossomed at the CSIR.

The National Research Institute for Mathematical Sciences (NRIMS) was first established in 1961 as part of the CSIR, which helped create an Operations Research group and a Statistical group. During the late 1960s and early 1970s, several Operations Research and Statistics Departments were created at universities, which attracted a number of the Operations Researchers and statisticians from CSIR to head these departments at the universities.[7]

CSIR has since been involved in a number of applications of statistics, but perhaps one of the most recognised and ongoing models developed was the CSIR Elections Prediction Model.

The South African Medical Research Council

The South African Medical Research Council (SAMRC) was established by the South African government under *Act No.19 of 1969*. Initially, the Biostatistics Research Unit was initiated as a support service to support the design and data analysis of various research projects within the SAMRC, as well as capacity development and postgraduate supervision at local universities in proximity to the respective regional centres. Then, in the mid-1990s, it was absorbed into the Centre for Epidemiological Research in South Africa. However, due to its strategic importance within the SAMRC and the broader health science community, it was reconstituted into an independent unit. Now the Biostatistics Research Unit is a multi-centre research facility within the SAMRC for biostatistical expertise in evaluating public health strategies, developing statistical

methods, and interpreting biomedical studies. The Unit has expertise in biostatistics, GIS, data management and food science and has strong collaborations with diverse research groups including clinicians, epidemiologists, health service researchers, and public health policy researchers within and external to the SAMRC. The Unit has three regional offices: Cape Town, Pretoria, and Durban. There are five key methodological research programmes within the Biostatistics Research Unit's Biostatistics Division: The design and analysis of clinical trials; Causal inference; Longitudinal data analysis; High dimensional analysis; and Spatial analysis. The SAMRC Biostatistics Research Unit is a highly collaborative unit and has played a pivotal role in several papers published in *SAJS*.

The South African Council for Natural Sciences Professions

The South African Council for Natural Sciences Professions (SACNASP) is mandated by the *Natural Scientific Professions Act, 2003 (Act 27 of 2003)* to register practising natural scientists in one of various fields of practice. The natural sciences encompass a wide range of scientific fields, covering all the basic sciences and many of their applied derivatives. Statistical Science is one of 26 fields of practice gazetted in the amended schedule I of the *Natural Scientific Professions Act* (Notice 469 of 2021). SASA and ICCSSA were instrumental in adding Statistical Science as a field of practice in 2015. Prior to 2015, statisticians could only register as professional scientists under the Mathematical Science field of practice. However, Mathematical Science does not cover and accommodate proper governance in the practice of Statistical Science. Specifically, while the applied sciences and engineering would be expected to understand and interpret statistical reports, they are not necessarily trained in the fundamentals of statistical methodologies such as the theories and applications of design of statistical experiments, inferential techniques, prediction and forecasting, multivariate analyses, quality control and sampling methods (both in the Bayesian and classical paradigm). Therefore, it was necessary to have Statistical Science as a field of practice under SACNASP for professional registration, regulation and continued professional development of practising statisticians in South Africa.

The Institute for Certified and Chartered Statisticians of South Africa

Towards the end of 2008, Mr H. Gabriels (Chair of the Statistics Council), Dr H. van Rooy (SASA President), and Dr V. Micali (independent) met to work on an initiative to create a professional association.

This association would be affiliated with SASA to coordinate the statistical profession in South Africa and, at the same time, to assure legal compliance. A general assembly of statisticians in industry got together on 22 January 2009 to commence this initiative. That assembly mandated an elected team to constitute an associated society to SASA, in the form of an Institute governed by the SASA Constitution and its own by-laws and compliant to SACNASP. Mr H. Gabriels was elected Chair of the task team. The task team made detailed proposals on the amendments to the SASA Constitution. The main proposal was to amend the constitution to allow an Associated Society to register with SASA. It was further proposed that the Institute for Certified and Chartered Statisticians of South Africa (ICCSSA) be recognised as an associated society. Following extensive consultations between Mr A.J. De Klerk, the representative of SACNASP, on the relationship with SACNASP, it was agreed that SASA and ICCSSA would apply to register as a voluntary association with SACNASP.

The ICCSSA was launched on 13 June 2011 by the Hon. Min. Trevor Manuel as the essential body for practising statisticians. The main purpose of ICCSSA was to (1) provide professional recognition and registration for practising statisticians in the industry, (2) improve the competency of members and other statisticians through the provision of Continuous Professional Development activities for members, and (3) create a Community of Practice for statisticians in industry.

The incorporation of ICCSSA as an associated society of SASA enabled collaboration for the support of both academic and practising statisticians

in South Africa. This was facilitated through representation of each organisation at the ICCSSA Board or SASA executive meetings. ICCSSA has been recognised by the South African Qualification Authority (SAQA) as the voluntary statistical professional body in South Africa since 19 February 2014 for the purposes of the *National Qualifications Framework (NQF) Act, Act 67 of 2008*, and SAQA approved the registration of the Chartered Statistician (ChM) and Certificated Statistician (CeM) for professional designations on the NQF. ICCSSA operated as a non-profit company and was registered with CIPC up until 2023. From 2024, the role of practising statisticians has lied with SACNASP.

On 17 August 2015, Statistical Science was gazetted to be included as a field of practice under Schedule 1 of the NSP Act in South Africa, separating statisticians from mathematical scientists and concreting the identity of a statistician in South Africa.

The Agricultural Research Council

The Agricultural Research Council (ARC) is a statutory parastatal body established in terms of the *Agricultural Research Act, 1990 (Act 86 of 1990)*. It is the principal agricultural research institution in South Africa. The ARC was established during 1992, and has a rich history. The ARC Biometry Unit provides a statistical consultation service that contributes to research in areas as diverse as biological pest control, animal production, nutrition, crop production, and breeding analysis programmes. Biometricians are successful in integrating their statistical expertise into research programmes, ensuring efficient scientific research. They ensure that information is fully utilised and scientifically viable. Through the services offered, the experienced team has established a reputation as a specialist team in South Africa.

The Statistics Council

The South African Statistics Council (https://council.statssa.gov.za/) is an independent advisory body that advises the Minister, the Statistician General, or an organ of state which produces statistics on matters pertaining to the promotion and safeguarding of official statistics, the coordination of statistical activities, and an environment which is supportive of the collection, production, dissemination and use of official statistics. Therefore, the Council is not a board, nor is it the Stats SA Council.

The Council appoints different committees as are necessary for the effective performance of the functions of the Council. Currently, the following committees in which members and relevant Stats SA managers dig deeper into specific issues, are the Population and Social Statistics Committee, Economic and Labour Statistics Committee, Methodology and Innovation/ICT Committee, and Strategy Committee.

The Minister, after consultation with the Cabinet, appoints the Members of the Council from nominations obtained. The Council consists of 18–25 members with relevant professional proficiency and interest, broadly representative of groups or interests concerned with the production and use of official statistics, of whom nine must be persons representing the respective provinces. The following SASA Members have served on the Council: Dawie Stoker up to 2003, Jacky Galpin up to 2018, Khangelani Zuma 2008–2018, Maseka Lesaoana 2008–2018, Tertius de Wet 2003–2008, Nico Crowther 2003–2008, Daan de Waal 2003–2008, Sarah Radloff 2013–2018, Sulaiman Salau 2013–2018, and Ariane Neethling 2013–current.

The Institute for Statistical Research

The following history is taken from the unpublished conference booklet.[3] The Institute for Statistical Research (ISR) has been one of the institutes of the Human Sciences Research Council (HSRC) since its inception. Prof. D.J. Stoker took over as Director of the ISR from Dr Japie Kies during 1979, firstly on a part-time basis and from 1981 on a full-time basis. After Stoker's appointment as Vice-President of the HSRC in July 1982, Prof. Nico Crowther from the University of Port Elizabeth was appointed as director of the ISR and he acted in this capacity from 1983 until 1990. For the subsequent 18 months until June 1992, D.J. Stoker, who had retired at the end of 1989, again took up this responsibility on a temporary basis. From July 1992, Stoker continued his involvement with the HSRC as a statistical consultant for several more years. Over

the period 1981–1990, the number of qualified statisticians in the ISR increased to 15. However, due to the necessity to rationalise caused by the government's requirement that Research Councils must increasingly earn their own income by undertaking contract work, the personnel corps of the Centre for Statistics, formerly known as the ISR, was drastically reduced over the years after 1990. The consequence of this reduction in the number of statisticians was that the Centre for Statistics was later incorporated into the IT section of the HSRC. One statistician remained employed. Dr Stephen du Toit, who took up an appointment at the ISR from January 1981, was responsible for quantitative data analysis and Prof. Stoker for (complex) sampling and qualitative data analysis. After Rolf Stumpf's appointment as statistician and Stoker's promotion to Vice-President, Stumpf took over the responsibility for qualitative data analysis, while Stoker, in addition to his responsibility as Vice-President, kept the responsibility for sampling. Crowther, after his appointment as Director, also took a special interest in qualitative data analysis. Since 1980, prominent statisticians have rendered extremely valuable statistical services to the HSRC on a part-time basis. Two of these statisticians are Profs H.S. Steyn and M.W. Browne. The investigations and research work done at the ISR have led to numerous MSc theses and one PhD, the latter being the study undertaken by Rolf Stumpf under the supervision of H.S. Steyn. The emphasis of the ISR's task fell in the first place on the development and promotion of sound scientific procedures for the analysis of survey data in the social and other human sciences. This objective required an in-depth study of the literature, the testing of procedures developed for the analysis of survey data, and the presentation of courses to make known and to promote the usage of these procedures by researchers in the human sciences. To meet the latter objective, courses were presented and workshops held at various places in South Africa. Furthermore, personnel of the ISR participated in or led various national investigations and projects undertaken by or contracted out to the HSRC. Examples of these are: (1) The development of indicators to measure quality of life, (2) The Joint Matriculation Board's Investigation into Differential Entrance Requirements for Tertiary Educational Institutions, (3) Various Health and Demographic surveys, (4) Various Household Income and Expenditure surveys, (5) "Sample (Population) Censuses" (i.e. a population census based on a sample) with the view to estimate populations and other demographic variables as well as household facilities. The most important of these was the ISR's involvement in the 1991 population census with the task of estimating census type variables in 88 areas across South Africa.

The above short historical overview of the ISR of the HSRC illustrates a 'rise and fall' of a strongly developed statistical institute over a period of a little more than 10 years. It had a significant impact on the use of sound statistical procedures in the social sciences in South Africa, which is still evident today.

Industry collaborations

Sasol had a long-term relationship with SASA. The Industrial Statistics and Data Science Team in Sasol was built over a period of about 20 years, and has initiated and implemented projects in Sasol processes with significant impact and value-add. Most notably was the development and implementation of the MSPEM™ Technology Package, which is an in-house developed web-based business solution that integrates near-real-time process data and statistical process modelling to deliver process intelligence and insight. The MSPEM™ package has been implemented in various Sasol processes and is used daily for decision-making, especially on the coal value chain for tracking coal properties from the source, for optimisation and management of coal blending, preparation and handling, up to the performance modelling and diagnostic analysis of the gas production facilities. Another significant project was the development of an artificial intelligent control algorithm in 2019, which has been implemented directly in the CO control program for automated control of the coal gasifiers in South Africa.

The Sasol Team has collaborated with many SASA Members and academic researchers over the years, including Prof. Linda Haines (University of Cape Town), Prof. Daan de Waal (University of the Free State), Prof. Niel le Roux (Stellenbosch University), Prof. Sugnet Lubbe (Stellenbosch University), and Prof. Paul Fatti (University of the Witwatersrand). From these collaborations, several research articles were published in national and international scientific journals. The Sasol Team also attended the SASA conferences regularly and invited international experts to South Africa, including Prof. Douglas Montgomery in 2000, Prof. Dennis Lin in 2009, and Dr Bradley Jones from SAS JMP in 2013.

There was the long-term project for Eskom that Prof. de Waal led (approximately 2002–2012). At that time, the Eskom Laboratory was established in the Department of Mathematical Statistics at the University of the Free State. In 2013–2015, the reliability project for Eskom was accomplished (led by Prof. Finkelstein) and the results (including the necessity of timely, mathematically justified maintenance of the generating units) were delivered to Eskom leadership (the latter, obviously, was not done as recommended).

In addition SAS, an international statistical software company, has been a long-term partner of SASA,and has been involved in conference funding, student funding and student development.

Maths4Stats programme

Mathematical thinking is very different from statistical thinking. Traditionally, learners have 12 years of training at school to become mathematically proficient, but only a fraction of time is spent on being statistically proficient. SASA Education Committee Members have accordingly been actively involved in advocacy and training programmes aimed at encouraging basic statistical knowledge and skills at school level.

The first such teacher training programme was the Maths4Stats programme defined by Stats SA in 2004. The SASA Education Committee was at the forefront of activities for this programme, with Delia North (SASA Education Committee) as Master trainer for the Maths4Stats programme, along with Jackie Scheiber (RADMASTE, Wits). Pali Lehohla asked North and Scheiber to partner with Stats SA to run the Maths4Stats programme, in which teachers and subject advisors were taken to venues for a few days to undergo training in statistics and probability. This programme ran for about 4 years; after the programme started to dwindle, North decided to run an extended Maths4Stats programme over weekends, at the University of KwaZulu-Natal (UKZN). An extensive annual programme followed, which was run over a few consecutive weekends, with teachers from the UKZN catchment area attending. SAS was also involved through Murray de Villiers, who came to speak to teachers, to motivate them about the value of teaching statistics meaningfully in the classroom. This programme won an ISI Statistics Literacy Award at the World Statistics Congress in Hong Kong in 2013.

In 2012, the Western Cape provincial Maths4Stats coordinator contacted the University of the Western Cape (UWC) to become involved in the Maths4Stats project. The three stakeholders – UWC's Statistics staff, Stats SA and the Western Cape Education Department – worked together to plan the training sessions. Training concluded at the end of 2014. Prior knowledge scores showed that the educators needed training in all the topics presented. Overall, the educators' knowledge improved during the training sessions.

The success of the Maths4Stats programme led to the launch of the Teachers4DataAnalytics programme, at UKZN, on 13 August 2022. This project was conceptualised by North, as a key project to create awareness amongst high school learners of job opportunities for those who study statistics at tertiary level. Nombuso Zondo (UKZN, South African Statistical Association Education Committee), was instrumental in defining the computer lab sessions (SAS Data Fly software) for the training sessions.

In order to ensure that teachers have top-class training, the Teachers4DataAnalytics programme was launched by partnering with Prof. Christine Franklin (Senior Lecturer Emerita in Statistics, University Georgia; K-12 Statistical Ambassador, American Statistical Association). The programme was extremely successful and was featured in the *Brainstorm Magazine*.

A series of three Teachers4DataAnalytics workshops were further held in 2023, at institutions around the country, led by the SASA Education Committee team of North and Zondo.

Statistics Departments in South Africa

There are Statistics Departments at all the universities in South Africa, some with significant history and others that are part of changes in university structures and that are still growing. The current departments and their heads are presented in Table 1.

An extraction of the origins of the departments as at 2003 is presented below, taken from the unpublished conference booklet.[3] The old university names are presented for historical records. Updates on institutional mergers are also included.[8] Table 1 shows the current university departments after mergers and renaming.

University of Pretoria: Probably the first recorded activities to establish a Department of Statistics at any South African university took place at a Commerce Faculty board meeting of the University of Pretoria on 3 June 1920. This was when Prof. A.E. du Toit enquired about the position of statistics and actuarial science in courses of the Faculty. Although a statistics department at the University of Pretoria was only established at the beginning of 1939, statistics was taught as part of the Mathematics syllabus since 1925 by the young Dr B. de Loor. He became the first Professor and Head of the 'Departement Statistiek en Handelswiskunde' in 1939. In 1958, the name of the department was changed to the Department of Statistics, in 1975 to Statistics and Computer Science, and in 1977 again to the Department of Statistics. After his death in 1962, Prof. de Loor was succeeded as Head of the Department by Prof. D.J. Stoker, who in turn was succeeded by Prof. H.S. Schoeman in 1981. Prof. N.A.S. Crowther has been Head of the Department since 1991. In 2004, the University of Pretoria and the Vista University–Mamelodi campus merged to form the University of Pretoria.

Stellenbosch University: The teaching of statistics has a long history at Stellenbosch University. A course in Statistics was taught to Agriculture students at the University as long ago as the 1920s, and, in 1933, a course in Elementary Statistics and Interest Calculation was initiated. This became a compulsory course for Business students in 1936. In 1942, the subject Statistical Mathematics was introduced as a possible major for Business students. A Department of Statistics was officially established in the Commerce Faculty at the University in 1946 with the appointment of Dr S.J. (Faantjie) Pretorius as the first Professor of Statistics.

University of the Free State: At the beginning of 1954, the senate of the University of the Orange Free State was informed of a request by the

Table 1: Statistics departments in South Africa and their heads, 2024

Department	Head of Department	Link to website
Nelson Mandela University	Chantelle Clohessy	website Some recent history of the department: Nelson Mandela University
North-West University: Mahikeng Campus Potchefstroom Campus Vanderbijlpark Campus	Kolentino Mpeta Gerrit Gobler Jacques de Klerk	website
Rhodes University	Jeremy Baxter	website
Sefako Makgatho Health Sciences University	Sollie Seeletse	website
Stellenbosch University	Justin Harvey	website
University of Cape Town	Freedom Gumedze	website
University of Fort Hare	Ruffin Mutambayi	website
University of Johannesburg	Jacques van Appel	website
University of KwaZulu-Natal	Retius Chifurira	website
University of Limpopo	Daniel Maposa	website
University of Pretoria	Samuel Manda	website
University of South Africa	Basetsana Pauline Ntsime	website
University of the Free State	Frans Koning	website
University of the Western Cape	Humphrey Brydon	website
University of the Witwatersrand	Stephen Jurisich	website
University of Venda	Simiso Moyo	website
University of Zululand	Maba Matadi	website
Sol Plaatje University	Dimpho Mothibi	website
Central University of Technology	Michelle Erasmus	website
Tshwane University of Technology	Seithuti Moshokoa	website
Durban University of Technology	Anisha Ananth	website
Cape Peninsula University of Technology	Thomas Farrar	website

Faculty of Commerce and Administration that there was a need for courses in statistics. This matter was discussed with the Head of the Department of Mathematics (the late Prof. A.P. Malan). At the end of August the same year, the Senate proposed to the Council that a 3-year course in Statistics should be instituted. In the beginning of 1955, a recommendation was put forward that Statistics should be offered as a 3-year major in conjunction with subjects such as Psychology, as well as subjects from the biological sciences. On 27 September 1955, the Senate announced that the Honorable Minister of Education had approved the formation of a Department of Statistics with a Senior Lecturer as head. Mr Andries Reitsma (later professor) was appointed as first Head of the Department. The University of the Orange Free State merged with the University of the North–Qwa-Qwa campus in 2003 and the Vista University–Vista campus in 2004 to form the University of the Free State.

Potchefstroom University: The Department of Statistics at Potchefstroom University was founded in 1956 when the Council of the University decided at a meeting held on 16 November 1955, that senate representation would be granted to this department. Dr J.M. de Wet was appointed as Head of the Department. The campuses of the Potchefstroom University of Christian Education, University of the North West, and Sebokeng campus of Vista University merged in 2004 to form the North-West University.

University of the Witwatersrand: The Department of Statistics at the University of the Witwatersrand was founded in 1957, with Prof. John Kerrich as its first Head. Kerrich had achieved a measure of fame for his coin spinning and urn experiments conducted while interned in Denmark during World War II, which he recorded in his monograph entitled *An Experimental Introduction to the Theory of Probability*. While still a member of the Department of Mathematics, Kerrich attended a meeting at the University on 28 October 1953, together with 12 other statisticians, at which the South African Statistical Association was founded. Kerrich subsequently spent three terms as President of the Association and was a Member of the Executive continuously until 1969. Two persons who were subsequently to make their mark internationally, Herbert Sichel and Danie Krige, both completed their master's degrees under his supervision. In 2005, the campuses of the Johannesburg College of Education and the University of the Witwatersrand merged to form the University of the Witwatersrand.

University of South Africa: The first statistician appointed at Unisa was Mr (later Dr) D.F.I. van Heerden. He was one of three academics in the Department of Mathematics in 1957. At that stage, BSc and BCom students could take Mathematical Statistics and Statistics as one of their majors. In 1959, the Department of Mathematical Statistics was formed and chaired by Prof. H.S. Steyn. Dr H.T. Gonin and Mr D.F.I. van Heerden were Senior Lecturers. The Technikon South Africa and Vista University Distance Education campus were incorporated into the University of South Africa in 2004.

University of Cape Town: The Department of Statistical Sciences at the University of Cape Town was established in 1965 as the Department of Mathematical Statistics, and assumed its current name at the beginning of 1991. The founding staff member was Prof. Cas Troskie who was later joined by his assistants June Juritz, and Arthur Money (Henley Management College) as Lecturers.

University of the North: The Department of Mathematical Statistics was established in the late 1960s (1965). It offered a major in Mathematical Statistics for students doing a BSc degree and a service course in Statistical Methods for students doing BCom or other degrees. Prof. Oliver pioneered the department as the Head and was later joined by some of his students, Mike Phala and Stanley Tlakula (Prof. Phala has now passed away and Mr Tlakula moved to the then Vista University). The University of the North merged with the Medical University of South Africa to form the University of Limpopo.

University of Port Elizabeth: The University of Port Elizabeth was established in 1964. The first lectures held on campus were on 1 March 1965, when the University opened its doors to 326 students, including 50 postgraduate students. The academic staff of 18 Professors, 8 Senior Lecturers and 7 Lecturers seems miniscule compared to the 202

academics now on campus. The Mathematical Statistics programme was started in 1965 under the tutelage of Prof. G.J.J. van Zyl. The University of Port Elizabeth merged in 2005 with the Port Elizabeth Technikon and Vista University's Port Elizabeth campus to form the now Nelson Mandela University.

Rand Afrikaans University: The Department of Statistics was founded, as was the University itself, in 1967 with the appointment of Profs A.J.B. Wiid and H.H. Lemmer and, a year later, the (then) Dr G.P. Viljoen and Mr M.J. Venter. All the founding members, except Prof. M.J. Venter, are now retired. The Rand Afrikaans University, Technikon Witwatersrand and the Soweto and East Rand campuses of Vista University merged in 2005 to become the University of Johannesburg.

Rhodes University: The Department of Mathematical Statistics was established in 1973 under the headship of Prof. P. van der Watt. The Department was formerly part of Rhodes Department of Applied Mathematics and Statistics. At the time of its establishment, the Department offered three undergraduate courses – namely Statistics, Mathematical Statistics 2 and Mathematical Statistics 3 – and postgraduate courses for honours and masterss students.

University of Natal-Durban: After a number of years in which second- and third-year, and postgraduate, courses in statistics were offered under the umbrella of the Department of Mathematics, a separate Department of Statistics was established in the early 1970s with Heinz Linhart as Professor and Head. On Linhart's relocation to Göttingen in 1975, Leon Troskie was appointed to the headship, a position he occupied for more than 20 years. With the re-organisation of the university in the late 1990s, the Department of Statistics was once again joined with Mathematics. In 2004, the universities of Durban-Westville and Natal merged to form the University of KwaZulu-Natal, and the Statistics Department of the former was combined with the Durban and Pietermaritzburg Statistics Departments of the latter.

University of Natal-Pietermaritzburg: Statistics and Biometry was founded by Prof. Arthur Asquith Rayner in 1949. Prof. Rayner, a New Zealander, arrived in Pietermaritzburg and took up the newly created post of Professor of Biometry in the Faculty of Agriculture and the Agricultural Technical Services. The first ever Biometry major for the BSc Agric degree in South Africa, and probably in the world, was thus offered at the Pietermaritzburg campus of the University of Natal. Statistics at this time was taught by the Mathematics Department. In 1974, Prof. Rayner took over the teaching of Statistics from the Mathematics Department and so was born the Statistics and Biometry Department, dually affiliated to the Faculties of Science and Agriculture. Prof. G.P.Y. Clarke took over from Prof. Rayner as the Head of the Department from 1984 until December 1998. Prof. Clarke retired and left in June 2000 to take up a research post at Agriculture West Australia in Perth.

University of Durban-Westville: The Department of Statistics was established in 1961 in the Commerce Faculty and has since offered service courses in Statistics to the Commerce Faculty. The Department began offering a BSc degree with a major in Statistics in 1972.

University of the Western Cape: The University of the Western Cape was established in 1960 for coloured students as an extension of the former government's policy of apartheid. It opened its doors at a formerly white pre-primary school in Bellville-South. It was an institution shunned and scorned by black academics, and attended under protest by most of its students, because their only other option was to forego the opportunity of residential tertiary education. There was widespread rejection of the establishment of the University College by the community. Senior academic appointments were made by political structures hostile to the community for which the university was intended. Statistics was initially offered within the Mathematics Department, but in the late 1970s, the Statistics Department was established.

University of Fort Hare: Prof. Steyn Linde, who was Head of the Department of Applied Mathematics at the University of Fort Hare, introduced Statistics into the Department of Applied Mathematics in 1962, thus forming the Department of Applied Mathematics and

Statistics. In 1978, these two disciplines were separated and the Department of Statistics came into its own right. Prof. Abrie van der Merwe and Prof. Piet Groenewald were among the early members of the Department of Applied Mathematics and Statistics and Prof. Gert Viljoen was the first Head of the Department of Statistics. He retained this position until 1996 when Prof. Joanne Tyler took over as Head of the Department. In 2003, the University of Fort Hare incorporated the Rhodes University East London campus into its structure.

University of Transkei: The Department of Statistics at the University of Transkei was established in 1982 with only two teaching staff at Lecturer level. A third Lecturer joined a year later while the first Professor and substantive Head took up his post in 1985. In 2005, the University of Transkei merged with the Border Technikon and the Eastern Cape Technikon to form the Walter Sisulu University.

University of Zululand: Statistics was first taught by the Mathematics Department as a service course to commerce students. Gradually, more and more Statistics courses for science students were introduced by the Mathematics Department. As a result of this growth in courses, a Department of Mathematical Statistics was started in 1982 under the leadership of Mr P. Steyn. After Steyn left the university, the teaching of statistics was again taken over by the Mathematics Department. In 1989, Mr Dube (later Prof. Dube) was appointed in the Mathematical Statistics Department. He was promoted to Professor in 1996.

Vista University: Vista University came into being in 1982 as a multicampus university. Initially, only basic degrees were offered, e.g. Arts, Education, Management and Law. Mathematics was offered as part of Arts from 1983. The Department of Mathematics offered Statistics at the first level. The Faculty of Science came into being in 1990, with a separate Department of Statistics. Prof. H.F.P Rautenbach (Hennie) was appointed as head of the department. Prof. Deon van Zyl from the University of Port Elizabeth developed the study material used. In the early 2000s, the various campuses of Vista University merged or were incorporated into geographically similar institutions following the restructuring of the South African education system during the period 2001 to 2007.

MEDUNSA: The Medical University of Southern Africa opened its doors to students in 1976. Since its inception, it has produced over 5000 health professionals in the fields of Medicine, Dentistry, Veterinary Medicine and Natural Science. In its short history, it has graduated more medical doctors than all other medical schools in South Africa combined. MEDUNSA has been and continues to be of major strategic importance to South Africa in redressing the race-based inequalities in healthcare provision. MEDUNSA is an institution with unparalleled success. It is located at Ga-Rankuwa, 30 km northwest of Pretoria. Although MEDUNSA was originally conceived as a health science university, an awareness of the need for science teachers in the black community soon arose. These realities led to the establishment of the Faculty of Sciences, which admitted its first students in 1989. Initially, the Department of Mathematics was housed in the Department of Physics under the leadership of Prof. Zingu. The department became autonomous as a separate unit, called the Department of Mathematics and Statistics, in 1992, and Prof. H.S. Schoeman, who was then employed at MEDUNSA as the University Statistician, was appointed as Head of Department, a post which he held until his retirement at the end of 1999. During 2000, Dr P. Gopalraj was appointed as acting Head of Department. In January 2001. Prof. John Fresen was appointed as Head of Department.

Technikon Pretoria: Statistics as a subject was first formally introduced at the Technikon Pretoria in 1980 when the School of Mathematical Sciences was created. Today, this institution is known as the Tshwane University of Technology after the merger in 2004 between Technikon Northern Gauteng, Technikon North-West, and Technikon Pretoria.

Technikon Witwatersrand: The Department of Statistics came into being in the late 1980s when it officially became a separate academic department with its own head, identity and dedicated staff. Before this date, it was incorporated within the Department of Mathematics, Statistics and Physics. In 2005, the Technikon merged with Rand Afrikaans University and the Soweto and East Rand campuses of Vista University, forming the University of Johannesburg.

It is worth also noting that universities of technology in South Africa have an important role to play and provide an alternative path to a career as a statistician. Cape Peninsula University of Technology (CPUT) is blazing a pathway to statistics careers via the diploma route for students who did not achieve a bachelor pass in secondary school. CPUT introduced a 3-year National Diploma: Mathematical Technology in 2009, which was replaced by the HEQSF-aligned Diploma in Mathematical Sciences (NQF level 6) in 2017. Admission requirements are 50% (achievement level 4) in Mathematics, English, and one of Physical Sciences, Geography, Accounting, Business Studies, or Economics in the National Senior Certificate or an equivalent NQF level 4 qualification. The Diploma includes a 6-month Work Integrated Learning placement or project completed with a partner organisation in business, industry, or government. A one-year Advanced Diploma in Mathematical Sciences (NQF level 7) was introduced in 2020, with a 2-year part-time offering launched in 2023. A Postgraduate Diploma in Mathematical Sciences (NQF level 8) is currently awaiting CHE accreditation. All three of these qualifications have Mathematics and Statistics as major subjects, with a strong emphasis on programming and computing, and domain application electives such as Biomathematics, Biostatistics, Financial Mathematics, and Econometrics. Once the Postgraduate Diploma is approved for implementation, the university plans to develop master's degrees in Applied Mathematics and Statistics. In this way, CPUT seeks to broaden access to careers and postgraduate studies in statistics to a predominantly black segment of the South African population who may previously not have had the opportunity to pursue statistics at the tertiary level. Besides offering Mathematical Sciences qualifications, CPUT's Department of Mathematics and Physics, which houses most of the university's statisticians, services statistics subjects to three faculties (Applied Sciences, Engineering and the Built Environment, and Health and Wellness Sciences).

Prominent statisticians in South Africa

Danie Krige and geostatistics

In the late 1940s and early 1950s, the mining engineers, Danie Krige, F.W.J. Ross and H.J. de Wijs, and the statistician, Herbert Sichel, developed some quantitative and highly innovative approaches to problems relating to gold-bearing ores in the mining industry in Johannesburg, South Africa. Their studies, in particular that of Krige on prediction across a spatial field and that of Sichel on long-tailed distributions, have had a great impact on statistical methodology over the years and are outlined here. Danie Krige completed a master's thesis at the University of the Witwatersrand in 1951. He introduced the concept that ore grades are a spatial variable with a spatial structure and used weighted regression techniques to estimate ore reserves.[9-11] Georges Matheron, a French mathematician and engineer at the French Geological Survey in Algeria, identified the work of Krige and developed a more formal approach. Matheron published a series of papers, initially in French and later in English, and, in a paper in 1967, named the approach kriging in honour of Krige.[12,13] A timeline detailing the birth of the geostatistical model in Africa is given in Haines and Thiart[14] and the findings are indeed truly 'Out of Africa'.

In essence, the work of Krige and Matheron relates to the sampling of ores over a spatial field and, more specifically, to the construction of an optimal predictor at an unobserved location on the basis of observations already taken. Their approach is distribution-free and is predicated on the fact that observations located close together are likely to be more highly correlated than those located further apart. Methodology based on the kriging model has advanced in a way that can only be described as amazing. Specifically, the assumption that the observations in the kriging model are distributed as Gaussian, considered by the geostatisticians to be a 'leap of faith', has led, in turn, to the concept of the model as a stochastic process, termed a Gaussian process. This notion has evolved further within the machine learning arena and Gaussian processes are widely used today as surrogates for complex models with multiple inputs and outputs.

Herbert Sichel made great advances in the study of long-tailed distributions in the early 1950s. Specifically, it was well known in the

mining industry that histograms of large numbers of assayed ore grades were notoriously long tailed. Sichel introduced the log-normal distribution to provide a fit to the histograms and thereby to facilitate a meaningful statistically based summary of the data and, in addition, developed the Sichel t-estimator. Somewhat later, Sichel developed a novel long-tailed distribution, which is rooted in those of the inverse Gaussian and the Poisson, and which was named the Sichel distribution.[15,16] The log-normal distribution is widely used in applied statistics in areas ranging from health care to finance and still presents some interesting theoretical challenges in the modelling of spatial data. In addition, the Sichel distribution itself is well known, particularly in the field of linguistics, as a model for word count data.

The use of geostatistics, in particular kriging, continues to flourish within the South African mining community. In addition, research into the methodology underpinning spatial statistics more generally and into a vast range of applications is, and indeed has been, actively pursued within the South African universities.

Trevor Hastie and statistical learning

Prof. Hastie worked at the Institute for Biostatistics at the Medical Research Council in the Western Cape for 3 years from 1977 to 1980; he had a BSc and worked in applied statistics. During his stay there he made some plots for Prof. Cyril Wyndham, for an article he was preparing. They had discretised some quantitative variables in a logistic regression, creating a number of bins for each. He then plotted the resulting fits as a piecewise constant function for each variable. He has no record of these plots, but in his mind these were the seed for what was to become 'Generalized Additive Models', his first book with Rob Tibshirani in 1990.

In 2003, he was invited as a special guest to attend the SASA conference in Johannesburg. It was the occasion of the 50th anniversary of SASA. The other special guest was Sir David Cox (full disclosure – he labels himself invited as the special "expat" guest). Nevertheless, this was one of the highlights of his career. He enjoyed being with David Cox, and was impressed with how he paid attention to the younger people.

Hastie has co-authored seven books. The last five of these are freely available as PDFs on his website, with permission from the publishers. They have also filmed a 10-week course based on the two 'Introduction to Statistical Learning' series (the first with R labs, the new one with Python labs). These courses are available for free via EdX, and he is happy to know that these and the free books have been used in South African classrooms.

Hastie worked at AT&T Bell laboratories for 8 years, and was part of the team that developed the statistical modelling software they use in R. He has been a Professor of Statistics at Stanford University for 30 years, and has spent all his sabbaticals in South Africa.

Random matrix theory

Random matrix theory is a rich, and often complex, branch within statistics that has fundamental roots in South Africa. Essential elements of interest that stem from this statistical area include hypothesis testing when considering equality of multiple means, sphericity of covariance structures, likelihood ratio testing in the linear model scenario, and classification in a discriminant analysis context, for example. There are several South African academics who made significant contributions during the latter half of the 20th century in these fields, and its impact is still observed through (1) regular citation in the current era and (2) its relevance and implementation in multidisciplinary fields. The works of Daan de Waal[17-21], Willie Conradie[22], Cas Troskie[23,24], June Juritz[25], and Kotie Roux and Andriette Bekker[26-28] are particular examples that stand out in this case. Recent citations[29] of these works are present.

In wireless communications, the distributional characterisation of wireless signals between transmitters and receivers is mostly assumed to be complex Gaussian; the quadratic form of this characterisation is of sincere interest when analysing a large multiple-input-multiple-output (MIMIO) system's capacity (loosely 'bandwidth') or probability of a signal failing (via a signal-to-noise ratio). These types of analyses are rarely theoretically complete without a theoretical investigation and determination

of the accompanying (maximum, minimum, or joint) eigenvalue behaviour of such quadratic forms. In a mathematical sense, the complexity of tractable and implementable derivations and solutions are exacerbated by these considerations, predominantly in the complex realm.

In this context, the essential contribution within this branch of multivariate analyses was particularly influenced by South African stalwarts of statistics, especially some of the work by Cas Troskie as well as the collaborators and legacy that he played a major role in securing for South African statistics. An example by Troskie[30] was instrumental to the development and refinement of the theory of MIMO systems, and continues to be cited within this field in this century.[31-35]

Through the contributions of individuals such as these, the random matrix theory subdiscipline in statistics is richer, stronger, and more flavourful than otherwise.

Multivariate statistics in South Africa

Among the first generation of statisticians in South Africa, Fanie Steyn was the specialist in multivariate statistics. Several of his PhD students – Cas Troskie, Kotie Roux and Michael Browne – followed in his footsteps. Amongst others, Daan de Waal, Willie Conradie, Riaan de Jongh, June Juritz and Les Underhill all obtained their PhDs under the supervision of Cas Troskie. Although Kotie Roux (and similarly Daan de Waal) later moved to Bayesian statistics, he supervised Niël le Roux, Piet Becker, Andriette Bekker, Paul Mostert and the master's of Michael Greenacre. In the meantime, Hennie Venter obtained his PhD in Chicago under Raghu Raj Bahadur, and, on his return, supervised Tertius de Wet who supervised Freek Lombard. Doug Hawkins, supervised by SASA co-founder John Kerrich, was Wits's first PhD graduate and in turn supervised Paul Fatti. Multivariate statistics was an active research field in the 1970s and 1980s at Unisa (Fanie Steyn Sr, Kotie Roux, Michael Browne, Michael Greenacre, Freek Lombard, Dan Bradu), the University of Cape Town (Cas Troskie, June Juritz, Les Underhill), University of the Free State (Daan de Waal, Piet Groenewald, Abrie van der Merwe), University of Pretoria (Piet Becker, Andriette Bekker, Nico Crowther), Wits (Doug Hawkins, Paul Fatti, Jacky Galpin), the then Potchefstroom University (Hennie Venter), Rhodes (Sarah Radloff), UKZN (Arthur Rayner), University of Port Elizabeth (Nico Crowther, Nico Laubscher) and Stellenbosch University (Niël le Roux, Willie Conradie). Nico Laubscher supervised Martin Kidd while Niel le Roux supervised Willie Conradie's master's and the PhDs of Sarel Steel, Nelmarie Louw, Sugnet Lubbe, Ruan Rossouw and Mwanabute Ngoy (Zambia). In turn, Niel le Roux and Sugnet Lubbe supervised Johane Nienkemper-Swanepoel while Sugnet also supervised Raeesa Ganey and co-supervised Andre Mostert with Roelof Coetzer. The Stellenbosch research group formed the Centre for Multi-Dimensional Data Visualisation (MuViSU) in 2021 with 5th and 6th generation students being supervised by Sugnet Lubbe and Johane Nienkemper-Swanepoel under the watchful emeritus eyes of Niel le Roux.

In the early days, the focus was on multivariate distribution theory and the development of Fortran routines for computations such as zonal polynomials. Later Michael Greenacre's 1984 monograph[36,37] introduced correspondence analysis to the English-speaking world. From Dan Bradu's collaboration with Ruben Gabriel on biplots to the present day, MuViSU is still actively developing methodology and software in the realm of biplots and multidimensional visualisation.

Statisticians in the SAJS

A number of researchers in the statistics community have contributed to the *South African Journal of Science* over the years, namely in financial statistics[1,38,39], in segmentation techniques[40], and on the important aspect of transformation at South African universities[41] with Dunne[42,43] providing important mathematical discussions regarding this analysis. Stewart[54] also tackles the mathematics and statistics used to rank universities, a hotly debated topic in academia, and the drop-out rate at universities in South Africa is also examined[44]. De Jongh[45] highlights the importance of industry training in Statistics degrees; Chikobvu et al.[46] contribute to rainfall understanding using statistical extreme value theory; and trends in road accidents in South Africa[47] are examined, as well as issues in public

health[48]. Van Staden report on the gender gap in science[49] and John et al.[50] provide an analysis of gender in science across Africa. Pazi et al.[51] look into electricity fraud in South Africa and Verster et al. investigate home loan offers using tree-based ensemble methods[52]. More recently, deep learning has been investigated for solar energy.[53]

Future of statistics in South Africa

Academic statistics in South Africa was declared in crisis by the National Research Foundation in 2015, due to ageing professors and limited mentoring staff at middle level positions. Ring-fenced funding was made available to assist the field with growth of new young academics. This grant was instrumental in supporting postgraduates and young staff without PhDs. The field is still operating at a less-than-optimal staff capacity, with all departments in South Africa experiencing huge teaching loads, resulting in staggered research output; however, through additional funding, there is still a focus on supporting academic statistics. Funding instruments, through COE-MaSS and NGA-MaSS, have been important in the statistics community, albeit focused more broadly on mathematical sciences but inclusive of statistics. Without these funders, the community would not have advanced to including many younger staff members who are passionate about statistics.

In 2020, an interest group of young researchers was initiated by Prof. Inger Fabris-Rotelli (University of Pretoria) to start discussing the challenges of doctoral supervision for novice and early-career supervisors in the absence of senior mentors, as well as possible solutions to these challenges. This group, composed of seven members spread across South Africa, has been meeting virtually since mid-2020 and has been identifying, discussing and documenting a number of issues pertinent within their own institutions – issues both common and unique. This group's meetings have shown that there is an urgent need for more support for young academics in statistical sciences in South Africa. This Statistics Supervision Network in South Africa (StatSNetSA) expands on the original group to include additional early- and mid-career academics across South Africa. One of the purposes of this network is to provide one other with support and guidance on how to effectively supervise statistics doctoral students. The group is now a special interest group of SASA and is active in providing support to the statistics community in development across institutions and experience levels to learn from each other in the absence of enough senior professors in the community.

In 2023, the South African Mathematics Society (SAMS) and SASA, under the leadership of the respective presidents and Prof. Loyiso Nongxa, initiated discussions towards a National Strategy for the Mathematical Sciences. The aim of these discussions was to actively pursue a path to improving the pipeline of mathematical sciences from pre-school into tertiary education and industry. The Mathematical Sciences Strategic Alliance has since been initiated to tackle this important pipeline.

SASA holds its annual conference every November, at which 250–350 statisticians from around the country meet every year. The conference serves as an important networking event to share ideas and further the field of statistics.

Due to the current data science buzz in all facets of society, the statistics community has an important role to play in grounding the field with statistics literacy and expert understanding, for example in explainable artificial intelligence (XAI). The skills of a statistician are essential to the underpinnings of data science and machine learning. The community in South Africa is passionate, energetic and willing to work together to advocate for statistics as a non-negotiable field of science. SASA will continue to support the field and its players, in its traditional form as well as in the advancements that are demanded by a speeding technological society.

Declarations

I.F.R. is the current (2023–2024) President of the South African Statistical Association. Other authors are Members of the Association. There are no other competing interests to declare. There is no AI or LLM use to declare. All authors read and approved the final version.

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