

## SKILLS

R, Python, SQL, Stata	3+ yrs
Machine Learning	3+ yrs
Statistical Analysis	5+ yrs
Clinical Research	5+ yrs
Epidemiology	5+ yrs
Project Management	10+ yrs
Quality Assurance	10+ yrs
Scientific Writing	10+ yrs
Clinical Medicine	10+ yrs

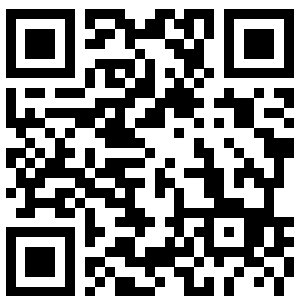
## CONTACT

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Digital Portfolio



# DR FRANCIS NGEMA

Data Science In Healthcare

## PROFILE

Experienced medical practitioner with a strong background in clinical and laboratory work, complemented by extensive exposure to both public and private healthcare settings. Specialised in the design and implementation of effective donor care programs, focused on the collection of an ample and secure blood supply while prioritising donor well-being.

Skilled in managing large-scale projects and collaborating within cross-functional teams. My proficiency extends to the fields of data science, machine learning, and marketing analytics, where I leverage my scientific expertise to extract insights and optimise strategies. With a solid foundation in scientific writing, I bring a comprehensive skill set to drive evidence-based approaches.

## WORK EXPERIENCE

### Founder and Data Scientist Research 100

Feb '23 – Present

Founded and led a data-driven healthcare research startup.

- collaborated with healthcare practitioners to assess chronic condition populations, using unsupervised learning methods to better understand patient segments (e.g., diabetes).
- developed predictive and prescriptive models to forecast clinical trends and provide actionable healthcare recommendations.
- extracted, transformed, and loaded (ETL) large clinical datasets using Python, R, and SQL for analysis and reporting.
- engaged with clinical stakeholders to present data insights, translating them into practical strategies for healthcare improvement.
- created and presented data-driven reports, dashboards, and visualisations to effectively communicate insights to both technical and non-technical audiences.
- leveraged advanced statistical methods, including logistic regression and clustering, to analyze structured and unstructured clinical data for actionable insights.
- conducted Health Technology Assessments (HTAs) to evaluate the efficacy, safety, and cost-effectiveness of medical technologies.

### ITAPS Mentee in University of California, San Francisco (UCSF) & South African National Blood Service Manuscript writing

July '22 – Dec, '22

The International Traineeships in AIDS Prevention Studies program (ITAPS) is a training program for international scientists. Its mission is to provide training and to conduct research on the prevention of HIV transmission in low- and middle-income countries.

# EDUCATION

2023 - 2024

**Masters in Applied Data Science (MADS)**  
University of the Johannesburg

2001 - 2009

**MBBCh.**  
University of the Witwatersrand

1998

**Matric**  
Inkamana High School

## TRAINEESHIP

**Scientific Manuscript Writing Program – July, 2022**

University of California, San Francisco - International Traineeship in AIDS Prevention Studies (ITAPS)

## CERTIFICATIONS

**HPCSA licensed -Up to Date**

The Health Professions Council of South Africa is a statutory body, established in terms section 2(1) of the Health Professions Act

**Big Data and Data Science Research Ethics – 13 Nov 2024**

University of California, San Francisco & CITI PROGRAM

**Essentials of Responsible AI – 13 Nov, 2024**

University of California, San Francisco & CITI PROGRAM

- data wrangling in Stata;
- performed descriptive analysis of numerical data using Stata;
- visualised data with figures and tables in Stata ;
- conducted study designs, categorical data analysis in Stata;
- tested for a difference between two group means in Stata;
- performed hypothesis testing & brief overview of Analysis of Variance (ANOVA) in Stata;
- conducted qualitative data collection, analysis, and interpretation;
- performed linear and logistic regression analysis in Stata;
- developed an analysis plan and table construction;
- formulated research question and performed literature search.

**Donor Medical Manager**  
**South African National Blood Service (SANBS)**

Feb '18 - Nov '22

Provided clinical oversight, timely advice, and ensured implementation of all medical matters relating to blood donors, donations, blood collections, including specialised collections. Ensured SANBS donor clinic compliance with the National Health Act, Standards of Practice for Blood Transfusion in South Africa, and the Protection of Personal Information Act (POPI Act).

- **Data Analysis and Strategy Proficiency:**
  - **Data Analytics:** Sound knowledge in biostatistics and data science, leveraged tools like Stata, Python, Power BI, and Tableau to perform in-depth data analysis. Analysed ferritin levels, HIV, HBV, HCV, and Syphilis, uncovering critical patterns and seasonality to provide actionable insights for informed decision-making.
  - **Data-Driven Ferritin Monitoring:** Collaborated in a data-driven ferritin monitoring post-introduction of iron tablets for blood donors, preventing iron deficiency arising from blood donation.
  - **Data-Driven Customer Insights:**
    - \* Conducted operational customer surveys among blood donors to extract valuable insights.
    - \* Explored essential aspects, such as whether blood donors were offered iron tablets.
    - \* Initiated focused internal studies to gauge staff knowledge and practices concerning the issuance of iron tablets based on survey insights.
    - \* These insights were instrumental in optimising procedures and ensuring the well-being of blood donors.
  - **Blood Usage Insights:** Monitored and analysed data for blood users, including hospitals, unlocking insights on blood usage patterns and anomalies. Provided advisory input on patient blood management within blood committees.
  - **Patient-Centric Telehealth Experience:** Provided counseling to blood donors with low ferritin levels in telehealth consultations. Communicated complex medical information in an easy-to-understand manner.
- **Quality Assurance**
  - developed protocols and procedures to define the criteria for the acceptance and deferral of blood donors including development of questionnaires.
  - designed and implemented donor care education strategies for collection staff.

### **CITI Good Clinical Practice Course – 12 Nov, 2024**

University of California, San Francisco & CITI PROGRAM

### **Human Subjects Protection Training – 18 July, 2022**

University of California, San Francisco & CITI PROGRAM

### **GAP Assessment and Process Improvement Certificate – 2021**

Two full day training in GAP analyses; Process Mapping principles; LEAN and 6-Sigma methodology; GAP assessment, Measurements and Metrics, Root Cause Analyses Techniques and Cost of Quality

### **ISO 15189:2012 IMPLEMENTATION Certificate – 2019**

Two full day training in Quality Management System, accreditations and the advantages, ISO standards and focus on ISO 15189:2012, the intent of the clauses of ISO 15189:2012, management processes and the advantages

### **Joint Task Force for Apheresis Education and Certification (JTFAEC) – 2018**

Apheresis training for nurses and physicians around the World

### **Problem Based Learning (PBL) Workshop – 2016**

Attended workshop in Facilitating in Problem Based Learning (PBL) for medical students.

### **Computer literacy certificate – 2001**

Completed training in Microsoft Word, Microsoft Excel and the Internet.

- benchmarked best practice and proposed standard updates accordingly to Lead Consultant.
- identified risks on an enterprise and departmental level and developed plans to mitigate and reduce risk.
- developed protocols and procedures to maintain and protect the health of blood donors. Clinical decision making whereby deviations from protocols are required.
- collaborated with Senior Nursing manager and Lead Consultant Donor to ensure SANBS compliance with National Health Act and ISO15189.
- developed content for donor education, recruitment and selection procedures to design programs which will enhance the safety of blood supply.
- optimised operational objectives in respect to safe and sufficient blood supply.
- participated in national initiatives relating to the setting of standards and teenage donor policy development.

#### **• Improving Integral Processes**

- provided medical advice regarding the suitability of individuals to donate blood.
- reviewed, edited and authorised standard operating procedures (SOPs) for Specialised Donor Services.
- ensured safe and effective operation of the platelet and plasma Apheresis Division by supporting SANBS apheresis staff and consulting medically related requirements of apheresis donors.
- provided clinical advice to attending staff on the optimal clinical management of apheresis donors.
- oversight on the investigation of serious and moderate donor adverse events.
- ensured implementation of corrective actions as identified.
- authorised adverse events referrals to external medical facilities.
- managed serious adverse outcomes to blood transfusion.
- provided clinical advice to attending doctors on the optimal clinical management of adverse reactions.
- educated blood users on the serological and infectious diseases risks associated with blood transfusion.
- designed a system to continuously monitor donor adverse events.
- compiled monthly reports for the operational and marketing meetings.
- compiled quarterly reports for the donor council meetings.
- participated in the scientific research committee responsible for reviewing research protocols.

#### **• Internal and External Stakeholder Engagement**

- reviewed and improved the content of communication and educational materials targeted at potential blood donors and the South African communities, including newsletters, pamphlets, and website articles. and timely reporting.
- delivered clear and concise information to all project stakeholders, including donors, healthcare professionals, and community leaders, to ensure engagement, acceptance, and adoption of best practices in blood donation procedures.
- developed effective communication and education strategies to inform and engage stakeholders most impacted by the Iron Strong project, and ensured that any changes in working practices were understood and implemented effectively.
- collaborated with cross-functional teams to implement ferritin testing and iron replacement programs for blood donors.

# ACHIEVEMENTS

## Iron Strong Project – Jan 2019 – Nov 2022

Provided scientific literature review for implementation of ferritin levels monitoring and iron replacement for whole blood donors in the South African National Blood Service. Collaborated with cross-functional teams to implement ferritin testing and iron replacement program for blood donors

## Fogarty International Grant – April 23 - 27, 2018

Introduction to Clinical Research Course – University of Cape Town

## Establishment of Carletonville Colposcopy clinic – 2015

Established Carletonville Hospital Colposcopy clinic in April 2015 in partnership with Right to Care focused on reducing the burden of cervical cancer in the outskirts of South Africa through screening and prevention programs.

## Medical Student Grant in the Medical Research Council (MRC) Molecular Hepatology Research Unit at Wits University – 2003

Work study position for 2 months where I learned and performed basic principles and practices varying from specimen handling and preparation to interpretation of results from basic tools of research such as PCR, Microarray, Western blotting.

- maintained an up-to-date list of stakeholders, including their groupings and subgroups, such as project-affected communities, to ensure effective stakeholder engagement.
- developed a stakeholder engagement matrix to identify relevant stakeholders and their interests, and used this information to guide communication and engagement efforts.
- provided appropriate and clinical best practice advice to SANBS staff dealing with customer service and marketing related queries, complaints and related issues.

### • Team Performance

- managed team of 8 Medical Liaison Officers.
- managed the counseling program for blood donors with positive viral markers (HIV, HBV, HCV) including syphilis and biological false results.
- developed key performance indicators (KPIs) to monitor performance of direct reports (Medical Liaison Officers).
- provided training, mentoring and coaching to encourage individual development.
- recruitment and selection of suitable candidates according to manpower plan recruitment and selection procedures.
- introduced SharePoint to improve workflows and enhance team performance.
- initiated a Microsoft Business Intelligence project for accurate reporting of counseled donors.

- **Reason for departure:** To advance my studies in Applied Data Science.

## Locum Doctor GP locums

April '17 - Jan '18

Worked at Dr Pran Andhee's practice in Randburg, Springs and KwaThema Medicross as a medical locum. The responsibilities include:

- offered holistic care of high quality to individuals, families and communities;
- offered comprehensive person-centred care, with a family and community orientation;
- investigated and diagnosed common conditions and injured patients;
- prescribed medical prescriptions to patients and giving appropriate health education and advice to patients and carers' to enable self-management;
- referred patients to hospitals or specialist clinics for further investigation;
- updated and maintained accurate patient records.

- **Reason for departure:** Temporary medical locums

## Registrar in Anatomical pathology University of Witwatersrand/ National Health Laboratory Service (NHLS)

Feb '16 - Mar '17

Responsible for biosafety principles, gross pathology, histology, molecular pathology and academic teaching

- **Biosafety principles**

# COMPUTER SKILLS

## Programming Languages

Python; SQL; R; Stata, Java

## Application software/ IDE

Jupyter Notebooks; Google Collab; Visual Studio Code; PyTorch; LaTeX; RStudio; Meditech; SharePoint; Slack; MS Power BI; Tableau, Jira

# PUBLICATIONS

## Frontiers in Research Metrics and Analytics – Accepted (25 Oct, 2024)

A Bibliometric Review of Predictive Modelling for Cervical Cancer Risk

## Journal of Medical Internet Research Artificial Intelligence (JMIR AI) – Submitted (30 Oct, 2024)

XAI-Driven Comparative Analysis of Machine Learning Models for Predicting HIV Viral Suppression in Ugandan Patients

# PEER REVIEWS

## Digital Health (Sage Journals) – Reviewer (22 Feb, 2025)

Reviewed manuscript titled *A Bibliometric and Visualized Analysis of Colorectal Cancer Detection and Diagnosis using Artificial Intelligence* (DHJ-24-1830).

## Translational Cancer Research – Registered Reviewer (21 Jan, 2025)

- adhered to biosafety regulations and standard operating procedures (SOPs);
- rendered services that promote laboratory safety;
- participated in continuing medical education in biosafety.

### • Gross pathology

- prepared specimens for grossing;
- performed cut-up of surgical specimens.

### • Histology

- performed histological evaluation of specimens;
- produced histological reports;
- utilised application software relevant to pathology;
- adhered to quality assurance standards;
- participated in external quality assurance programmes.

### • Autopsy

- performed paediatric and adult autopsy;
- provided autopsy reports including histology.

### • Molecular pathology

- interpreted molecular pathology results;
- attended academic meetings in molecular pathology;
- received training in molecular pathology techniques.

### • Academia

- reviewed and presented articles in a departmental journal club;
- prepared and presented cases in multidisciplinary meetings;
- attended academic meetings and problem rounds;
- prepared and presented lectures to undergraduate health sciences students;
- facilitated medical students in problem based learning (PBL);
- attended Jozi Path International Academy of Pathology (IAP) Africa congress 2016.

### • Reason for departure: Family responsibility.

## Medical Officer Carletonville hospital

Sep '13 - Jan '16

Medical officer in Obstetrics and Gynaecology, Surgery, 24 hour Casualty, Outpatient and Medico-legal services. The responsibilities include

### • Reproductive Health

- Offered reproductive health services;
- counselled patients on proper birth control methods and prevention of diseases such as cervical and breast cancer;
- consistently improved patient quality of life through gynaecological and obstetric procedures, treatments and professional medical counselling;
- offered services to sexual assault victims .
- Managed colposcopy clinic;
- performed Colposcopy assessments and collected cervical biopsies;

Invited to join the reviewer database for *Translational Cancer Research* (ISSN: 2218-676X), an international peer-reviewed, open-access bimonthly journal focused on bridging laboratory and clinical settings in oncology research. Role involves potential review of submissions based on expertise.

- performed Loop Electrosurgical Excision Procedure (LEEP) under colposcopy guidance.

- **Surgery**

- clinical responsibilities including examinations, investigating, diagnosing and overseeing the treatment of patients in the department;
- performed basic surgical procedures in theatre including bed side procedures;
- assessed newly admitted patients.

- **Casualty**

- managed health care resources in a limited resource centre;
- worked 24 hour calls as a casualty officer;
- assisted patients with advanced life support;
- triaged patients according to medical condition severity;
- resuscitated critically ill patients;
- counselled patients on risk factors of medical conditions.

- **Miscellaneous**

- complied with quality assurance standards;
- attended academic meetings;
- appropriately diagnosed and treated a variety of diseases and injuries in an outpatient setting;
- worked in surgical and medical wards including performing bed side procedures;
- maintained and taught junior colleagues about appropriate and accurate health records in accordance with legal / ethical and continuity of the patient care;
- attended court proceedings to assist with sexual assault cases;
- improved turnaround time of admission discharge cycle.

- **Reason for departure:** To pursue academic endeavours.

**Medical officer in the Department of Ophthalmology**  
**Charlotte Maxeke JHB Academic Hospital(CMJAH)**

Sep '12 - Feb '13

Medical officer in the Department of Ophthalmology. The responsibilities include:

- administration and preparation of surgical lists and patients;
- examination, investigation and treatment of ophthalmological patients;
- performed intra-vitreous injection;
- carried out extra-ocular surgery, including conjunctival mass excision, pterygium excision and autograft;
- administered and prescribed appropriate courses of treatment, including pharmaceutical ophthalmic medicines;
- inspected medical instruments, equipment and operating rooms to maintain proper hygiene and sterility.
- advised and educated patients regarding diet, diabetes and hypertension and effective disease prevention methods;
- attended academic meetings.



- **Reason for departure:** 6 months contract ended.

**Community Service Medical Officer**  
**Hillbrow Community Health Centre / Orlando Clinic**

Jan '12 - June '12

Worked at Orlando clinic as a community service medical officer and performed 24 hour calls in Hillbrow

- part of a primary health care team, ensuring primary, continuing, comprehensive, holistic and personalised care of high quality to individuals, families and communities;
- offered comprehensive person-centred care, with a family and community orientation, responding to undifferentiated illness and acting as a medical officer to the primary health care team;
- investigated and diagnosed sick and injured patients on their ailments and then arranging appropriate treatments for them;
- prescribed medical prescriptions to patients and giving appropriate health education and advice to patients and carers' to enable self-management;
- if necessary, referring patients to hospitals or specialist clinics for further investigation;
- casualty officer at Hillbrow ( managing emergencies and referring P1 and P2 patients to CMJAH);
- attended academic meetings;
- updated and maintained accurate patient records.

- **Reason for departure:** Completion of 6 months of community service in family medicine (combined with surgery which is 6 months makes a total of 1 year of community service which is required by HPCSA).

**Community Service Medical Officer in the Department of Surgery**  
**Sebokeng hospital**

June '11- Dec '11

Community service medical officer in the Department of Surgery.

- worked as part of a team liaising with nurses, registrars and other health-care professionals ;
- assisted, facilitated and participated in quality of care, assisting team members with quality assurance quality improvement projects, morbidity and mortality reviews, monthly audits;
- clinical responsibilities including examinations, investigating, diagnosing and overseeing the treatment of patients in the department;
- ensured development of clinical guidelines and policies as per programme and disease profile;
- performed limb amputations, haemorrhoidectomy, perianal abscesses fistulae procedures, and skin grafting;
- active participation in training interns and junior staff;
- worked in the accident and emergency ward, and rotated in ICU;
- maintained and taught junior colleagues about appropriate and accurate health records in accordance with legal / ethical and continuity of the patient care;
- assessed newly admitted patients.

- **Reason for departure:** Completion of 6 months of community service in the surgery department.

Medical intern  
Charlotte Maxeke JHB Academic Hospital(CMJAH)

May '09- May '11

Commenced medical internship

- **rotated through the following disciplines as a medical intern**
  - Paediatrics including Neonatal High Care and Intensive Care Unit;
  - Internal medicine ;
  - General Surgery;
  - Vascular Surgery;
  - Trauma;
  - Surgery;
  - Psychiatry;
  - Family Medicine;
  - Orthopaedic Surgery;
  - Obstetrics and Gynaecology;
  - Obstetrics High Care.
- **Routine duties**
  - admitted and treated patients as part of the hospital's 24-hour on-call services;
  - examined patients and ordered diagnostic tests and analysed diagnostic images to further investigate patient conditions;
  - attended academic meetings;
  - treated paediatric patients with minor illnesses, acute and chronic health problems and growth and development concerns;
  - worked in outpatient departments of different medical disciplines;
  - monitored patients' condition and progress and re-evaluated treatments as necessary.
- **Reason for departure:** Completion of Medical internship as per HPCSA regulation.

## REFERENCES

Name	Contacts	Company	Position
Dr Kamela Mahlakwane	0833056077	SANBS	Transfusion Medicine
Dr Ruth Rankapole	0826622629	NHLS	Haematopathologist
Dr Thanolo Kashamba	+26775779535	NHLS	Anatomical Pathologist
Dr Albert Whata	0815081258	University of Pretoria	Senior Lecturer