

DR. FRANCIS NGEMA

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PROFILE

Medical practitioner and applied data scientist with over 15 years of clinical experience and specialist expertise in health data analytics, machine learning, and evidence-based research. Published researcher with peer-reviewed work in explainable AI for HIV treatment outcomes and bibliometric analysis of predictive modelling in oncology. Experienced in supervising teams, mentoring healthcare professionals, and translating complex data insights into actionable policy recommendations. Passionate about advancing healthcare through rigorous research methodology and committed to developing the next generation of health researchers.

RESEARCH INTERESTS

- Explainable machine learning for chronic disease management and treatment outcome prediction
- Health technology assessment and cost-effectiveness analysis in resource-limited settings
- Predictive modelling for cancer screening and prevention programmes
- Application of data science methodologies to medical scheme analytics and healthcare policy

EDUCATION

Master of Applied Data Science (MADS)

2023 – 2024

University of Johannesburg

Dissertation: Applied machine learning techniques to healthcare datasets with focus on interpretable models for clinical decision support.

MBBCh (Medicine)

2001 – 2009

University of the Witwatersrand

RESEARCH TRAINING

International Traineeship in AIDS Prevention Studies (ITAPS)

Jul – Dec 2022

University of California, San Francisco (UCSF) & South African National Blood Service

- Completed structured research training programme focused on HIV prevention research methodology in low- and middle-income countries.
- Developed competencies in scientific manuscript writing, research question formulation, and systematic literature review.
- Acquired proficiency in quantitative methods: data wrangling, descriptive and inferential statistics, hypothesis testing, ANOVA, and linear/logistic regression using Stata.
- Gained experience in qualitative data collection, analysis, and interpretation for mixed-methods research.
- Constructed analysis plans and developed skills in table and figure presentation for peer-reviewed publication.

PUBLICATIONS

- Ngema F, et al. "Explainable AI-Driven Comparative Analysis of Machine Learning Models for Predicting HIV Viral Nonsuppression in Ugandan Patients: Retrospective Cross-Sectional Study" - *JMIR AI* (Jan 2026). DOI: 10.2196/68196
- Ngema F, et al. "A Bibliometric Review of Predictive Modelling for Cervical Cancer Risk" - *Frontiers in Research Metrics and Analytics* (Oct 2024). DOI: 10.3389/frma.2024.1493944

PROFESSIONAL EXPERIENCE

Medical Advisor & Internal Stakeholder Support Manager

Jul 2025 – Present

Government Employees Medical Scheme (GEMS), Medical Advisory Services Division

- Conduct evidence-based analysis of healthcare programmes and develop data-driven recommendations for South Africa's largest medical scheme serving over 2 million beneficiaries.
- Apply advanced analytics and machine learning techniques to evaluate clinical outcomes, cost containment strategies, and programme effectiveness across multiple healthcare domains.
- Lead health technology assessments and systematic reviews to inform clinical policy decisions and benefit design.
- Develop performance scorecards and KPI frameworks integrating clinical, operational, and financial metrics for stakeholder reporting.
- Collaborate with cross-functional teams on regulatory compliance, including PMB determinations and CMS complaint resolution using structured analytical methodologies.

Founder and Data Scientist

Feb 2023 – Present

Research 100

- Developed predictive models using supervised and unsupervised learning to analyse chronic condition populations and treatment outcomes.
- Conducted independent Health Technology Assessments (HTAs) evaluating clinical efficacy and cost-effectiveness of healthcare interventions.
- Created interactive dashboards and data visualisations (R Shiny, Python) to communicate research findings to clinical and policy stakeholders.
- Published peer-reviewed research on machine learning applications in HIV treatment and cancer screening.

Donor Medical Manager

Feb 2018 - Nov 2022

South African National Blood Service (SANBS)

- Managed and mentored a team of eight Medical Liaison Officers, including recruitment, performance monitoring, and professional development coaching.
- Designed and implemented a donor adverse event surveillance system enabling data-driven risk identification and quality improvement.
- Led the Iron Strong Project: developed research protocols, conducted literature reviews, and collaborated with cross-functional teams to implement ferritin monitoring and iron supplementation programmes.
- Directed the national donor counselling programme for individuals with positive viral markers, ensuring ethical communication and appropriate clinical follow-up.
- Standardised donor eligibility criteria through evidence-based clinical protocols, achieving a 15% reduction in deferral disputes.
- Oversaw more than 100 clinical investigations with 95% corrective action implementation rate.

Registrar in Anatomical Pathology

Feb 2016 - Mar 2017

University of Witwatersrand / National Health Laboratory Service (NHLs)

- Delivered formal lectures to undergraduate health sciences students spanning general pathology to case-based learning.
- Facilitated problem-based learning (PBL) sessions, mentoring medical students in clinical reasoning and critical analysis.
- Presented research articles in departmental journal clubs and contributed to multidisciplinary academic discussions.
- Participated in organising the Jozi Path International Academy of Pathology (IAP) Africa Congress 2016.

RESEARCH SUPERVISION CAPABILITIES

- **Methodological expertise:** Proficient in quantitative research design, statistical analysis (regression, survival analysis, clustering), machine learning model development, and systematic review methodologies.
- **Technical skills:** Advanced proficiency in Python, R, Stata, and data visualisation tools; experience with ETL processes and large healthcare datasets.
- **Mentorship experience:** Track record of developing healthcare professionals through structured coaching, performance management, and knowledge transfer in clinical and research contexts.
- **Domain knowledge:** Deep understanding of South African healthcare systems, medical scheme regulation, clinical governance, and health policy frameworks.
- **Publication track record:** Successfully navigated peer-review process with publications in JMIR AI and Frontiers journals, demonstrating ability to guide students through research dissemination.

CERTIFICATIONS

CITI Good Clinical Practice Course

UCSF & CITI Program (2024)

GAP Assessment and Process Improvement

Quality First Academy (Pty) Ltd

ISO 15189 Implementation

Quality First Academy (Pty) Ltd

HPCSA Licensed

Health Professions Council South Africa

SELECTED ACHIEVEMENTS

- **Iron Strong Project (2019-2022):** Led scientific literature review and cross-functional collaboration to implement evidence-based ferritin monitoring and iron replacement protocols at SANBS.
- **Fogarty International Grant (2018):** Completed Introduction to Clinical Research Course at University of Cape Town, strengthening clinical study design and research ethics competencies.
- **Carletonville Colposcopy Clinic (2015):** Founded hospital colposcopy clinic in partnership with Right to Care, expanding cervical cancer screening access in underserved communities.
- **MRC Research Grant (2003):** Awarded placement at Wits University Molecular Hepatology Research Unit, gaining experience in PCR, Microarray, and Western Blotting techniques.