

GENETICS

careers focus

Genetics refers to our DNA or genes, which are the building blocks of all humans. Simply put, it encompasses all the recipes or instructions that tell our bodies how they should be built and function. If there is a pathogenic variant (a change in the gene sequence), or it results in certain genetic disorders. Technology has advanced, allowing us to study all the coding regions of DNA (whole exome sequencing) and the entire coding and non-coding regions of the DNA (whole genome sequencing).



Ms Malebo Malope

What does it mean to work in genetics?

by Ms Malebo Malope, lecturer and genetic counsellor at Stellenbosch University

I am in the field of human genetics, but there are other fields in genetics, including plant and animal genetics.

What careers are there in human genetics?

Here are some of the main careers/job positions:

- Biomedical technologist
- Laboratory technician
- Researcher
- Research coordinator
- Laboratory assistant
- Clinical trial coordinator
- Medical scientist (diagnostics, research)
- Genetic counsellor

- Medical geneticist
- Lecturer
- Bioethicist
- Clinical researcher
- Clinical research associate
- Research assistant
- Training coordinator
- Clinical scientist
- Data scientist/bioinformatician
- Medical science liaison
- Sales representative
- Principal investigator (research)

There are many more positions to suit everyone's personalities and interests. Furthermore, there are three main streams in human genetics, each with various disciplines and career paths:

Diagnostic laboratory: An honours or master's degree, followed by an HPCSA Medical Scientist Internship, enables work in private and state laboratories.

Research: This path usually involves completing honours and master's degrees, and for some, a PhD. They can become research assistants, postdoctoral fellows, researchers, principal investigators (leading their own research groups), and progress to professorships. They may work in academia as researchers, lecturers, or both.

Clinical genetics: A genetic counsellor requires an MSc in Genetic Counselling and the completion of a two-year HPCSA internship. Genetic counsellors can work in clinical settings, research or genetic diagnostic laboratories. Medical geneticists are medical doctors with a speciality in medical genetics. They may also work for universities as researchers and/or lecturers.

There are two main bodies to register with in human genetics, depending on the career path: HPCSA (Health Professions Council of South Africa) and SACNASP (South African Council for Natural Scientific Professions). Registration with these bodies is important for some available positions.

Which subjects should a learner choose in high school to qualify to study genetics?

Mathematics (pure), Life Sciences and Physical Sciences. These subjects will allow the learner to choose a science degree that aligns with their interests.

My selected high school subjects were Mathematics, Physical Sciences, Life Sciences and Accounting (I wanted the range to allow me to pursue any career that interested me).

Undergraduate degrees to consider if you want to continue into genetics at honours or master's level

BSc Biomedical Sciences, BSc Medical Sciences, BSc in Molecular Biology and Biotechnology, BSc Human Life Sciences, etc. It is important to choose genetics modules if available and to study genetics at the honours level. While looking up different BSc degrees, check which modules would be included during the course of the degree.

My journey as a geneticist

I grew up in Gauteng, on the West Rand, in a township called Kagiso. My early childhood was based in Kagiso and at my great-grandmother's house in rural Limpopo. I then returned to Gauteng to live with my grandmother when I started Grade R. I attended all my schooling in Krugersdorp (Monument Primary and St Ursula's School for high school) and was fortunate to attend good multiracial schools. In my matric year, I was unsure about what I wanted to study at university. I knew I did not want to do medicine anymore. I was not accepted at the three universities I applied to (although I was accepted at one for a field I was not interested in at all) and submitted a late application to the University of Limpopo, where I completed my undergraduate degree in BSc Medical Sciences. At the University of Limpopo, BSc Medical Sciences is a four-year degree, and in my honours year, I specialised in Human Genetics.

At that time, I knew I was passionate about human genetics and that I wanted to work with people. Counselling had also been something I was interested in. My honours supervisor informed me about genetic counselling, and I was immediately captivated. The seed for the field was sown then because it combined all my interests. Only two institutions in South Africa offer an MSc in Genetic Counselling (the universities of Cape Town and the Witwatersrand). Other people complete a medical sciences undergraduate degree and go into other fields in health sciences such as medicine and pharmacy.

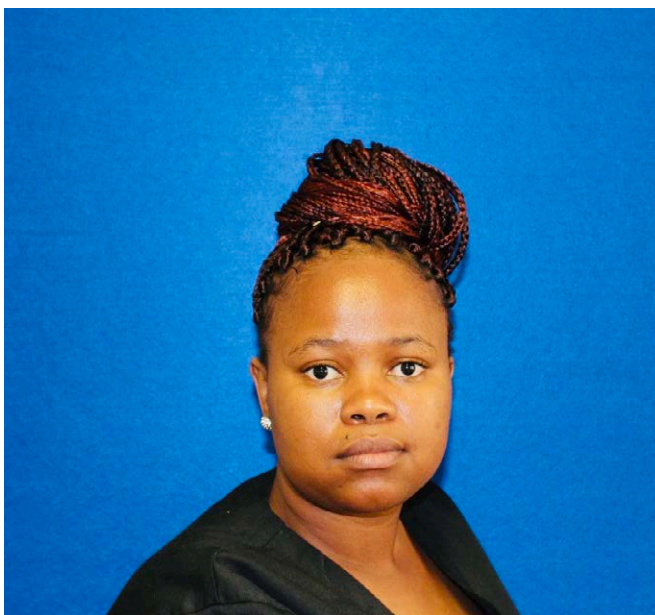
I obtained my MSc (Med) Genetic Counselling from the University of Cape Town, where I also completed my genetic counselling internship and registered with the HPCSA as an independent practitioner. Subsequently, I became the first black genetic counsellor in South Africa. Ever since I began my genetic counselling journey, I developed a passion for accessible and equitable genetic counselling services. Completing a total of six weeks in Limpopo providing genetic counselling as an intern solidified my passion for the field and the need to make it more accessible, as the majority of the country does not have access to genetic counselling services.

The lack of knowledge and understanding of genetic conditions contributes to issues of stigma, intolerance and lack of resources for those living with genetic conditions. Hence, the necessity for more clinical genetics services, especially those provided by people of colour. Since qualifying, I have been passionate about mentoring and guiding the next generation of genetic counsellors and raising awareness about the career to Black people, as it is a career one might not necessarily know about. Over the years, I have received a few awards, the most prestigious of which was being included in the *Mail & Guardian's* Top 200 list. I have also presented at national and international conferences. I am currently completing my PhD.

I am employed at Stellenbosch University as a lecturer, and I am the teaching coordinator for the unit. Along with my colleagues, I provide teaching to undergraduate students and healthcare professionals. My role includes providing clinical genetic counselling to patients and clinical teaching, which involves supervising intern and student genetic counsellors in the clinic and examining them. I enjoy my current job as I can be creative with the teaching and train others in clinical genetics while still being able to provide genetic counselling to patients.

From poor orphan to geneticist: Your background does not determine your future

**by Dr Khuthala Mnika, lecturer in human genetics at the
University of Cape Town**



Dr Khuthala Mnika

My name is Dr Khuthala Mnika, and I am an orphan. I have two sisters. My father passed away when I was four years old, and my mother passed away when I was 11

years old. At the age of 17, my sister had to take on the role of being a mother. I come from a small town in the Eastern Cape called Matatiele. When I was growing up, Matatiele did not have as many resources or access to knowledge as it does now. My village is called Tsepisong, and that's where I attended primary school. After completing Grade 9, I attended high school at Mount Hargreaves Senior Secondary School, which is located about 34 km away from home. In this school, students from well-off families would stay in the boarding house, while those who couldn't afford it would stay in the village where the school is located. I was one of the students who stayed in the village, and we were referred to as '*amagxamesi*', which simply means tenants.

When I consider the distance, it would seem feasible to travel daily and avoid renting a place, but the school is located in a village with gravel roads. Transportation was a challenge, so my family decided it was best for me to stay in the village near the school. During my high school years, I didn't face financial difficulties, perhaps because I was aware of our situation at home and didn't expect much. I took Mathematics and Science in high school, and I believe that's where my interest in genetics originated. Our Life Science teacher was very passionate about her subject. In Grade 11, we studied patterns of inheritance for plants and humans, and I could envision myself pursuing this field. At that time, I hadn't considered genetics as a career path; I had only dreamed of becoming a teacher or an electrical engineer, influenced by my environment and exposure. In Grade 12, I began thinking about my career, but I kept telling myself it was pointless as my sister couldn't afford to pay for my university education. However, a year later, a fellow student in my class told me to apply and worry about finances later.

Eventually, I applied to study Genetics at the University of the Free State. The first year did not have funding; it was difficult. Sometimes there was no food or even money to go to the university as I was staying in the township. I used to walk for about 30 minutes to campus and attend lectures on an empty stomach. In December, my sister lost her job. At that point, I thought the dream of continuing with my studies was over. Mind you, I had an outstanding fee of over R20,000. I did not receive my results for my first year as I had an outstanding fee. Some of my community members were already asking me what I was going to do as I didn't have the money to go back to university. That was sad; however, I had a dream of breaking the cycle of poverty at home. I asked around about funding or any help. I was told about social development and that I could contact the social worker and request a letter. This letter should be addressed to the university social worker, requesting assistance with fee payment.



I went to the university social worker to discuss my outstanding fees. They informed me that they don't pay outstanding fees that are more than a certain amount. I felt hopeless, realising how much I wanted to change my family's situation. The assistant social worker asked to see my results before making a final decision. Luckily, I had four distinctions, even though I had been studying for some of the exams on an empty stomach. They agreed to pay, and in my first year, I applied for NSFAS. However, I couldn't view my outcome status due to the outstanding fees. After the fees were paid, I received confirmation that my NSFAS application was successful. With the social worker's assistance, I was able to get accommodation on campus. I had NSFAS funding for the rest of my degree. I completed my degree in 2013 and registered for honours, graduating in 2014.

In 2014/2015, I worked as an intern at the Department of Education. It wasn't my dream job, but I had to work because I didn't have enough money to continue with my MSc studies. In 2015/2016, I did an internship at

the University of Cape Town in the Division of Human Genetics under the supervision of Prof. Ambroise Wonkam as part of an NRF initiative. This year was a highlight, validating my dream as I worked on a sickle cell disease project. They say hard work pays off, and I believe that God always aligns your path with situations or individuals who will help you manifest your dreams. Being assigned to Prof. Ambroise was a blessing, and I worked tirelessly, dedicating myself to go the extra mile. My hard work was acknowledged, and I received an acceptance letter to pursue my master's. I completed my master's in a year, and due to the quality of data I produced, I upgraded my master's to a PhD. During my master's and PhD, I travelled the world and presented my work in places I had never dreamed of. I won honours awards and travel awards. It was then that I realised that your background does not determine your future. People may write you off by looking at your situation, but they will never write off your hard work and God's plans. I completed my PhD in 2020.

In 2021, I worked as a research coordinator for Prof. Ambroise. During the same year, I secured a permanent position as a Senior Medical Scientist at the National Health Laboratory Service/University of the Witwatersrand. This role involved a 50/50 split between diagnostic work and research. While I was passionate about capacity building in my academic career, I found that my job was limiting my ability to focus on this area. As a result, I decided to apply for a lecturing position at the University of Cape Town, where I could fully pursue my goal. I am currently a lecturer at the University of Cape Town in the Division of Human Genetics. In this role, I convene the honours programme and serve as a co-chair of the Human Genetics postgraduate committee. My daily responsibilities include ensuring the smooth running of the programme, preparing and delivering lectures, organising assessments, supervising honours, MSc and PhD students, as well as addressing student issues and devising solutions. I am passionate about my job, and most importantly, I am living my dream.

Go bolela eng go šoma ka dikarolwaneng tša leabela? Ke mešomo efe yeo e lego gona, gomme o ba bjang rathutamahlale wa dikarolwana tša leabela? Mo tsepamiso ya mešomo ye, o tla bona gore mang le mang a ka šoma ka dikarolwana tša leabela, go sa šetšwe setlogo sa gago.

Translated into North Sotho by A/Prof. Walter Matli