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UNIVERSITY OF CALIFORNIA SAN DIEGO

Making the Invisible Visible: Skin Cancer Obfuscation in South Africa

A thesis submitted in partial satisfaction of the requirements for the degree Master of Arts

in

Global Health

by

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Committee in Charge:

Professor Claire Edington, Chair

Professor Bonnie Kaiser

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2022

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University of California San Diego

2022

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ABSTRACT OF THE THESIS

Making the Invisible Visible: Skin Cancer Obfuscation in South Africa

by

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Master of Arts in Global Health

University of California San Diego, 2022

Professor Claire Edington, Chair

Skin cancers, among the most common cancers worldwide, have rapidly increased over the last fifty years, contributing to the overall global burden of disease. In the Republic of South Africa, skin cancer rates have skyrocketed, but little to no interventions have been put in place to promote the detection of this relatively neglected disease category. Currently, there is no global consensus on how to institute the screening of skin cancers, which is further complicated by the lack of awareness on diagnosing skin cancer among darker skinned populations. Differences in skin pigmentation affect how patients inflicted with malignancies, such as Kaposi's sarcoma, Merkel cell carcinoma, and melanoma are diagnosed. The resources for skin cancer surveillance on a global level rely on three main mechanisms: the Global Initiative for Cancer Registry

Development, the Skin Cancer Foundation, and AIM at Melanoma. While these initiatives work to educate the public on the importance of skin cancer prevention, these organizations lack the necessary tools to expand healthcare resources in skin cancer surveillance. This thesis examines how skin cancer has been rendered as invisible in South Africa at three different levels: the impact of skin cancer on the body, within national public health infrastructures, and global policies put in place for the surveillance and monitoring for this disease. Broadening options for prevention and treatment for skin cancer among more diverse populations than those currently reflected in dermatology textbooks needs to be implemented for further education and screening purposes.

1. Introduction

1.1 Neglect of Oncology in South Africa

According to the World Health Organization (WHO), the incidence rate of skin cancers has increased over the past decade with a total between two and three million non-melanoma diagnoses, as well as approximately 132,000 malignant melanomas occurring globally every year (*World Health Organization, 2019*). The Cancer Association of South Africa (CANSA) reports that skin cancer is the most common cancer found throughout the provinces of Northern Cape, Eastern Cape, Western Cape, North West, Gauteng, KwaZulu Natal, Mpumalanga, Free State, and Limpopo (*CANSA, 2022*). The morphologies of the malignancies differ in population size, composition, and experience different levels of solar ultraviolet radiation. These statistics also almost certainly suffer from under-reporting. The methods of skin cancer surveillance estimation are country specific, and the quality of national estimates are all reliant on health care coverage and accuracy of the indicated diagnoses in a given country. Moreover, in the Republic of South Africa, where nearly a quarter of all adults have been diagnosed with HIV, cancer patients also suffer from virus-associated cancers that are facilitated by HIV-related immunosuppression (Hu et al., 2011). Before antiretroviral treatments (ARVs) were available, many of South Africa's cancer patients died from AIDS-related infections, but with a form of cancer that was undiagnosed. As a result, the AIDS epidemic in South Africa overshadowed efforts to diagnosing skin cancers among black and colored individuals, which set a pattern of inattention and invisibility into the future of public health responses (Benton, 2015).

The association of cancer with the “epidemiological transition” of the West has resulted in a serious lack of cancer registries, as well as diagnostic and screening abilities throughout the region (Livingston, 2012). The technoscientific shift in the Global North towards cancer

detection was viewed as irrelevant for African contexts, where interest and resources gravitated towards large-scale epidemic and infectious diseases like malaria and HIV/AIDS (Greaves, 2014). For instance, the public health system in the Republic of South Africa failed to fit cancer treatments into the politics of triage since the International Agency for Research on Cancer heavily focused on infectious pathogens, population control, and genetic research (Khazaei et al., 2019). Rather than invest in hollowed out African health care systems, the push for technological quick fixes has resulted in the relative invisibility of cancer. Moreover, in South Africa, as of 2022, there are currently 220 dermatologists registered by the Health Professions Council of South Africa, with a ratio of 1 dermatologist: 216,000 people and most practicing in the private urban areas (Makaula et al., 2022). The lack of specialists in rural areas especially enforces the vulnerability of these populations to skin cancer, including premature deaths, lost productivity due to years of life lost and the social, economic, and psychological impacts on communities and families.

Even though viruses and cancers (including skin cancers) are often co-indicated, such as the case of Kaposi's sarcoma and HIV, global cancer disparities were not on global health agendas and development until 2010 (Farmer et al., 2010). Cancer was not seen as a problem that could be feasibly addressed by the global health field, much in the same way that HIV was once thought to be untreatable with antiretroviral treatments because they were too complicated and expensive to be offered to resource-poor regions that would likely not follow the regimen. Recently explored efforts, through the work of Partners in Health and Dr. Paul Farmer, include establishing the Global Task Force on Expanded Access to Cancer Care and Control in Developing Countries to break the view among the global health world to take cancer disparities seriously (Farmer et al., 2010). By challenging the public health community's assumption that

cancers will remain untreated in poor countries, there has been a push toward health system strengthening (Farmer et al., 2010). Targeting the deployment of primary and secondary caregivers, use of off-patent drugs, and application of regional and global mechanisms for financing resource-constrained countries are all applicable to close the gap between developed and developing countries in cancer survival. Acknowledging the scale-up work that Partners in Health has contributed to catalyze the expansion of cancer care, control, and prevention among low-income countries is necessary to understand how neither care nor prevention can be neglected. The time has come in the global health field to challenge and disprove the widespread assumption that cancer will remain untreated in developing countries (Farmer et al., 2010). However, it is still apparent that strides need to be taken to focus on the growing undetected burden of skin cancer among darker skinned populations in South Africa to ensure equal access to care for this subsided population.

Neglect thus manifests itself in the invisibility of groups most affected by a particular disease, as well as the socioeconomic conditions that produce cycles of harm and vulnerability at the international level of health policies (Nunes, 2016). In other words, it is imperative to recognize that neglect of skin cancer is shaped by biological, social, cultural, and political complex patterns that both shape and may undermine the efforts of global health mechanisms. This thesis will utilize the social epidemiological model to view how skin cancer has been rendered as invisible in the realm of global health through the levels of the body, public health infrastructure, and global obscurity. The social ecological model was developed by the Centers for Disease Control and Prevention (CDC) to model the factors affecting health that is grounded in the levels of the individual, the interpersonal relationships, the community, and societal influences to develop approaches to disease prevention and health promotion (Sallis et al. 2008).

The first level of this model establishes how the individual biology and personal history factors increase the likelihood of becoming susceptible to disease with some of these factors including age, education, and income that shape the overall health status and emotional well-being of the individual. Next, interpersonal relationships include the individual's closest societal circle, such as friends, partners, and family members who affect the person's behavior and contributes to their health engaging experiences. The third level builds on how the surrounding settings in which people engage with, such as schools, workplaces, and neighborhoods seek on identifying characteristics that affect health strategies among the physical and social environment. Finally, the fourth level of this model provides insight on broad societal factors that favor or impair health and includes sociocultural norms, as well as economic, educational, and social policies that outline inequalities between groups (Krug et al. 2002). This framework identifies and integrates the social and structural determinants of health and may help us to better understand the local and global challenges faced with pursuing the diagnosis and treatment of skin cancer. In South Africa, the theme of neglect cultivated through the means of lasting historical health disparities has rendered public health efforts particularly vulnerable to the carcinogenic fallout of global capital and has hindered progression in the field of oncology.

At the same time, the concept of neglect within the social ecological model is also essential for drawing attention to how there are multiple possible routes available for achieving successful disease control in different socio-ecological settings (Michael & Madon, 2017). Societal efforts need to address an approach for policymaking and global health governance that is incremental and adaptive to the levels of the individual and local community for change, management, and progress to the obscurity seen throughout the dismantled health care systems and vulnerability of black and colored individuals to skin cancer throughout South Africa.

1.2 Development of Health Care for Dark Skinned Populations in South Africa

To effectively understand the historical development of medical care for Black and Colored South Africans, it is critical to explore how systemic bias in the culture of medicine and scientific investigation favors powerful demographic populations and disregards non-white populations in South Africa. Racial and gender discrimination, the migrant labor system, the destruction of family life, vast income inequalities, and extreme violence have all formed part of South Africa's past that has affected health and health services today (Coovadia et al., 2009). The country's infrastructure was molded by the violence subjugation of indigenous people, appropriation of their land and resources, as well as the use of unjust laws to force black people to work for low wages to generate wealth for the white minority (Parle & Noble, 2014). During the time of Dutch and British colonialism from 1652 to 1910, traditional healers, European trained doctors in Western biomedicine practices, and missionaries offered a mix of health care resources. Towards the early nineteenth century, medically trained physicians were only catering to White South Africans since indigenous and traditional healers were marginalized, thus Black and Colored South Africans received orthodox medical care from missionaries. Violence and warfare were used to create dominance between settler powers and silenced the pushback from the indigenous population, which became a major determinant of subsequent disease patterns given the accessible medical care that was offered among non-white populations. From the period of segregation from 1910 to 1948, the overall ratio of physicians for White South Africans was one doctor for 308 white people compared to one doctor for 22,000 non-white people living in the reserves of South Africa (Rispel et al., 1996). These reserves led to the creation of overcrowded, unsanitary hostels and slums infested with the spread of disease in the country.

The apartheid years from 1948 to 1994 saw the development of Bantustans, which was a territory that the National Party administration of South Africa set aside for black inhabitants to prevent them from living in the urban areas and aimed to move every Black or Colored South African to their respective ethnic homeland in order to have South Africa at the hands of the White population (Naylor, 1998). The system put in place was based on racial classification from birth of all South Africans into European (White), Asian (Indian), colored, or Bantu (black) with the placement of white people at its apex. This classification was established and dictated where a person could live, work, go to school, whom they could marry, resources allocated to their education, and health care. The Bantustans acted separately from each other and were run by non-profit, missionary hospitals that had underdeveloped primary level services and lacked professionally trained medical professionals. By the early 1980s, 62 percent of general doctors and 66 percent of specialists were working in the private public health sector, which was not extended to individuals living within the Bantustans (Coovadia et al., 2009). To illustrate the extent of this stark marginalization, less than 10 percent of the entire South African population were members of private sector, yet 46 percent of all health-care expenditure was attributable to private sector health care in order for patients to be seen by specialists. The average amount of money spent for non-white populations in the Bantustans was less than R1300 (\$160 USD) per person for government primary care and hospital services (Parle & Noble, 2014). Clearly, the severe health deficiencies and changing patterns of health services during this time significantly impacted Black and Colored South Africans seeking out proper medical care amidst a marginalized social hierarchy for health care.

Since 1994 and the end of apartheid, the health system of South Africa faced massive challenges and is still faced with challenges for transforming institutions and promoting equity in

development (Khan et al. 2013). Health services in the Bantustans were systemically underfunded and the 1997 Health Act perpetuated the fragmentation with curative services being a provincial responsibility, which meant that these resource-poor environments had to carry out diagnosis and treatment practices with limited access to modern medical technologies (Parle & Noble, 2014). The fourteen health administrations established by the Bantustans provinces, alongside the ones outside the Bantustans, were consolidated into one national and nine provincial health departments with each province having local community health workers, as well as clinics. Primary health care was made the corner stone of health policy and became desegregated in order to address the disempowerment, discrimination, and underdevelopment that occurred over centuries to the weakened health care system in South Africa. The public health system considers Black and Colored South Africans residing in rural regions an important priority in order to redress historical inequities and provide essential care to these disadvantaged minority class groups (Kon & Lackan, 2008). Despite some efforts to redistribute resources across the country in response to different needs, the ability to provide equitable care has been constrained by inadequate human resource capacity, poor stewardship, leadership, and management, as well as the increased stress on the public health system caused by the HIV/AIDS epidemic that restricted spending in the public health sector (Coovadia et al., 2009). Currently, 70 percent of private health care hospitals only occupy three of the country's nine provinces – Eastern Cape, Free State, and Gauteng – and are located in regions that have the highest percentage of White South Africans in the country. Structural barriers dating from the colonial period – including the enforced geographic separation of populations according to race and disinvestment in rural areas – continue to impede Black and Colored South Africans from receiving equitable health access to this day.

1.3 Colonial Medicine Impacts

It is essential to consider how diseases in the Global South are formulated through idioms of distress that are situated in the legacies of colonialism and colonial public health medicine. South African medical historians have adopted a dual framework of colonial and underdevelopment theories that describe how the racist medical policies of colonial government have shaped the foundations of modern Western biomedicine (Deacon, 2001). Specifically, they argue that colonial medicine in South Africa needs to be understood from the perspective of racialization within the medical profession, discrimination in medical practices, and racism in medical theory. For example, the number of black patients attended to by colonial physicians was stark in comparison with their white counterparts, as they were only allowed to Western hospitals for a few specific ailments that overall delayed their course in treatment (Khan et al. 2013). Not only were colonial physicians located great distances between farms and settlements in South Africa, but doctor-patient relationships were strained because of systemized discrimination practices taken place in missionary hospitals (Livingston, 2012). Due to these factors, the emergence of colonial medicine was prompted by institutional factors that left an indelible mark on dynamics between racism and Western medicine that still inflict diagnostic practices today in South Africa.

The use of indigenous medicine by South African populations helped to mitigate the harms of colonial Western medical practice. These practices persist today. Medical racism forced exclusion from biomedical treatment, thus making the health care needs of Black and Colored South Africans invisible and neglected. One way this population coped with the inaccessibility to the treatment of skin cancers was through indigenous healing methods.

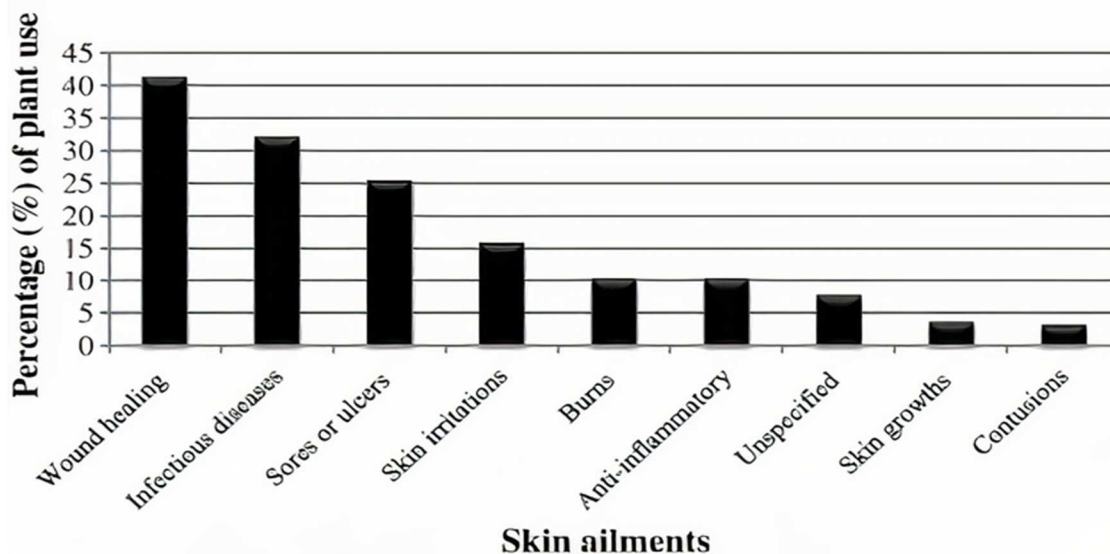


Figure 1. Frequency of use (%) of southern African medicinal plants for the treatment of various skin ailments.

In the realm of skin cancer, for instance, one form of indigenous healing practice for skin cancers is the usage of medicinal plants to treat cancer morphologies on the skin, which can pertain to sores, ulcers, irritations, burns, as well as growths on the affected area. When looking into ethnobotanical literature, over 100 plant species have been identified when considering the traditional dermatological medicinal plant use in southern Africa, which can be seen in Figure 1 and the application of various types of plants (Mahomoodally, 2013). For example, the leaves of the bittergousblom plant are commonly used to make a leaf paste that is applied as a tincture to wounds and sores of Kaposi’s sarcoma patients. Also, traditional healers use the roots and bark of a buffalo-thorn tree as a decoction that is applied topically for Merkel cell carcinoma patients dealing with skin inflammation around the area of the nodule breaking through the skin (Mahomoodally, 2013). Additionally, the Cape aloe plant is harvested for its leaf sap that is then applied topically as a dressing for melanoma patients (Mabona, 2013).

Clearly, the biodiversity in the resources available to treat skin ailments in South Africa shows the adaptability individuals in these regions have resorted to due to an overall lack of medical service providers. As a contribution to the on-going search for alternative, available, and affordable treatments to skin cancer infections in South Africa, it is necessary to advocate intense scientific research on plants used for skin diseases among sociocultural applications (Mabona, 2013). These sufficient healing methods have an effective response in the management of skin cancers given, but darker skinned populations should not have to resort to these practices due to structural barriers in attaining equitable healthcare. The use of plant combinations to treat skin cancers needs to be addressed, as well as more attention needs to be brought towards the combination of medicinal plants with conventional biomedicines that treat various skin cancer morphologies (Mabona, 2013). While some individuals of this populations would prefer to seek out traditional, indigenous healers to aid in their medical diagnosis, there should not be an overall pushback given the colonial medicine impacts stemming from the past. The scientific validation on the efficacy of integrating Western biomedicine with the use of medicinal plants from traditional healers can lead to new directives and insight for integrating indigenous treatments to mainstream medicine (Mabona, 2013). Overall, there should not be a structural exclusion from modern medicine, but the push towards including indigenous healing methods instilled by Black and Colored South Africans into the contexts of Western colonial medicine regimens are crucial to closing the racially driven gap in biomedical treatments. Moving forward, by utilizing African medicinal plants of dermatological relevance, this incorporation of traditional healing practices rooted in ethnomedicine among clinics in South Africa can be seen as a pushback to Western biomedical practices, yet allows for new grounds to be explored in the biomedical field to accept traditional healing methods among contemporary treatments.

1.4 Vulnerability of Black and Colored Bodies to Skin Cancer

According to the 2017 South Africa Census, 56.52 million individuals, have been categorized into four main racial groups, currently live in the nine provinces that constitute South Africa (*The World Bank, 2021*). As per Figure 2, 80.8 percent declared themselves to be Black African while 7.9 percent were shown as White, 8.7 percent colored, and 2.6 percent Indian or Asian. 89.5 percent of this population or 50.59 million people residing in this country have darker skin pigmentation, which means that there is a higher concentration of melanin among these individuals. Although having more melanin makes the skin less vulnerable to sun damage due to it being a biological effector of ultraviolet radiation damage, it also makes many people think they cannot get skin cancer, which is not true (Greaves, 2014). Published medical literature has established a racial disparity in skin cancers, at the time of diagnosis, which has been attributed in part to delayed detection in black and colored bodies compared to their white counterparts given their accessibility to private health care systems (Gupta et al., 2016). The overall lack of physician knowledge about clinical presentations of skin cancer in black and colored bodies, in addition to misperceptions that skin cancers only occur in sun-exposed areas all contribute to diagnostic delay (Lester et al., 2019). Even though the National Cancer Registry reports that skin cancer incidence is lower among Black Africans in South Africa compared to White South Africans, the type of skin cancer and anatomic site occurrence differs significantly between the two population groups. For instance, skin cancer diagnoses usually occur on the shoulders, hip, and bottom of feet in Black Africans compared with the head and torso regions in White South Africans (Gupta et al., 2016). In terms of the terminology of health disparities seen in the diagnosing of skin cancers among Black and Colored South Africans, while the incidence is lower in this population group, these individuals are treated less frequently for their cancers,

South Africa's population in 2017

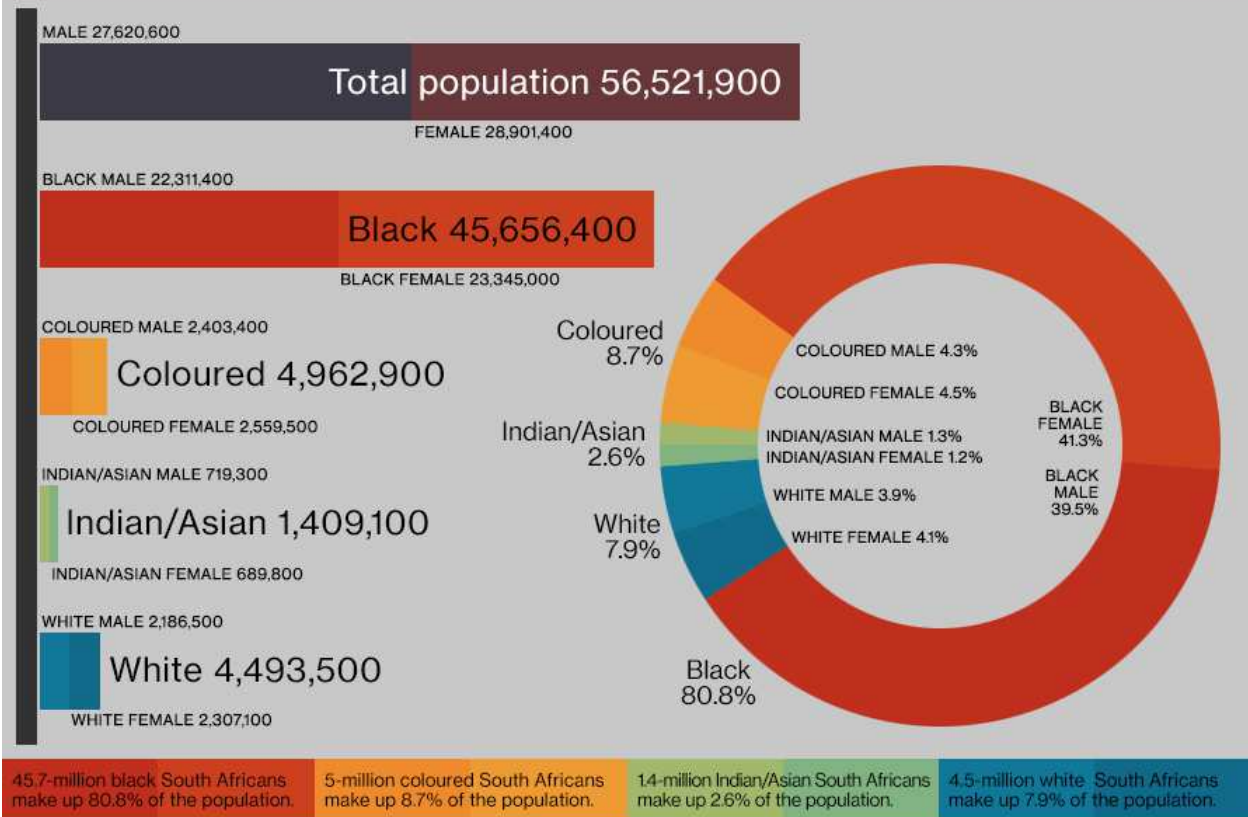


Figure 2. Demographic distribution of South Africa's population in 2017.

have a higher fatality rate once diagnosed, and present their morphologies at a worse prognosis stage compared to White South Africans. The medical ambiguity surrounding clinical knowledge concerning the risks and prevention of skin cancer in darker skinned populations poses the need for understanding variations in color among skin lesions (Agbai et al., 2014). Contributing factors related to delayed diagnosis seen among skin cancers in black and colored skin pertain to how there is a low index of suspicion of skin cancers among healthcare providers given the suboptimal access to care in these regions (Culp & Lunsford, 2019). The exact rates of death after diagnosis for darker skinned populations is unable to be obtained in this instance since limited data has been supplied by the country of South Africa, which is why there is a concern for improved tactics in monitoring and screening at the core of the public health

infrastructure. For example, as compared to more than 80 percent of White South Africans, only 56 percent of Black South Africans are diagnosed with a localized stage of skin cancer, which shows how nonwhite racial groups have skin cancer morphologies diagnosed at a later stage (Greaves, 2014). In fact, according to the American Academy of Dermatology, 25 percent of malignant skin cancers in individuals with darker skin are diagnosed after the cancer has already spread to the surrounding lymph nodes (*American Academy of Dermatology*, 2022).

The relatively sparse literature on the status of skin cancer control throughout predominantly darker skinned South African provinces paints a picture of the inadequate skin cancer planning and control, low public awareness, and comorbidity with infectious diseases propagated by HIV/AIDS (Wright, 2018). As established, data cannot be generated on the controlling of skin cancer within black and colored individuals simply because this research has not been targeted on a global scale and information has only been captured on interview with South African dermatologists. One particular problem concerns the training of dermatologists working in the country. Medical students have few opportunities to see skin cancer examples in darker skinned populations during their short dermatology clerkships, or across much of their training which affords limited opportunities to train and assess medical students' diagnostic skills in black and colored bodies (Wang et al., 2015). For example, a cross-sectional study carried out at the Faculty of Medicine and Health Sciences of Stellenbosch University in South Africa assessed final phase medical students (in their final 18 months of training) in properly diagnosis acral melanoma that is specifically seen in dark skinned populations (Eksteen et al., 2021). This consisted of 101 skin cancer patients from all various Fitzpatrick phototypes being presented to the medical students with pictures provided to aid in the diagnostic process. Prior to the study, this group of medical students reported awareness that people with pigmented skin can develop

skin cancer and 70 percent knew that the most common sites of melanoma development in black and colored skin tones. Yet, the study results concluded that only 7.9 percent of the medical students diagnosed the melanomas correctly and misdiagnosed the majority of black and colored skin lesions participants with having benign skin cancers (Eksteen et al., 2021). This study suggests that a clear teaching strategy is required to inform future doctors in South Africa about diagnosing skin cancers in darker skinned populations, as well as the need for producing an increased number of dermatologists among the public and private health sectors.

As it stands, if efforts are made to increase skin cancer prevention in South Africa and improve earlier detection rates, the 220 dermatologists residing in the country would face an enormous burden while practicing in the public and private sectors (Lubuzo et al., 2022). The complexity of preventing skin cancers in South Africa among multiracial populations extends beyond difficulties in training to the representativeness of patient populations in current skin cancer research. Dermatologic oncology clinical trials are critical for developing novel and safe tools in order to use in the prevention, diagnosis, screening, and treatment mechanisms for skin cancer. In cancer research from the Global Center for Research on Genomics and Global Health study, only 2 percent of participants involved in genomic studies being of African descent and only 0.06 percent of analyzed data from the BioBank of the United Kingdom contains people of African ancestry (Dalnoki-Veress & Pomper, 2016). The lack of oncology data among individuals of African descent further contributes to the discrepancies in accurately monitoring skin cancers throughout South Africa. Additionally, the International Skin Imaging Foundation (ISIC) does not have any pictures of black or brown skin cancer morphologies for dermatologists to differentiate lesions on these skin tones (Dr. Sarah Coates, Interview, February 28th, 2022).

The systematic neglect of skin cancer within the realm of dermatology was described poignantly by Dr. Dagmar Whitaker at the European Association of Dermato Oncology conference in 2018,

“Skin cancer in black skin is ignored and not really talked about. People are still under the impression that it doesn’t exist or if it does exist it gets diagnosed late which usually means that the patients carry a much worse prognosis than their Caucasian counterparts. The patient awareness is definitely very much in its baby steps and by the time that the patients present to our clinic, which is a tertiary referral clinic, meaning the patient would go to a nursing station, then to a day hospital then to a provincial hospital and then end up at the university hospital, but by the time that they arrive at the university they usually often present with metastatic disease. Skin cancer in black skin or dark skin does not necessarily follow the same genetic patterns as in Caucasian skin. The risk factors are different and not enough resources are channeled in that particular problem,” (Dr. Dagmar Whitaker, Interview, November 20th, 2018).

By acknowledging this statement from Dr. Whittaker, it is apparent that black and colored skin is being ignored and neglected in South Africa. The explanation given on patient awareness to detecting skin cancers shows that monitoring is still at an early stage because not enough research has been done in the field. Even in countries with large financial resources, socioeconomic circumstances make it difficult to acquire newer treatments made available in the dermatological oncology field or having access to treatment methodologies within developing countries. Having Dr. Whittaker actively call out a skin cancer patient’s trajectory to receiving care in South Africa brings attention to this subject matter and can inspire research to be carried out among public and private institutions in the country. Encouraging individuals who partake in academic medicine can lead to possible therapeutic approaches being administered into the public domain for the treatment of skin cancers.

However, there are currently no interventions within South Africa’s two-tiered health system to educate physicians about skin lesions in darker skin populations nor public awareness campaigns to inform individuals about this pressing public health issue. Despite the rising incidence and mortality rates in South Africa for skin cancer with about 20,000 cases every year and 700 deaths – note this is the only statistic concerning skin cancer and it was generated in

2010 – it is clear that skin cancer has been given a low priority in the research field and in health care services throughout public and private hospitals, as well as points of care in the country (CANSA, 2010). Within South Africa, there are differences in how skin cancer presents across skin tones, and this is an under-appreciated phenomenon that presents a major health burden for darker skinned populations. Thus, these examples showcase how socioeconomic circumstances and biomedical institutions need to focus on increasing skin cancer awareness and treatment protocols for individuals of darker skin types. In short, there is a need for academic medicine to study this area of importance in the hopes that this can lead to better therapeutic outcomes in South Africa.

2. Community Treatment Interventions

2.1 Lack of Medical Access in South Africa

At the moment, South Africa has a two-tiered healthcare system that is divided into public and private sectors, which makes access to quality care highly unequal. The public sector is state-funded and caters to approximately 80 percent of the population. On the other hand, the private sector is largely funded through individual contributions to medical aid schemes or health insurance policies, and serves about 20 percent of the population (Maphumulo et al., 2019). Due to this, the majority of South Africans are unable to afford the exorbitant cost of private healthcare, as the public sector is extremely underfunded. When South Africa's health services were officially desegregated in 1988, the federal government further upheld health inequities by providing the former mainly white provinces twice as much capital for healthcare spending in the private sector (Mika, 2021). Given that over 50 percent of the population lives below the poverty line, publicly-funded healthcare is not allocated based on need, but rather determined by each province's share of the population (Rensburg, 2021). In this case, that means the funding for

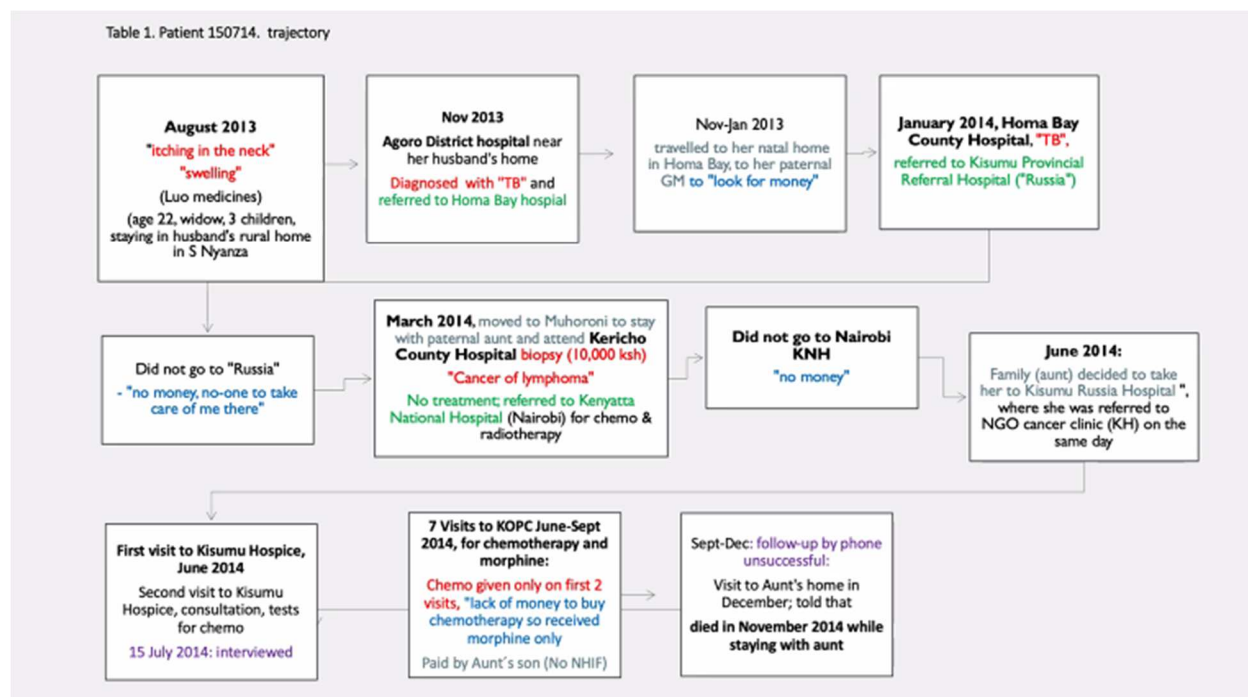


Figure 3. Flow chart of treatment trajectory for a skin cancer patient that spread to malignant melanoma in South Africa by Dr. Ruth Jane Prince.

provinces of Western and Eastern Cape would be roughly the same, despite there being a stark difference in the population demographics of both regions. What is needed is to move services out of private funded facilities towards the public system and engagement with community health workers in order to ensure more equitable health practices. In South Africa alone, there are only three cancer treatment facilities services offered to the public (*Cancer Care South Africa, 2022*). The Netcare Hospital Group owns the three facilities – Life Healthcare, Nelson Mandela Academic Hospital, and Life Kingsbury Hospital – and are located in Johannesburg, Mthatha, and Cape Town, respectively (*Cancer Care South Africa, 2022*). Considering that the only health facilities conducting oncology care in South Africa are all located among the private sector located in provinces with the highest concentration of white populations, improvements need to be made to strengthen the health infrastructure by expanding these services into the public sector. By being more responsive at the levels of care where the

majority of the population are likely to access it, this would ease the burden on health clinics for diagnosing people at early stages of disease and infection, as in the instance of skin cancer.

While it is important to understand neglect among the public and private health sectors in South Africa, one must also take into consideration the infrastructural elements a cancer patient must take to attain a diagnosis and care. In terms of living below the poverty line in South Africa, which consist of predominantly of black and colored individuals, approximately 28.2 million of the population live in underdeveloped areas that make attaining a prognosis, diagnosis, and treatment difficult (Mika, 2021). When considering the spatial epidemiology of South Africa, roads, railways, electricity grids, transportation methods, and telecommunication systems all have historical roots in colonial conquest and later colonial development initiatives (Edwards & Greeff, 2017). In other words, socioeconomic status, race, insurance status, regionalization, and spatial epidemiology are associated with limited access to care among Black and Colored South Africans, as they experience the greatest structural barriers to healthcare attainability.

This flowchart (Figure 2) by Dr. Ruth Jane Prince, a social anthropologist at Oxford University, explains the barriers faced to receiving accessible oncology care among Black South Africans who reside in the homelands. It shows the vast distances and high travel costs, especially for black and colored individuals in rural areas, as well as high out-of-pocket payments for care as a cancer and skin cancer patient in South Africa (Dr. Ruth Jane Prince, Conference, February 8th, 2022). Many cancer patients would only visit a tertiary hospital after being referred by community health workers due to poverty, which meant that medical professionals would be allowed to administer two chemotherapy sessions in one session as a remedy for inaccessible, unaffordable health services (Livingston, 2012). This figure shows the trajectory of a patient who was only referred to a dermatologist and radiologist through a word-

of-mouth based community. The average time to receive a diagnosis from a healthcare professional in South Africa is approximately three to five months under the National Hospital Insurance Fund (Dr. Ruth Jane Prince, 2022).

If a black or colored individual presents a delayed onset of malignant cancer or skin cancer and is uninsured, the average time it takes them to be referred to a private sector physician is about a year; meanwhile, it takes White South Africans less than three months to secure an appointment within a private hospital and receive surgery, chemotherapy, and radiation therapy care (Dr. Ruth Jane Prince, 2022). As a result, many of these treatment methodologies for dermatological oncology patients are improved by increased social networks or a family member that has health insurance through education systems in South Africa (Livingston, 2012). From the perspective of oncology measures, South Africa only has a small handful of specialists in private sector hospitals who have the ability to treat cancer patients with expensive technology interventions, such as chemotherapy, radiation therapies, or extensive surgical measures. Ultimately, delineating access barriers is a first step towards reversing health inequities and is a prerequisite for implementing diagnostic and screening measures among darker skinned individuals inflicted with skin cancer.

2.2 Data Collection for Literature Review

Before assessing the skin cancer epidemiology associated among darker skinned populations in South Africa, it is critical to take into consideration how the data for the literature review was compiled. Consequently, it was quite difficult to gather published literature on this topic of skin cancer for Black and Colored individuals in South Africa. Very minimal data has been produced in the field of global health, which is why the purpose of this work sheds light on what needs to be done in the global health field, as well as at a community and individual level.

An initial database search was conducted through the National Institutes of Health (NIH) Fogarty International Center. The NIH Report generated through the key search terms of “Skin Cancer South Africa” produced no records found matching the search criteria. After breaking the NIH Report into keywords found amongst the projects and publications for the words used in search, no reports were published, and it was asked to alter the query and try again within the search bar. Therefore, this led to looking into the National Library of Medicine (NCBI), where most of the literature compiled for this research was compiled. NCBI mainly consisted of journals and publications focused on skin cancer occurrences among white skin with documentations admitting they did not research Black and Colored South Africans. Therefore, incidence reports for each skin cancer discussed – Kaposi’s sarcoma, Merkel cell carcinoma, and malignant melanoma – may not have accurate incidence, morbidity, and mortality rates calculated. The data extracted from the majority of the publications in NCBI do not contain specified detection rates for darker skinned populations, which is a pertinent issue in the global public health domain. After looking into NCBI, I turned to the Latin American and Caribbean Health Sciences Literature (LILACS) database in order to see if research had been produced among other developing countries on this global health disparity. LILACS only contained two studies published, but the first one pertained to a journal on Kaposi’s sarcoma that was produced in Spain looking into the biological mechanisms of this skin cancer in Sub-Saharan Africa and not South Africa as its own standing country. Additionally, the other report in the database investigated Hodgkin’s lymphoma for rural populations in Central Africa and Asia, again not specifically South Africa and pertaining to darker skinned populations.

With minimal data composed through LILACS, the Scientific Electronic Library Online (SciELO) was explored to obtain literature for this topic of skin cancer malignancies among

Black and Colored South Africans. However, out of the entire database of published journals, including looking into South African collections, only six published studies could be located. Subsequently, four of the published works promoted sun awareness as the only public health intervention seen in South Africa regarding skin cancer for malignant melanoma and mainly targeted White South Africans. Likewise, one of the journals concerned living with albinism in South Africa and the challenges of maintaining healthy skin given the high indexes of ultraviolet radiation year-round. However, one publication contained appropriate information to malignant melanoma among darker skinned populations in South Africa and was applied in this literature review. From here, the Wiley Online Library database was consulted to search publications, journals, reference works, and online books regarding the topic at hand. The literature in this database ultimately consisted of published articles before 2000 and mainly in the early 2010s looking into basal cell carcinoma. While collecting and finding references that contained skin cancer epidemiology information, as well as historical developments in public health infrastructures for Black and Colored South Africans, were integral for the purpose of this research, many of the publications were outdated. Due to this, the information gathered further compels the necessary point of this thesis, which is to bring skin cancers among darker skinned populations out of obscurity and to the forefront of global health regimens. Therefore, two key interviews were conducted to gain more information on skin cancer lesions among Black and Colored South Africans and were to search for published literature on this opportune agenda. The first was conducted with Dr. Sarah Coates from University of California, San Francisco Dermatology who worked on Kaposi's sarcoma cases in Uganda addressed similar matters during her GloCal Fellowship. Finally, Dr. Julius Okuku from the CDC South African branch aided in offering publications produced in South African pertaining to this literature review.

2.2 Epidemiology of Skin Cancer Morphologies

In order to address skin cancer awareness among black and colored bodies, a holistic approach will be needed. This means that a comprehensive analysis between the racial population groups in South Africa must be taken into consideration. The three most common types of skin cancers are basal cell carcinoma (BCC), squamous cell carcinoma (SCC), and malignant melanoma among White South Africans (de Wet et al., 2020). On a global scale, South Africa has the second highest incidence of skin cancer in the world after Australia, but this

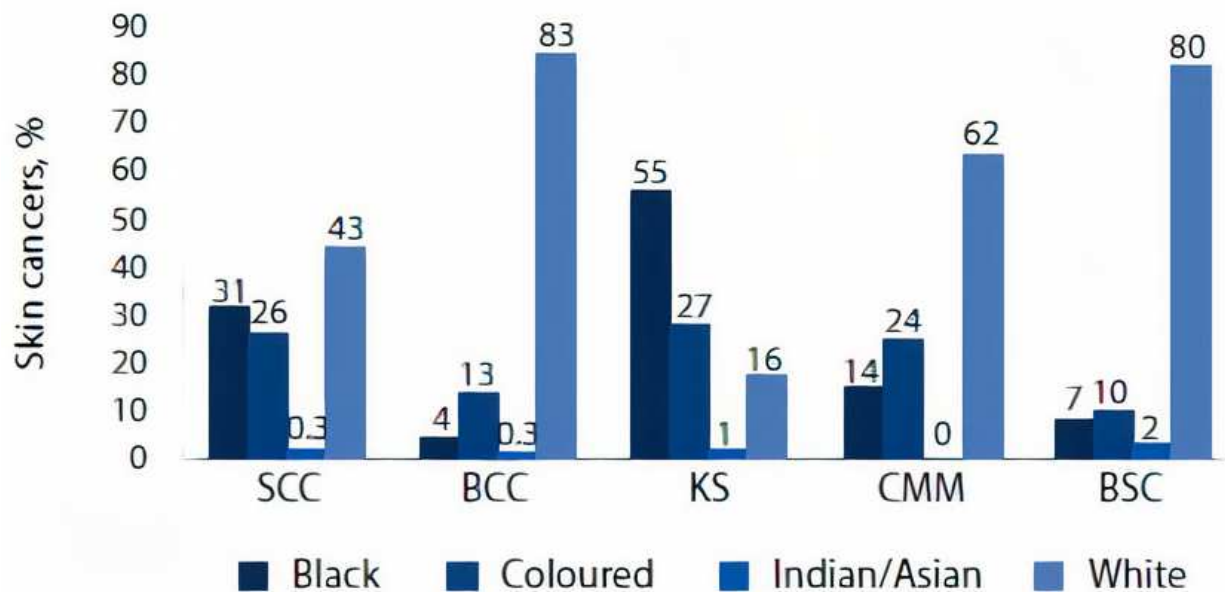


Figure 4. Skin cancer distribution by population group in South Africa by Dr. Katherine York.

country does not mirror the most common types of skin cancers among black and colored bodies (York et al., 2017). As per Figure 4, the only skin cancers generally recognized by practitioners in the field are squamous cell carcinoma (SCC), basal cell carcinoma (BCC), Kaposi's sarcoma (KS), cutaneous malignant melanoma (CMM), and basosquamous carcinoma (BSC). Emphasized on this figure, as of 2017, there is one of the highest incidences of malignant melanoma with reports as high as 62 per 100,000 population among the white population due to the year-round high ambient solar ultraviolet radiation and latitude (York et al., 2017).

Additionally, White South Africans account for 83 percent and 80 percent of basal cell carcinomas and basal squamous carcinomas, respectively. While these statistics give rise to necessary pathology concerns among white populations presenting with skin types of I, II, or III on the Fitzpatrick phototype classification scale, White South Africans constitute 84 percent of private sector patients and are able to treat these non-invasive pathologies in a timely manner (Sommers et al., 2019). Moreover, the remaining 16 percent of the white population in South Africa who engage with the public sector are able to effectively seek out private physicians given their social status to pay out-of-pocket to receive the adequate treatment needed for their skin cancers (York et al., 2017). Skin cancer care disparities are thus manifested through how black and colored populations experience differentiated skin cancers that have poorer prognosis rates and presenting the tumor at metastasis during the time of diagnosis (Sommers et al., 2019). Additionally, black and colored populations have a higher risk of developing skin cancer if they are already positive for the human immunodeficiency virus (HIV).

Currently, the estimated HIV prevalence rate in South Africa is approximately 19.2 percent of the total population, with Black and Colored South Africans having a prevalence rate of 17 percent compared to 0.3 percent among their white counterparts. As persistent infection with HIV leads to a reduction in circulating CD4+ T-lymphocytes, immunodeficiency, opportunistic infections, and eventually AIDS, there is the potential for an increased risk of skin cancer development in HIV-infected individuals throughout the country (Okoye & Picker, 2013). Among individuals in South Africa who have a darker skin pigmentation, there is a growing endemic of undiagnosed Kaposi's sarcoma (KS), Merkel cell carcinoma, and malignant melanoma clouded with comorbidity rates of being undiagnosed with HIV/AIDS. Based on a key terms database search among the National Library of Medicine, Scientific Electronic Library

Online, and the Cochrane Library for these malignancies, there are no current reports accurately assessing the weight of this issue, which presents an issue with gathering outdated data that does not reflect the current burden these skin cancers hold in South Africa. With the growth of the HIV/AIDS epidemic, the clinical severity, incidence, and mortality of skin cancers have increased significantly, thus having a profound impact in South Africa (Guedes et al., 2008). A critical understanding of the epidemiology for Kaposi's sarcoma, Merkel cell carcinoma, and malignant melanoma is obscured and therefore needs to be brought to light.

To begin, Kaposi's sarcoma is a malignant neoplasm, also known as an abnormal growth of tissue, located on the body, that is caused by infection with Kaposi's sarcoma associated herpes virus (KSHV) and forms in the lining of blood and lymph vessels (Hu et al., 2011). The tumors of Kaposi's sarcoma typically appear as purple hued spots on the legs, feet or face; lesions can also be found in the genital area, mouth or lymph nodes. Prior to the 1980s, there was little clinical interest in Kaposi's sarcoma, which was initially thought to be an indolent tumor that had a relatively slow clinical progression (Amerson et al., 2016). However, the emergence of the HIV/AIDS epidemic in the United States, and then in South Africa, led to this skin cancer being regarded as an AIDS defining malignancy and is now known as one of the most common cancers amongst black and colored bodies in the country. With South Africa accounting for 70 percent of the global burden of HIV infection, Kaposi's sarcoma has been described due to coinfection with HIV and KSHV among men and older people under classical conditions. Since the introduction of antiretroviral therapy (ART) to manage HIV/AIDS related conditions, including the epidemic of Kaposi's sarcoma, clinical outcomes have vastly improved with a combination of ART and chemotherapy (Schneider & Dittmer, 2017). However, South Africa's burden of HIV, late rollout of ART, socioeconomic issues, and intervention implementation

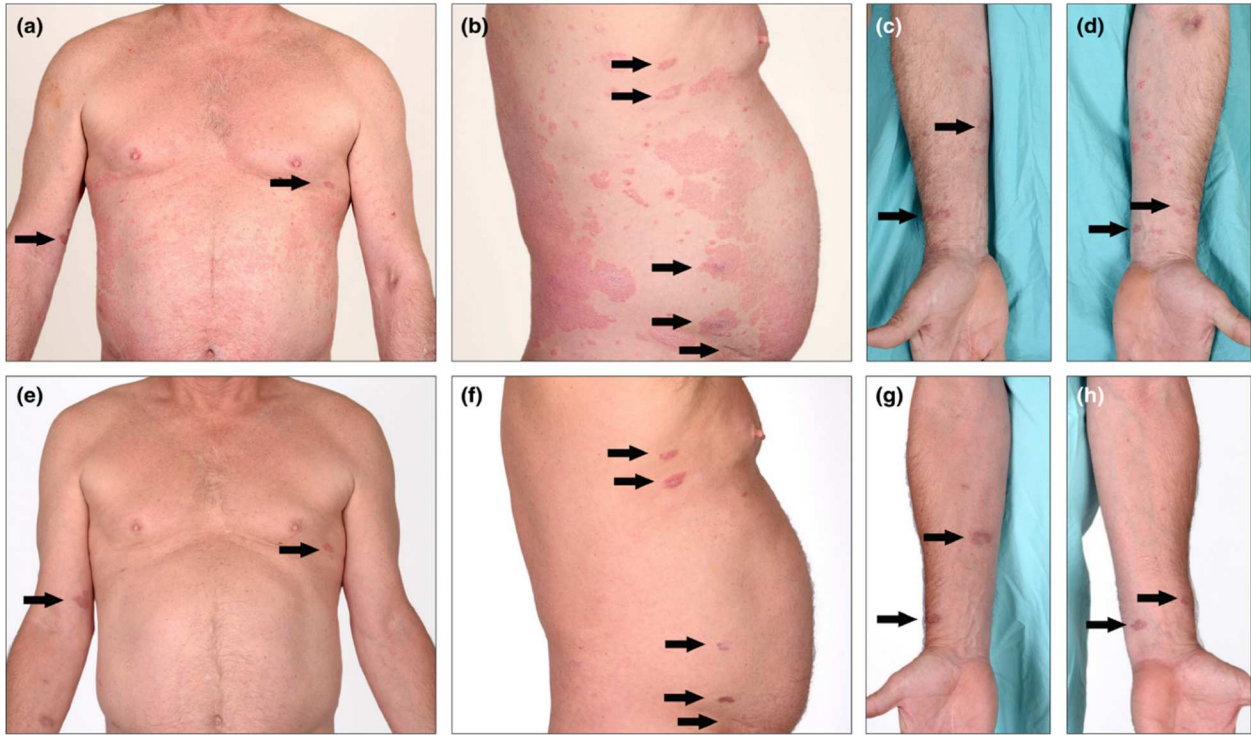


Figure 5. Differentiating Kaposi's sarcoma on black and white skin from the Cleveland Clinic.

challenges in this region can explain the differential intervention outcomes between high income countries. According to the Global Cancer Observatory, the incidence rates (per 100,000) for Kaposi's sarcoma were 11.5 and 5.1 among males and females with the highest incidence rates being reported in Swaziland/Eswatini with males at 17.2 and females at 9.5 (Wright et al., 2020). While Kaposi's sarcoma has generated an interest in the global health field, data generated only reflects the white population of South Africa and underreporting among black and colored populations is due in part to the structural barrier of stigmatization associated with a HIV/AIDS diagnosis. With Kaposi's sarcoma reports not being generated until the late 1990s, there are still large gaps in data availability and given its comorbidity rates with HIV/AIDS that are established in developed countries and not into the context of South Africa, this has led to physicians only focusing on the treatment of HIV and undermining the Kaposi's sarcoma diagnosis.

Merkel cell carcinoma (MCC) is a rare cutaneous neuroendocrine tumor of the skin associated with Merkel cell polyomavirus (MCPyV) or with genetic alterations characteristic for chronic UV exposure (Hughes et al., 2014). Although Merkel cell carcinoma is about 40 times less common than melanoma with reports of only 1,500 cases diagnosed in South Africa, this skin cancer has the potential to be lethal and prompts aggressive treatment (CANSAs, 2022). The purplish nodule is regarded as a lethal tumor, with a mortality exceeding that of melanoma based on case fatality rates, with a 5-year disease-specific survival estimated of more than 80 percent (Tenea et al., 2019). Almost one-third of patients present at primary diagnosis with locoregional or in transit metastases. However, in South Africa, black and colored patients presenting with Merkel cell carcinoma have a localization of the tumor at the head and neck regions with the skin cancer already at metastasis leading to a decreased survival rate of less than 50 percent. The pathology of Merkel cell carcinoma behaves more aggressively in immunocompromised



Figure 6. Differentiating Merkel cell carcinoma on black and white skin from the Mayo Clinic.

individuals including those with an HIV infection, which makes darker skinned populations diagnosed with HIV in South Africa having a high risk of developing this skin cancer with spreading to lymph nodes found in more than half of patients (Schneider & Dittmer, 2017). While ART aids in the treatment for Kaposi's sarcoma, the nature of Merkel cell carcinoma can only be treated through surgery and radiation therapy that is not easily accessible for Black and Colored South Africans in the public sector. The obscurity of Merkel cell carcinoma in South Africa makes it difficult for physicians to properly diagnose the morphology, as it is commonly confused with being a benign basal cell carcinoma (CANSAs, 2022). Physicians in the private sector of South Africa only have the modern medical technology to treat this skin cancer as the nodule grows rapidly or the overlying skin breaks down. Further exploration on Merkel cell carcinoma still needs to be addressed among darker skinned populations given its high mortality rate and lack of oncology data surrounding the diagnosing and monitoring of this severe disease.

Finally, malignant melanoma is a cancerous growth that develops when unrepaired DNA damage to skin cells triggers mutations in skin cells that multiply rapidly to form malignant tumors (Matthews et al., 2017). The tumors associated with malignant melanoma originate in the pigment-producing melanocytes in the basal layer of the epidermis, which causes the morphology to resemble moles. There are distinct differences in malignant melanoma of the skin between South African populations regarding the incidence, anatomical distribution, histogenetic types of melanomas, stage at presentation, and prognosis. While the incidence of melanoma is 15 times less among dark skinned individuals with an incidence rate in black and colored populations being 0.9 per 100,000, 70 percent of melanomas are found on the lower extremities and 90 percent of melanomas on the leg occur below the ankle (Karimkhani et al., 2017). Acral lentiginous and subungual melanoma are the most common histologic types found in black



Figure 7. Differentiating melanoma on black and white skin from the Cleveland Clinic.

populations in South Africa, but are difficult to detect because these melanomas either resemble a mole or are not pigmented (Eksteen et al., 2021). When left untreated the tumors are able to extrude through skin or nail plate causing ulceration, secondary infection, and bleeding. In extreme cases, a delayed prognosis with an advanced stage of melanoma may lead to plantar or phalanx amputation (Rapoport et al., 2016). The cumulative effect of multiple negative prognostic factors with the presentation of advanced malignant melanoma has led to the reported 5-year survival rates of less than 25 percent among black and colored bodies in South Africa. Likewise, more than one-third of black melanoma patients in South Africa present with nodal disease, as well as 15 percent of these patients having disseminated metastatic disease at the time of initial presentation (Tod et al., 2019). Improved health education and earlier morphology detection rates would reduce the mortality with malignant melanoma in South Africa.

2.3 Artificial Intelligence Surveillance

Artificial intelligence (AI) software has expanded into wide applications of healthcare and most recently has submerged its way into the field of dermatology. Machine learning (ML) is a subfield of AI that utilizes statistical models and algorithms that can progressively learn from past data to predict future characteristics of new samples in order to perform a desired task (Das et al., 2021). For the field of dermatology, AI can be of use for the early detection of skin cancer to help develop a system to evaluate images of skin lesions to diagnose skin cancer based on their morphology (Pham et al., 2021). In 2016, the International Skin Imaging Collaboration (ISIC) used a dataset to create a conglomeration of deep learning algorithms and compared the accuracy of diagnosing images for skin cancers against the performance of eight dermatologists (Das et al., 2021). The AI software and dermatologists were given pictures of 100 skin lesions

and had to identify them as either benign or malignant. Based on the results, the ISIC’s conglomeration of algorithms surpassed the clinical diagnoses of the dermatologists, with a precision of 76 percent and specificity of 62 percent, compared to a precision of 70.5 percent and specificity of 59 percent for dermatologists. This study allowed for the expansion of AI to be brought into smartphone applications to therefore educate people to perform skin examinations on themselves (Jutzi et al., 2020). At this level, each form of skin lesion that is sent into the application is assigned a classification, such as “benign” and “malignant”, or “naevi” and “melanoma”, which constructs a new machine learning skin cancer algorithm. The wide scope application AI has for benefitting clinicians in South Africa is paramount among healthcare settings, but it is up to clinicians and patients in developed countries to provide more representative skin images for better AI results.

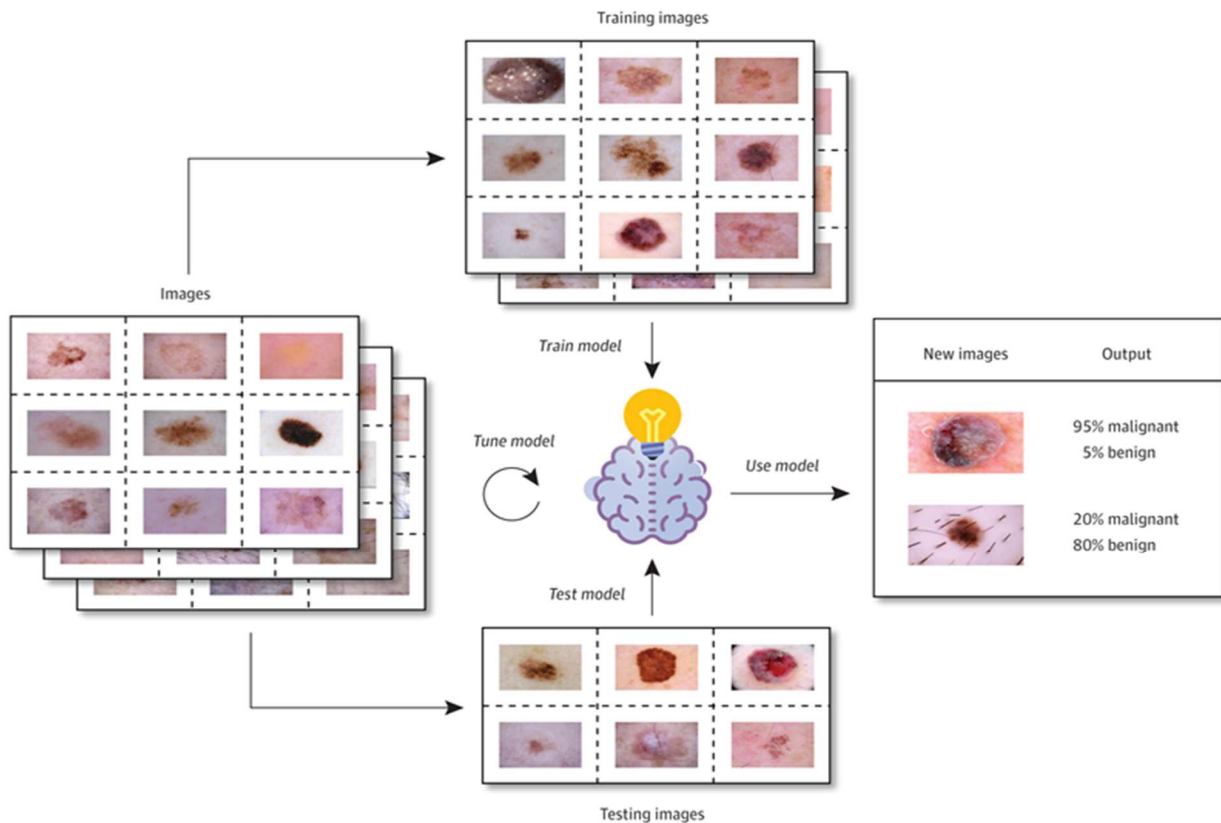


Figure 8. Machine learning process for pigmented lesions among training image sets.

To illustrate the machine process, images of pigmented skin lesions are inputted into convolutional neural networks and are split into a larger training image set and a smaller testing image set. As per Figure 6, the machine learning algorithm located in the center of the image uses the training images in order to learn how to properly categorize the pigmented lesions based on visual features (Chan et al., 2020). The model that is produced is then tested with the testing images to determine model accuracy, which is then fine-tuned with more testing images. Once the machine learning algorithm is developed, it can be used on new images that are collectively fed into the machine process. In the end, the output gives an estimate on new skin cancer images that give an estimate of the likelihood that the lesion is either malignant or benign. As algorithms improve and broaden, machine learning has potential to revolutionize the field of dermatology.

While AI holds the potential to foster future research in diagnosing skin cancer, one of the biggest challenges that must be tackled is addressing imbalanced datasets for not including darker skin tones. Racial disparities in AI and machine learning are not a new issue, as inadequate data can cause machine learning to misdiagnose people of color with nonexistent skin cancers - or miss them entirely (Lashbrook, 2018). The inherent biases of AI databases is yet another symptom of invisibility that has clinical consequences for black and colored bodies. Not only is the paucity of dark skin images in dermatological textbooks a reflection of racial injustice in biomedicine, but as of 2022 there are only three published papers on studies conducted in Africa for the detection of skin cancer through the usage of AI software (Rezk et al., 2022). Out of the three published studies, only one was conducted in the South African capital city of Pretoria, where 52 percent of the population there is white (Takiddin et al., 2021). While the reasons for exclusion from databases are complex, compounding factors include a lack of medical professionals from marginalized communities, inadequate information about individuals

in these communities, and socioeconomic barriers that are embedded in foundations for not being able to participate in research (Laurence, 2021). Nonetheless, the underrepresentation of dark skin images makes the trajectory for diagnosing skin pathology in people of color challenging since early diagnosis is key between life and death. What is needed is more inclusive skin cancer early diagnosis systems that are fully trained and tested on diverse images of skin lesions that captures the myriad of human skin tones (Takiddin et al., 2021). To improve physician education and research applications, expanding skin tone diversity among AI image banks is therefore essential to address the current gap in underrepresentation of darker skin tones to improve the generalizability of skin cancer detection.

3. Global Impact of Skin Cancers

3.1 Global Health Non-Governmental Organizations Involved in Skin Cancer

To fully understand the ambiguity of skin cancer in South Africa, it is important to acknowledge the role of non-governmental organizations (NGOs) in addressing the global health challenges posed by skin cancer. As mentioned earlier, the current legal mechanisms to address the surveillance of skin cancers in South Africa come from global policy regulations from organizations including: the Global Initiative for Cancer Registry Development (GICR), the Skin Cancer Foundation, and AIM at Melanoma. The World Health Organization launched the GICR in 2011 as a partnership based on the commitment of leading cancer organizations to address inequities in underserved countries with six regional hubs located across the world to strengthen the quality of cancer data and their use of cancer control (GIRC, 2022). To better serve the needs across the regional hubs, the International Agency for Research on Cancer (IARC) implemented IARC GICR Collaborating Centers in order to further build upon cancer registration, introduce cancer education courses for physicians, and employ site visits at every level of care for a

particular country (*IARC, 2022*). However, to date, there have not been any courses or site visits carried out in South Africa. In terms of courses, the nearest one offered for physicians in South Africa is in Namibia and Malawi, which places a burden on public clinicians who are unable to travel these distances to expand their knowledge on cancer based diagnoses and treatments (*IARC, 2022*). Furthermore, every country in Sub-Saharan Africa has had site visits from their designated Principal Investigator and Regional Hub Advisory Committees except South Africa. If tailored programs to reduce cancer burdens have benefited other countries, regionalization of these centers needs to be implemented in South Africa.

Even though there may be gaps among the GICR, the global health governance of the Skin Care Foundation, moderated by the World Health Organization, has provided public education on skin cancer prevention, detection, and treatment through the means of the foundation's International Advisory Board, which represents 23 developed and developing countries, including South Africa (*Skin Cancer Foundation, 2022*). Since 1979, the Skin Cancer Foundation has made strides in helping people understand the importance of skin cancer prevention, early detection, and effective treatment measures. Although the organization addresses social, economic, and political determinants to mitigate the burden of skin cancer disease through the means of public-private partnerships, this organization believes medical surveillance is still a gap seen in skin cancers worldwide (*Skin Cancer Foundation, 2022*). As a result, in 2011, the Skin Cancer Foundation partnered with the South African National Cancer Registry (NCR SA) in accordance with Regulation no. 380 of the National Health Act to make cancer a reportable disease and to establish a population-based cancer registry (*NCR SA, 2022*). Since January 2017, population based cancer data have been collected from Ekurhuleni metropolitan municipality in the Gauteng Province. Despite the efforts made, the publications

from the NCR SA for the summary statistics of cancer diagnosed histologically per year only includes skin cancers of simple squamous cell carcinoma, basal cell carcinoma, and malignant melanoma. Additionally, the NCR SA is situated in the wealthiest city in South Africa and has twice as much data on White males and females compared to Black males and females, as well as colored males and females (*NCR SA, 2022*). Working to grow partnerships between the South African National Cancer Registry and public sector hospitals and clinics will help to ensure the accurate reporting of skin cancers among all demographics throughout the country.

Lastly, AIM at Melanoma is a federal and state legislation for the United States and Canada that educates the public globally on the aspects of skin cancer including melanoma and focuses on clinical trial options that match patients' specific treatment and diagnosis history (*AIM at Melanoma, 2022*). The organization works alongside state officials, politicians, and lobbyists to ensure patient, care-givers, and knowledgeable information on melanoma status updates with partnerships in the pharmaceutical industry are established to increase research speed. For instance, AIM at Melanoma is currently developing a vaccine for melanoma with GAVI the Vaccine Alliance. Yet, equitable access to these new biomedical technologies is often overlooked (*AIM at Melanoma, 2022*). To address inequity seen in the distribution of melanoma worldwide, in 2014 AIM formed the Melanoma International Patient Advocacy Coalition (MIPAC) to collaborate with organizations across the globe in order to increase awareness and change public perceptions of melanoma. The international coalition works alongside the Global Melanoma Coalition in order to ensure access to clinical trials and early detection for melanoma, but this global support community is not extended to Sub-Saharan Africa. The Global Melanoma Coalition boasts over 30 locations worldwide, yet there are not any locations throughout all of Africa (*Global Melanoma Coalition, 2022*). Therefore, AIM at Melanoma looks to the Cancer

Association of South African (CANSA) in order to obtain data on integrated services to the public and individuals affected by cancer in this region. Here, the partnership between AIM at Melanoma and CANSA enables research with regards to lower cancer risk, educating the public regarding symptoms, and providing skin cancer screenings to aid in risk reduction. Bolstering this partnership with community level points of care is necessary to integrate public health services to bring awareness to skin cancers among the rural populations of South Africa.

3.2 Layering the Cost of Skin Cancer Epidemics

These achievements in skin cancer surveillance through advanced screening mechanisms should be looked into being integrated in a working manner at the global level. In order to understand the effectiveness of screening and monitoring of skin cancers in developing countries, the expenditure of epidemics on this matter needs to be considered. According to the National Cancer Registry in South Africa, the increasing incidence of skin cancers will demand larger amounts of scarce healthcare resources and will cultivate a burden that is already seen among this country's strained public health system (Wright et al., 2016). By targeting diseases like skin cancer, which are largely preventable if health inequities were targeted in the country through better awareness among its citizens, then healthcare resource burdens could be minimized (Gordon et al., 2016). Cost-of-illness studies deployed in South Africa to measure the economic burden of skin cancer have been created to describe the key pathways of skin cancer management. The National Cancer Registry provided a bottom-up micro-costing approach that was established to estimate the economic burden of skin cancer costs of care incurred by patients (Wright et al., 2016). As South Africa does not have published skin cancer clinical guidelines, the pathways were created by a team of practicing and experienced dermatologists to mimic "real life" patterns for private and public sector skin cancer care (Gordon et al., 2016). The time

horizon was twelve months because for most cases, treatments were considered to be completed within this period among the dermatologists. While this is the case for many individuals receiving skin cancer care in the private sector domain, another model should be produced for individuals experiencing treatments at the level of community health workers who are faced with burdens in the diagnosing process of skin cancers within local provincial clinics.

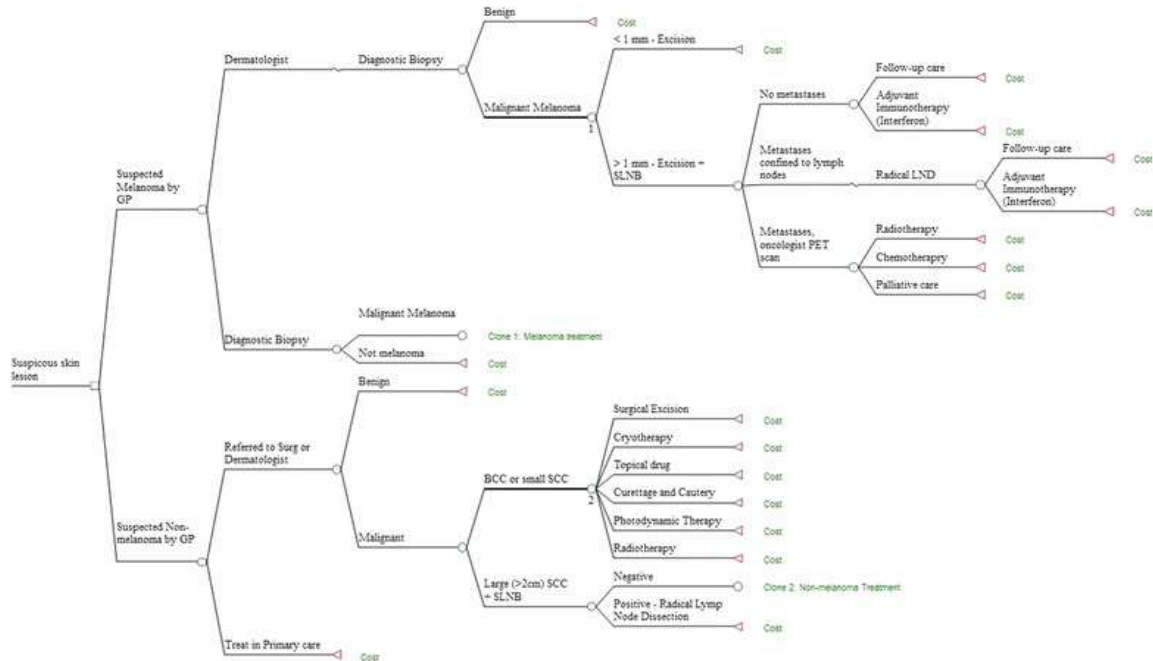


Figure 9. Pathways of costs for skin cancer patients in South Africa by Dr. Louisa G. Gordon.

The main components of costs generated in the model included: initial and follow-up consultations by general practitioners or specialists, pathology and treatment alternatives, as well as prescriptions issued. In South Africa’s public health system, most skin cancer patients were seen by a general practitioner at a primary health care level and then were treated in a secondary level public hospital or were then referred to a tertiary academic institution for diagnostic and treatment procedures. As per Figure 7, costs for public hospital services were derived from the National Public Hospital Tariff schedule, while costs for private practitioners were derived from invoices charged by the private sector (Gordon et al., 2016). This figure alone demonstrates the

hurdles associated with a skin cancer diagnosis in South Africa and the levels of care that an individual has to go through to properly obtain medical treatment. Factoring in appointment times and the distances traveled for a suspicious skin lesion is exhausting to the cancer patient and ends with a price to pay that the majority of darker skinned populations cannot afford.

In the end, the model predicted that the annual total cost for screening, diagnosing, and treating skin cancers in South Africa at ZAR 92.4 million (or \$157 million USD). It was noted that this model assumed all of the skin cancer patient cases were diagnosed and treated properly through clinical practice, which means that loss to follow-up for skin cancer patients in the public sector may be potentially higher. Nonetheless, the estimated costs for non-melanoma skin cancer was approximately ZAR 81.6 million (\$13.8 million USD), malignant melanoma was ZAR 10.8 million (\$1.8 million USD), as well as skin cancers that were diagnosed as benign being ZAR 45.1 million (\$7.7 million USD) (Gordon et al., 2016). The primary costs in this analysis were costs of follow-up and investigations, with costs of excision and usage of histopathology to accurately diagnose skin cancer. This study highlighted the need for more efficient surveillance and data capturing for the adequate prevention of skin cancer, which falls into the hands of the National Cancer Registry in South Africa. Additionally, health resources are heavily skewed towards the private sector, which largely caters to White South Africans who receive world-class health care from private healthcare providers through private medical insurance and are able to pay out-of-pocket in the public sectors. Conversely, the strained public health system in South Africa is provided free of charge, yet it serves a population of black and colored individuals with significantly different resources that are underfunded to diagnose and treat skin cancers (Hengge et al., 2007). The lower rates of Black and Colored South Africans seeking medical care for skin cancer can be explained in part by high travel costs to attend health

care, out-of-pocket treatment burdens, treatment from health facility staff, and a preference to see traditional healers (Hengge et al., 2007). Thus, the impact of this financial model in South Africa to affordably deliver treatment regimes in skin cancer patients is necessary for capturing medical surveillance data, while also shedding light on historical racial disparities.

3.3 Shifting Scales for Access to Care

Several steps are needed to successfully increase accessibility to monitoring skin cancers in order to ensure health equity for all in South Africa. The complexities of preventing skin cancers in overlooked population groups, such as black and colored bodies, come with a wide array of health disparities that are challenging to combat. Identifying data on Kaposi's sarcoma, Merkel cell carcinoma, and malignant melanoma morbidity and mortality rates remains difficult because population level surveillance for skin cancers in dark skin is fragmented and parietal. As apparent in South Africa, the high burden and socioeconomic impact of dermatological skin cancers demands more attention, more resources, and more guidelines at multiple levels of care in the private and public healthcare systems. By implementing the framework of the social ecological model, barriers to care can be overcome by targeting resource-poor regions in South Africa from partnerships established by global health actors and local communities.

The lack of specialized healthcare practitioners in already resource poor areas result in either neglect or a reliance on unvalidated data, which can potentially lead to patient harm. Among public healthcare systems in South Africa, trained healthcare professionals are crucial since community health workers have limited ability to perform biopsies on skin cancers. Recent goals of research include developing remote care and non-invasive diagnostic methods, as well as exploring how socially determined factors shape health inequities that exist in various stages of skin cancer diagnosis among individuals with dark versus fair skin. Teledermatology can help

overcome gaps in care to allow better access for individuals living in South Africa to obtain a trained dermatologist along with reduced travel and waiting times compared to local clinics (Hu et al., 2011). Similarly, the emergence of mobile teledermatology utilizes cell phones to transmit images straight to a dermatologist's clinic in order to be assessed immediately. Evidence from a cross-sectional survey among HIV-positive patients in Swaziland has shown that patients felt that a mobile teledermatology visit would provide the same level of care as a face-to-face visit (Walters et al., 2016). Hence, the infrastructure of healthcare systems in South Africa would need to adapt and accept the validity of teledermatology to expand dermatology services for skin cancer patients to optimize care in rural regions attending to darker skinned populations.

The relative lack of physicians with dermatological training in South Africa should motivate specialists to build educational programs to train future generations of dermatologists. It is critical that clinicians in this region – even those with more generalist training – become familiar with important features that characterize skin cancers in patients across all Fitzpatrick phototypes for different skin colors (Roth, 2022). In essence, clinical photography is deeply tied to the history of the clinician's gaze, which means that definite illustration of skin cancers on darker skinned populations must be incorporated into contemporary medical use on a global scale (Engelmann, 2018). Updated dermatological textbooks with photos of skin cancer morphologies on black and colored bodies, for instance, would help to raise awareness about dermatologic health disparities among overlooked populations. The shortage of literature in resource-poor settings also needs to be improved to detect early signs of skin cancer diagnosis in pigmented skin among darker skinned populations. Broadening options for in-person treatment can also be enforced by expanding beyond the role of the dermatologist through task shifting given the shortage of professionally trained dermatologists in South Africa (Brown et al., 2018).

For example, dermatologists may mentor a newly trained healthcare worker in order to provide them with the skills needed to carry out in-person visits seen in private and public healthcare systems. This avenue of medical adaptation is imperative to aid in dermatological education on a global level that can benefit resource-poor regions among darker skinned populations.

Finally, international policies in research and disease management guidelines can improve the future for international dermatology training collaborations within resource-poor environments like South Africa. In 2012, the World Health Organization approved skin cancers to be included on the WHO List of Essential Medicines, which is a list of cost-effective medicines that include accessible treatment measures for dermatologic diseases (Seth et al., 2018). Several integrative care models have been proposed to control the costs for these medications and institutions are now taking steps to provide dermatology training programs throughout the country. For instance, the International Foundation for Dermatology (IFD) established the Regional Dermatology Training Center (RDTC) in Tanzania and recently expanded its two year dermatologic training program for experienced medical assistants and nurses to Swaziland, South Africa (Seth et al., 2018). The graduates of this program serve as dermatologic resources in their countries and will reduce the burden of stress faced by current dermatologists in South Africa. Promotion for this program on international and public health levels is integral to provide training to understaffed environments among the public healthcare system to offer a new avenue for furthering education of skin cancer diseases (Seth et al., 2018). At the same time, Dr. Toby Maurer of the University of California, San Francisco is working to establish dermatology residency training programs in Uganda, Kenya, and South Africa to train regional cohorts of dermatologists to service resource-poor regions (Seth et al., 2018). The development of these training programs will play an indelible role in the dermatologic care of

people living in these countries and make a significant contribution for individuals with skin cancers in developing regions. In brief, these current and future interventions are key to drive increased awareness to skin cancers and are essential to highlight what has been known to be a blind spot of neglect for decades in South Africa.

4. Critique of Skin Cancer Obscurification

4.1 Analysis of Social Ecological Interventions

As established, the social ecological framework is imperative to understanding the range of factors that influence health and well-being. This multifaceted model assists in providing a complete perspective of factors that affect specific health behaviors, including the social and structural determinants of health. Establishing this framework throughout the progression of the thesis and integrating other theories and models proposed ensured the design of future comprehensive health promotion avenues, disease prevention programs, and policy approaches for skin cancer among darker skinned populations in South Africa. By acknowledging black and colored bodies affected by skin cancer through lasting historical developments, such as navigating the health care system for individuals of this population post-apartheid, these factors curate the level of the individual seen in the social ecological model. Moving through the course of the model, relationship efforts are addressed by the usage of indigenous medicine given the overall pushback to care among Western biomedical regimens. The level of community is witnessed through how Black and Colored South Africans do not receive equitable care from the public health sector compared to White South Africans engaging in the private sphere, thus cultivating a cycle of neglect composed of harm and vulnerability. Finally, societal efforts are seen through non-governmental organizations advocating for proper diagnostic and screening abilities for skin cancers on a global scale, yet more equitable endeavors need to be pursued.

4.2 Conclusion

The trajectory of skin cancer in South Africa is embedded at all levels of care, from the level of the body and individual experience, through their interaction with regional public health infrastructures, through to the interest and awareness of the global health community. This thesis has discussed how skin cancer has been rendered invisible in prevailing public health strategies, both in South Africa and globally. And yet, understanding the historical reasons for neglect – and their contemporary implications – in the realm of global health can have a positive impact in response to molding the future of skin cancers within social, political, and economic transformations to provide a solution to the ongoing problem. For instance, mobilizing against colonial structures which negated the value of indigenous medicine, today the acceptance of traditional healing ailments among the biomedical realm can foster awareness of skin cancer morphologies and accessible care within South Africa. With increased cooperation between the two domains of medicine, published medical literature can then bolster education efforts to address disparities seen in the diagnosis and monitoring of skin cancers. This would then extend into community and public health interventions to ensure the two-tiered healthcare system establishes services to increase points of care among community healthcare workers. Ensuring this process would mitigate gaps for darker skinned populations still affected by the Bantustans and post-apartheid legislations to improve impediments in diagnostic care.

The need for new improved mechanisms for tracking the epidemiology of skin cancer morphologies among Black, Colored, and White South Africans – including cancer registries and enhanced diagnostic and screening abilities – is essential for the early identification of skin cancer symptoms and improving prognosis. Kaposi's sarcoma, Merkel cell carcinoma, and malignant melanoma may appear different across different skin tones and the range skin cancer

morphologies from all tones of skin colors need to be better represented in dermatological education. The overall absence of black and colored skin from AI databases has clinical repercussions that facilitate racial injustices seen in Western biomedicine. In essence, what can be learned from these instances is building a bridge between more inclusion of diverse images of skin lesions presented in dermatology textbooks and enhancing the development of published studies targeting skin cancers among marginalized communities globally. The agendas of global health governance can focus on strengthening policy reformations among the Global Initiative for Cancer Registry Development, the Skin Cancer Foundation, and AIM at Melanoma by shifting scales to access for care among skin cancers in South Africa. Furthermore, these non-governmental organizations must recognize the layering of costs that consume skin cancer epidemics seen amidst resource-poor environments found throughout strained African public health care systems. The attainability of equitable access to expanding research, education, and awareness of skin cancers relies on regional, national, and global health agendas to develop effective adaptations that provide appropriate promotion of knowledge among the vast amount of skin types present in the world today. Increasing the scope of skin cancers through training future dermatologists to integrate an intersectional lens that acknowledges sociocultural elements in the diagnosing and treatment of skin cancers will bring this obscure health issue to the forefront of private and public healthcare systems in South Africa.

The decolonization of skin cancer perceptions worldwide is what is hoped to be achieved in this work in order to ensure black and colored bodies who have been subjected to neglect through harm and vulnerability enables further development to earlier pathways to detection. Broadening the framework of how skin cancers are discussed is imperative to improve education and awareness among community based interventions and global health mechanisms that can

facilitate the necessary steps among informing the general public and future medical professionals. By integrating a collaborative effort from all levels of care in South Africa and international agendas will allow the apparent shift needed in the epidemiological obfuscation for skin cancers seen among the current biomedical curriculum.

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