ATTRITION IN THE DENTAL THERAPY PROFESSION: AN EXPLORATION OF THE CONTRIBUTING FACTORS

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A THESIS

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DECLARATION

I, Pumla Pamella Sodo, declare that this Thesis/Dissertation/Research Report is my own unaided work. It is being submitted for the Degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

(Signature of candidate)

23rd day of May 2024 in Johannesburg

DEDICATION

To God Almighty

"I can do all things through Christ who strengthens me" - Philippians 4:13

In memory of my late father, Geddies Monde Sodo

1941 – 2021

Your love and your words of encouragement kept me moving throughout this journey.

"Rest in Peace Tata"

To my mother, Princess Nomfanelo Sodo

Thank you for your support and encouragement; you are my inspiration!

To my daughter Kanya Sodo and my son Owethu Sodo

Thank you for affording me time to focus on my PhD; you are my pride and joy!

To my siblings, thank you for your support and always believing in me.

OUTPUTS GENERATED FROM THIS PHD

Original peer-review publications

For all the listed publications, Pumla Sodo contributed to the study design, research management, data collection, data management (including cleaning/coding and analysis), and first authorship:

1. **Sodo PP**, Jewett S, Nemutandani MS, Yengopal V., 2023. Attrition of dental therapists in South Africa—A 42-year review. Community Dentistry and Oral Epidemiology. 51(3), pp. 462-468.
2. **Sodo, P.**, Yengopal, V., Nemutandani, S., Muslim, T.A. and Jewett, S., 2023. Dental therapist job satisfaction and intention to leave: A cross-sectional study. South African Dental Journal, 78(07), pp. 338-349.
3. **Sodo, P.P**., Malele-Kolisa, Y., Moola, A., Yengopal, V., Nemutandani, S. and Jewett, S., 2023. Exploring reasons why South African dental therapists are leaving their profession: A theory-informed qualitative study. PLoS one, 18(10), p.e0293039.

Conference presentations

1. **Sodo, P.P**., Yengopal, V., Nemutandani, M.S. and Jewett, S., SAAHE Conference 2022, took place from 27 to 30 June 2022, Virtual - Poster presentation.
   Title: Attrition of dental therapists in South Africa- A 42-year review
2. **Sodo, P.P**., Yengopal, V., Nemutandani, M.S. and Jewett, S., WITS Faculty of Health Science Research Day held on the 15th of September 2022, University of Witwatersrand, Johannesburg, Gauteng Province, South Africa - Poster presentation.
   Title: Dental therapists' intention to leave their profession: A cross-sectional study
3. **Sodo, P.P.,** Yengopal, V., Nemutandani, M.S. and Jewett, S., 24th Association of Medical Councils of Africa (AMCOA) international conference hosted by the Health Professions Council of South Africa (HPCSA), Sun City, Northwest Province, South Africa – Oral presentation.
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ABSTRACT

Background: A new type of oral health profession called dental therapy was introduced to address the growing need for affordable and accessible oral healthcare services, especially among marginalised communities. Extensive global research has demonstrated that dental therapists provide cost-effective and high-quality services, effectively addressing the issue of limited access to basic oral health services. The introduction of dental therapy into the South African healthcare system took place in 1977, however, disparities in accessing basic oral healthcare persist, particularly among some population groups where the highest prevalence of oral diseases has been reported. Despite being established over four decades ago, the number of registered dental therapists remains low, and there have been reports of attrition within this professional group. This PhD aimed to explore the factors contributing to attrition in the dental therapy profession. The first objective was to determine South African dental therapists' attrition rate and demographic profile over 42 years (1977-2019). The second objective explored factors contributing to attrition, while the third objective explored the applicability of the Hertzberg Two-Factor Theory in the context of dental therapy attrition in South Africa.

Methods: This was a concurrent mixed methods study, involving registered graduate dental therapists, former dental therapists, and key stakeholders. The conceptual framework that guided the study was derived from Hertzberg's Two-Factor Theory. Data sources included the HPCSA registry and primary data collected using a quantitative survey investigating job satisfaction and intention to leave among registered graduate dental therapists and qualitative in-depth interviews with former dental therapists and key stakeholders to gain insights into their perspectives on attrition in the dental therapy profession. The attrition rate was determined by using the formula (Attrition Rate = Number of dental therapists who left the profession divided by the total number of dental therapists registered during the period of interest, multiplied by 100). Quantitative data was analysed in STATA version 15 using descriptive and inferential statistics, and qualitative data was analysed using thematic analysis.

Findings: A total of 1232 dental therapists were registered with HPCSA over 42 years, with only 714 registered in 2019, two-thirds of whom were Africans. The attrition rate over the 42 years was 40%, while it reduced to 9% during the 10 years from 2010 to 2019. Of the 200 registered dental therapists who took part in the survey, 74.5% being Africans, approximately 51.5% expressed their intention to leave the profession and a notable 69.5% reported job

dissatisfaction. In logistic regression analysis, job satisfaction correlated positively with several factors, including qualification from UKZN (AOR= 2.28, CI: 1.06-4.91), post-graduation job availability (AOR=3.87, CI: 1.73-8.69), awareness of postgraduate opportunities (AOR=2.28, CI: 1.05-4.96), and feeling valued (AOR= 6.91, CI: 1.45-26.36). Conversely, job satisfaction was negatively associated with becoming aware of the scope of work only after enrolment (AOR= 0.31, CI: 0.21-0.81). Job satisfaction was inversely correlated with the intention to leave; satisfied individuals had significantly lower odds of intending to leave (AOR= 0.25, CI: 0.11-0.57). In-depth interviews with 14 former dental therapists identified diverse reasons for enrolling in dental therapy and a shared enthusiasm for the dental therapy profession. Most reasons they cited for attrition, such as inadequate remuneration, job scarcity, poor working conditions, lack of career advancement opportunities, and policy implementation gaps aligned with Herzberg's Two-Factor Theory. One novel factor contributing to attrition not covered by the theory was a lack of professional identity. The 12 key stakeholders who were interviewed echoed similar factors contributing to the attrition of dental therapists. To address limitations in moving from a description of factors to recommendations on how to address system-level challenges, I adapted a framework that is a combination of Herzberg's Two-Factor Theory and the Human Resources for Health System Development framework. This new framework addresses multifaceted issues affecting dental therapists, covering production, deployment, and retention.

Conclusion: This study sheds light on challenges within South Africa's dental therapy profession, highlighting their profound implications for both the profession and the broader healthcare system. Despite comparable attrition rates to other mid-level health professionals, there were alarmingly high job dissatisfaction levels and intentions to leave the profession, demanding immediate attention and intervention. Identifying key factors contributing to attrition and the novel insight into the lack of professional identity collectively highlight the multifaceted nature of the issue. To address these challenges, embracing a comprehensive human resource retention framework is imperative. This study emphasizes the urgent need for proactive measures to ensure the sustainability and contentment of dental therapists, ultimately benefiting the healthcare system and the communities it serves. Addressing these factors will lead to increased retention rates and improved access to basic oral health services nationwide.

Keywords: Dental Therapists, human resource for health, attrition, staff turnover, Hertzberg Two-factor theory, Human Resources for Health System Development; South Africa

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LIST OF ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ATLS	Advanced Trauma Life Support
CHE	Council on Higher Education
GEMP	Graduate Entry Medical Programme
HIV	Human Immunodeficiency Virus
HPCSA	Health Professions Council of South Africa
HR	Human Resources
HRH	Human Resources for Health
HRHSD	Human Resources for Health System Development
IDIs	In-depth Interviews
LMIC	Low- or Middle-Income Country
HIC	High Income Country
MBBCh	Bachelor of Medicine, Bachelor of Surgery
MEDUNSA	Medical University of South Africa
OSD	Occupational Specific Dispensation
SADTA	South African Dental Therapy Association
SAQA	South African Qualifications Authority
SMU	Sefako Makgatho University
STATA	Statistical Software for Data Science
UDW	University of Durban-Westville
UKZN	University of KwaZulu-Natal
WHO	World Health Organization

STRUCTURE OF THE THESIS

This thesis is presented in a divided block format, as prescribed by the Faculty of Health Sciences, University of the Witwatersrand. The chapters specific to this thesis therefore include the following:

Chapter 1: Provides information on the context and background of the dental therapy profession. The chapter then culminates with the study rationale, aim, and objectives. This chapter also provides an outline and critique of the literature concerning the dental therapy profession. It details the existing state of the field, highlights the gaps in the literature before embarking on the PhD, and provides details of the conceptual framework and study justification.

Chapter 2: Describes the overarching methodology and justification of the methodological approaches used.

Chapter 3: Outlines the results of the study, whereby each section of this chapter presents different papers emerging from this PhD aligned with different study objectives.

Chapter 4: Provides an integrated discussion of the thesis by synthesizing key findings from the collective results with existing literature.

Chapter 5: Provides the concluding summary remarks of the entire thesis and the key proposed recommendations.

CHAPTER 1: INTRODUCTION AND BACKGROUND

This chapter will offer insights into the burden of oral health diseases, and the context and background of the dental therapy profession, with a particular focus on attrition trends. It will proceed to outline and critically assess the existing literature on attrition within the dental therapy profession, by providing an overview of the current state of the field. The chapter will also highlight the gaps in the existing body of literature, presenting the conceptual framework that informed this study and offering a rationale for its undertaking.

1.1.Burden of oral health diseases

Oral health diseases represent a significant burden globally, impacting individuals' quality of life and imposing substantial economic costs on healthcare systems. Healthcare systems necessitate sufficient human resources to deliver quality oral health services, especially considering the significant burden of diseases they must address. According to the report, around 3.5 billion individuals worldwide suffer from oral illnesses [1]. In high-income countries (HICs), such as those in North America, Europe, and Asia-Pacific, oral health conditions remain prevalent despite advancements in preventive measures and access to dental care [2]. Dental caries, commonly known as tooth decay, and periodontal diseases, which affect the gums and supporting structures of the teeth, are among the most common oral health issues encountered in HICs [1]. +Despite the widespread availability of fluoridated water and oral hygiene products, dental caries affects individuals of all ages, particularly children and adolescents [1].

Furthermore, periodontal diseases, including gingivitis and periodontitis, remain a significant concern, contributing to tooth loss and compromising individuals' oral health-related quality of life [3]. While access to dental care is generally better in HICs compared to low- and middle-income countries, disparities in oral health outcomes persist among certain population groups [4]. Low-income individuals, racial and ethnic minorities, and marginalized communities often face barriers to accessing timely and affordable dental care, exacerbating existing oral health disparities [5].

The burden of oral health diseases in South Africa is substantial, it affects a large portion of the population and imposes significant economic and healthcare challenges. The prevalence of oral health problems is highest in Sub-Saharan African countries, where it affects half of the

population [6]. More than 257 million new cases of oral disease have been reported in the African region in the last 30 years, and it impacts people of all ages [6]. Common conditions such as dental caries and periodontal diseases are widespread, and limited access to dental care services, particularly in rural and underserved areas, exacerbate the problem. Dental caries, gum disease, and tooth loss are all on the rise, and they disproportionately affect underserved populations because of existing healthcare disparities [7]. Health inequities persist, as vulnerable populations face higher disease burdens due to socioeconomic disparities [7].

In Sub-Saharan Africa, accessing oral health care is difficult for most people because of inadequate coverage and long wait times which are caused by shortage of dental professionals, especially in rural areas. Access to oral healthcare services is limited for many reasons, including financial resources and geographical barriers [8]. Disadvantaged groups in Sub-Saharan Africa bear a disproportionate share of the cost of oral health problems. This limited access to dental care contributes to worse oral health outcomes for low-income people, rural communities, and marginalized groups. Several factors, including socioeconomic status, educational gaps, and cultural norms, influence oral health inequalities in the region [7]. Most dental conditions are preventable through proper oral hygiene practices and education; hence, addressing this burden necessitates comprehensive efforts to improve access to care, raise awareness, and reduce disparities in oral health outcomes across the nation.

Oral diseases have a significant impact on the health of the population in South Africa, as they do in many other countries. About 60% of South African 6-year-olds have experienced dental caries, making it the most common oral disease in the country [9]. Even though fissure sealant programs are in place in schools, a large percentage of caries in 6-year-olds remain untreated. Oral diseases also pose a significant burden on adults, impacting both their oral health and overall well-being [10]. Despite improvements in healthcare infrastructure and oral health education initiatives, several factors contribute to the prevalence of oral diseases among adults in the country [11]. Periodontal diseases, including gingivitis and periodontitis, are also prevalent among adults in South Africa [12, 13]. Due to limited resources, such as inadequate and maldistributed oral health professionals, specific populations and regions in South Africa experience a disproportionately high prevalence of oral health diseases [14]. Poor oral health outcomes and an increased burden of oral diseases are expected in disadvantaged communities because of a lack of access to oral healthcare services. South Africa's population ratio of 1.1 dentists per 10 000 people in 2019 is lower than the global average of 3.28 dentists per 10 000 [14].

Conditions affecting the mouth and jaw can significantly affect a person's standard of living [15]. Pain, discomfort, difficulty eating and speaking, and emotional distress are all possible outcomes [7]. Loss of teeth, oral infections, and oral cancers can severely affect one's ability to eat and speak normally, as well as one's confidence and sense of well-being. Due to poor oral health, there are significant monetary costs to individuals, communities, and healthcare systems [7]. Restorative dental care and extractions and prosthetics can be expensive, especially for those without access to dental health insurance or financial assistance. Productivity loss due to oral health issues can also have a sizable indirect cost [7]. Disparities in oral health conditions between populations and socioeconomic groups are common. Low-income people, people of colour, and people living in rural areas are disproportionately affected by poor oral health and have less access to dental care than the general population. These inequalities exacerbate preexisting health disparities and gaps in oral health [16]. The state of one's mouth can be indicative of general health. Cardiovascular disease, diabetes, respiratory infections, unfavourable outcomes in pregnancy, and some forms of cancer have all been linked to poor oral health [17]. The importance of oral health promotion and disease prevention is bolstered by the fact that the effects of oral health diseases often extend well beyond the mouth [17].

An adequate oral health workforce is necessary to implement preventive strategies, oral health promotion, early detection, and access to affordable and equitable oral healthcare services to reduce the prevalence of oral health diseases [18]. Reducing the global burden of oral health diseases and improving population health requires the integration of oral health into overall healthcare systems, implementing effective prevention programs, promoting oral hygiene practices, and improving oral health literacy [4].

1.2.Introduction to the Dental Therapy Profession

Dental therapy is a midlevel health profession that was established to enhance access to basic oral health services [19, 20]. Midlevel healthcare practitioners play a crucial role in improving healthcare access, efficiency, and overall patient outcomes. These professionals fill crucial gaps in healthcare delivery, especially in underserved populations, where shortages of healthcare workers persist. Their ability to perform various tasks, from prevention, and diagnosis to treatment, significantly alleviates the burden of unmet healthcare needs. This proficiency streamlines healthcare operations and reduces waiting times, and their cost-effective approach benefits healthcare affordability [21]. The dental therapists' specialised training allows for tailored care, emphasising patient-centeredness, and they collaborate with

diverse healthcare professionals to deliver comprehensive services. Dental therapists are trained to diagnose and treat a wide range of oral health problems, including cavities, gum disease, and tooth decay [22]. Moreover, they play pivotal roles in addressing public health challenges and driving healthcare innovations, which makes them invaluable members of the healthcare workforce [23].

Reports from several countries indicate that the integration of dental therapists into health systems has been notably successful, yielding significant improvements in access to dental care, particularly in underserved areas [24]. In New Zealand and Australia, dental therapists have been integral in providing preventive and restorative dental services to children, leading to marked improvements in oral health outcomes and a reduction in dental caries [24]. The United Kingdom's National Health Service has utilized dental therapists to address regional disparities in dental care access, achieving high patient satisfaction and maintaining quality of care[24]. In Canada, particularly in Indigenous and rural communities, dental therapists have effectively delivered essential services, emphasised preventive care and reducing the incidence of severe dental issues [24]. In the United States, pilot programs in states like Alaska and Minnesota have demonstrated that dental therapists can significantly expand access to dental care for underserved populations, leading to improved oral health outcomes and demonstrating cost-effectiveness [24].

The dental therapy profession has evolved, and today addresses the need for expanded access to oral health care and the reduction of oral health disparities in various countries [24]. The dental therapy profession emerged as a response to the challenges of providing basic dental care to underserved populations, especially in remote or disadvantaged areas [19, 20]. The concept of dental therapy started in New Zealand in the early 20th century [24]. In 1921, school dental nurses were introduced in New Zealand to provide dental care to school children [24]. This introduction marked the beginning of a new type of dental professional who focused on preventive care and basic dental treatments and became an integral part of public health initiatives in several countries. Dental therapists played a vital role in various countries, particularly in school-based dental programs, community health centres, and outreach initiatives, and they promoted oral health education and provided basic oral health services [24]. Their significance was particularly reported in developing countries, where access to dental services was limited, and oral health disparities were prevalent [25]. Due to the success of this approach, more than 54 countries, including South Africa, have adopted dental therapy models to address the oral health needs of their populations [24]. Several countries, including

South Africa, officially acknowledged dental therapists as licensed and regulated professionals, granting them the ability to practice independently within their defined scope of practice [24]. This recognition led to the establishment of dental therapists as a well-integrated and essential part of the dental workforce in many nations.

Despite significant progress, the dental therapy profession continues to face challenges globally, which include lack of career pathing, variations in recognition, regulation, and issues related to job dissatisfaction across different countries [24, 25, 26, 27, 28]. However, opportunities for expanding dental therapy services and addressing oral health disparities remain a priority for policymakers and public health advocates [23]. Dental therapists encounter challenges related to career pathing, recognition, regulation, and job dissatisfaction in various countries around the world [24, 25, 26]. In the United States, disparities in state-level regulations create hurdles for dental therapists, with some states lacking recognition of the profession or imposing restrictive scopes of practice [29, 30]. In Australia, variations in recognition and regulation between states and territories contribute to uncertainties in career progression and job satisfaction for dental therapists [25, 26]. Similarly, in Canada, disparities in regulation across provinces and territories result in inconsistent opportunities for dental therapists and hinder their ability to fully utilize their skills [31]. New Zealand also experiences variations in regulation, impacting the career paths and job satisfaction of dental therapists [32]. Additionally, in the United Kingdom, where the profession is less established, dental therapists face challenges in gaining recognition and advancing their careers within the oral healthcare system [30, 33]. These challenges underscore the need for greater uniformity in regulations, enhanced professional support, and improved career development opportunities for dental therapists globally.

1.3.Literature review

1.3.1. Dental therapy profession in South Africa

Dental therapy, which was introduced into the South African healthcare system in 1977, serves as a mid-level oral health provider that aims to fulfil the basic oral health requirements of the population while also tackling disparities in the delivery of oral health services [19, 20]. According to the World Health Organization (WHO), mid-level health providers play an important role in strengthening health systems and improving access to essential healthcare services, particularly in underserved areas [23]. They contribute significantly to addressing

healthcare workforce shortages and promoting universal health coverage [4]. Dental therapists have a comprehensive scope of practice that encompasses the holistic care of patients, which ranges from the prevention of oral diseases to the promotion of oral health and the management of oral pain and ailments [34]. In South Africa, dental therapists play a crucial role in treating and preventing the most common oral health issues, such as dental caries [9, 35]. The dental therapy profession does not serve as a replacement for dentists, however, the existing literature indicates that training and utilizing mid-level health professionals, like dental therapists, can be a cost-effective approach to enhance healthcare access and alleviate workforce shortages, especially in rural and underserved regions [19, 36]. In South Africa, dental therapists undergo a three-year training program, while dentists complete six years of training (five years of university education and one year of compulsory community service). Furthermore, the salary of a dentist in the public sector in South Africa is equivalent to employing two to three dental therapists. Globally, there is evidence that dental therapists play a crucial role in delivering high-quality and cost-effective basic dental services, particularly for children and underserved communities, as compared to dentists [37]. Although there is a significant demand for dental therapists, the Health Professions Council of South Africa (HPCSA) data [38] show that there is underproduction of dental therapists in South Africa as compared to dentists. Additionally, there is a concerning trend of attrition in the dental therapy profession, which poses a threat to the profession and restricts the advantages that this cadre can offer. Dental therapists in South Africa are trained and graduate every year by two universities, the University of KwaZulu-Natal (UKZN) and Sefako Makgatho Health Science University (SMU). However, the number of dental therapists registered with the HPCSA remains low as many have chosen to leave their profession to pursue other careers or businesses, resulting in attrition [39].

Voluntary attrition, which was a focus of this PhD, presents a significant public health concern due to its potential consequences, including staff shortages, limited access to health services, and a high burden of untreated diseases, especially among disadvantaged populations. Addressing voluntary attrition is crucial for effective workforce planning, but the lack of data on attrition poses a significant barrier to tackling this issue [40]. To address this challenge, it was essential to document the attrition rate and identify the factors contributing to job dissatisfaction, intention to leave, and attrition. This information was deemed critical for human resource planning and the development of strategies aimed at reducing voluntary attrition. The limited data on attrition in the dental therapy profession in South Africa motivated this study.

The purpose of this study was to determine the attrition rate and explore the factors influencing attrition within the dental therapy profession.

The establishment of the dental therapy profession in South Africa is intrinsically tied to colonial and apartheid legacies [41]. This profession was introduced to cater to the oral health needs of segregated communities, forming part of a larger structure that distributed healthcare resources unequally among racial groups[41]. The healthcare system during the colonial and apartheid eras was deeply affected by discriminatory practices, limiting access to quality healthcare for non-white populations [41]. Recognizing the need to address oral health disparities and improve access to dental care, efforts were made to create a new cadre of oral health professionals who could provide essential services to underserved communities [19]. Hence, the dental therapy profession was introduced to fill a critical gap in oral health services, particularly in underserved and rural areas where access to dental care was limited due to historical inequalities, working under the supervision of dentists (although that changed in 1993 when dental therapists were allowed to practice independently). The Department of Health, in collaboration with the South African Dental Association (SADA), played a pivotal role in establishing dental therapy as a recognized profession within South Africa. In 1977, the inaugural dental therapy training program in the country was initiated at the Medical University of South Africa (now Sefako Makgatho Health Science University - SMU), Subsequently, in 1980, the University of Durban Westville (now the University of KwaZulu-Natal - UKZN) followed suit [42, 43].

As the number of qualified dental therapists grew in numbers, the South African Department of Health could not afford to employ all of them in the public sector. Hence, they were allowed to practice independently after having worked for one year under supervision in 1993 [24, 44]. This led to most dental therapists practicing independently in private practice. A regionally-based study that was conducted among UKZN dental therapy graduates reported that the majority of dental therapists worked in the private sector [39] Unfortunately, the high cost of private dental care means that only 15% to 20% of the population can afford to see a dental therapist in private practice [45, 46, 47]. This undermines the original intent behind the introduction of dental therapists in South Africa, with a high burden of oral health diseases. In addition to most dental therapists shifting to the private sector, studies have reported attrition of dental therapists due to several factors related to job dissatisfaction [25, 26, 27, 28].

1.3.2. Attrition

The diversity of definitions of attrition within the context of the health workforce is a significant challenge that hinders comparability and consistency in research and data collection efforts [40]. Attrition, broadly defined, refers to the process of individuals leaving their positions within an organization or profession [40, 48]. However, the specific criteria and parameters used to define attrition can vary widely across studies, disciplines, and contexts. One factor contributing to the diversity of definitions is the multitude of ways in which attrition can manifest within the health workforce. Furthermore, the definitions of attrition may differ based on the perspectives and objectives of various stakeholders, including researchers, policymakers, and healthcare organizations. For example, researchers may define attrition narrowly to focus solely on turnover rates within specific healthcare professions or sectors [40], while policymakers may adopt broader definitions that encompass workforce migration and mobility patterns at national or international levels [49]. The lack of internationally comparable definitions and guidelines for measuring attrition further complicates efforts to assess and monitor workforce dynamics across different countries and regions [50]. Without standardized definitions and methodologies, it becomes challenging to compare attrition rates, identify trends, and develop evidence-based strategies to address workforce challenges on a global scale. Moreover, variations in healthcare systems, workforce structures, and cultural contexts further contribute to the complexity of defining and measuring attrition. What constitutes attrition in one country or setting may not necessarily apply to another, making cross-country comparisons difficult, which is why precision is critically important.

In the context of this PhD, attrition is defined as a gradual reduction of the workforce, which may be due to either voluntary or involuntary factors. Involuntary factors are described as factors that either the employer or employee has no control over; and these include retirement, ill health, or death, while voluntary factors are described as factors that lead to resignation; these factors can be prevented or addressed by the employer [51]. Voluntary factors influencing attrition may include integrative variables such as job satisfaction, remuneration, professional progression, career pathing, working conditions, and individual nonworking variables, such as family [52].

Voluntary attrition, which is the focus of this study, is a major public health problem that affects many professions globally. Attrition is one of the ten essential items needed to address

workforce planning; however, the challenge is the lack of data to track attrition, especially in countries with high attrition rates [40, 53]. Voluntary attrition contributes to staff shortage globally although it may not be the only cause; other causes may include the underproduction of health professionals' inappropriate skills mix inappropriate task allocation as well as uneven staff distribution [40, 54, 55].

It is important to appreciate the linkages between global health workforce challenges and attrition as they are interconnected and affect the broader efforts of strengthening health systems to achieve sustainable development goals (SDGs). The 2013 Recife Declaration, adopted during the Fourth Global Forum on Human Resources for Health, emphasized the critical importance of addressing health workforce shortages worldwide [56]. It recognized that attrition, or the loss of health workers from the workforce, is a significant challenge that undermines efforts to achieve SDGs, particularly in the health sector [56]., such as SDG 3 on ensuring healthy lives and promoting well-being for all.

Similarly, the WHO has recognized the urgency of addressing health workforce challenges and has developed strategies to tackle them. The WHO's 2030 Global Strategy on Human Resources for Health outlines a roadmap for countries to strengthen their health workforces, improve workforce planning and management, and ensure equitable access to healthcare services [57]. In 2022, the WHO launched the Working for Health Action Plan for 2022-2030, which builds upon the 2030 Global Strategy and provides a framework for countries to implement concrete actions to strengthen their health workforces [57, 58]. This action plan emphasizes the need for strategies to improve recruitment, retention, and support for health workers.

In South Africa, the 2030 National Human Resources for Health (HRH) Strategy outlines the country's goals and priorities for strengthening its health workforce over the next decade [59]. This strategy recognizes attrition as a significant challenge and includes measures to address it, such as enhancing workforce planning, improving working conditions, and investing in training and professional development [59].

Attrition rates vary by country, although the highest rates are reported low and middle-income countries (LMICs) compared to HICs [40]. A global study that reviewed the literature from 51 countries (high, middle, and low-income countries) reported that overall attrition rates ranged

between 3% and 44%, while annual voluntary attrition rates ranged between 0.3% and 28% [40]. The highest voluntary attrition rate was reported among doctors (range between 1% and 10%) followed by nurses (range between 1.4% and 9.3) [40].

In HICs, attrition among dental therapists is influenced by a variety of factors related to workforce dynamics, job satisfaction, and career opportunities. In countries like the United States and Australia, where dental therapy is an established profession, attrition may stem from challenges such as limited career advancement opportunities, variations in scope of practice regulations across jurisdictions, and disparities in remuneration compared to other dental professions [25, 30].

In LMICs, attrition among dental therapists poses significant challenges to the delivery of oral healthcare services, with various factors contributing to workforce turnover [24, 60]. Several LMICs face common issues related to attrition among dental therapists, as evidenced by the literature, these issues includes Limited Career Progression, Inadequate Remuneration, Poor Working Conditions, Lack of Recognition and Support, and Training and Education Constraints [61].

Despite the commendable efforts of two South African universities to train and produce dental therapists since 1977, the total number of registered graduate dental therapists in South Africa remains low, primarily due to issues related to underproduction and attrition, as presented in the background. A regionally-based South African study conducted among UKZN dental therapy graduates reported attrition of dental therapists [39]. This study reported that 26% of dental therapists left the profession, of which 19% went back to study dentistry, and 7% left the profession. Studies conducted among dental therapists in other countries also reported a high attrition rate. For instance, a study conducted in Western Australia between the years 1999–2003, reported that 28% of dental therapists left their profession to pursue new careers, and they cited family commitments, relocation, poor pay, injury, or stress as their main reasons to leave [26]. Another South African study estimated a 25% annual voluntary attrition rate among health workers, which excluded an additional 6% involuntary attrition rate [62]. While anecdotal reports indicate that many dental therapy graduates have chosen to leave their profession resulting in an unusually high attrition rate in this profession, limited studies have been conducted among dental personnel. Voluntary attrition has been reported among dental therapists globally and this contributes to a very low practitioner/population ratio, which limits access to oral health services, especially among the disadvantaged population [27, 40].

Lack of access to basic oral health services leads to an increase in the number of untreated diseases. According to Statistics South Africa 2010, the ratio of oral health professionals to the population was very low in all the provinces (See Table 1).

Table 1 Population Practitioner ratio by province (1:10 000)

Province	Population	Oral Health professionals
KwaZulu-Natal	10 645 400	685
Gauteng	11 191 700	1800
Limpopo	5 439 600	165
Western Cape	5 223 900	1011
Northern Cape	1 103 900	55
Eastern Cape	6 743 800	221
Northwest	3 200 900	214
Free State	2 824 500	147
Mpumalanga	3 617 600	229

Source: Lehohla PJ. Mid-year population estimates by province. Statistics South Africa. Statistics release [serial online]. (P0302); 2010:4. Available from: http://www.statssa. gov.za/publications/P0302/P03022011.pdf 12 Fisher R. Oral health professionals' statistics by provinces.

Though not disaggregated by professional status, these ratios are very low as compared to the national norms and standards, which require ratios to be 1:60 000 for dentists/dental therapists and 1:100 000 for oral hygienists [63].

The attrition of the health workforce can have significant implications for healthcare systems and communities. It can lead to a shortage of healthcare professionals, increased workload on remaining staff, reduced access to care, longer waiting times, compromised quality of care, and diminished patient outcomes. Addressing attrition in the health workforce requires implementing strategies such as improving working conditions, providing competitive compensation packages, offering career development opportunities, and promoting a supportive work environment to attract and retain healthcare professionals [40].

1.3.3. Reasons for attrition

The most cited reasons for high attrition in the above-mentioned studies include low salaries, lack of access to professional development and further education, lack of effective supervision,

weak regulatory environments, isolation for those in rural or remote areas, poor working conditions, large workload, lack of motivation and low job satisfaction [40, 64].

Job dissatisfaction can lead to a desire to seek alternative job opportunities or career paths that offer a more fulfilling and rewarding work experience. This intention to leave is driven by the hope of finding a better professional environment that aligns with their needs and aspirations, and where they feel more satisfied and motivated in their roles. A study conducted among healthcare workers in three countries, including South Africa, found a link between low job satisfaction and the intention to leave [65]. Among the countries studied (Tanzania, Malawi, and South Africa), South Africa had the lowest job satisfaction and the highest intention to leave, with 47.9% of participants dissatisfied with their current jobs, and 41.4% actively seeking other employment. Other studies have also shown that the intention to leave is a strong predictor of voluntary workforce attrition [40, 52].

In sub-Saharan Africa, 36 countries reported staff shortages as a crisis and attrition is the major contributing factor [16]. Although the health worker shortage is due to many reasons, including underproduction of skills, international migration, career changes among health workers, premature retirement, morbidity and premature mortality migration of trained personnel from lower-income countries in sub-Saharan Africa to higher-income countries were the main factors [66, 67]. Health workers choose to migrate to high-income countries because they are unsatisfied with low pay and lack of career progression in low-income countries [40, 53]. Another study estimated a 70% to 75% attrition rate among physicians and approximately 28% of nurses were due to migration [40].

The cited reasons contributing to attrition are all connected to job dissatisfaction. These factors can be understood and explained using Hertzberg's Two-factor theory [68] According to Hertzberg's two-factor theory, there are two sets of factors that influence job satisfaction and dissatisfaction in the workplace, intrinsic factors (also called motivation) and extrinsic factors (also called hygiene) factors [68]. Extrinsic factors are external factors that are essential to preventing job dissatisfaction but do not directly lead to job satisfaction. They include aspects such as salary, working conditions, job security, company policies, supervision, and relationships with colleagues [68]. When these factors are lacking or perceived negatively, employees become dissatisfied and demotivated. Intrinsic factors are internal factors that directly lead to job satisfaction and motivation. They are related to the nature of the work itself and include factors such as recognition, opportunities for personal growth and advancement, responsibility, and the sense of achievement [68]. When these motivating factors are present, employees are more likely to be satisfied and motivated in their roles. According to Hertzberg,

the absence of hygiene factors can lead to job dissatisfaction, while the presence of motivating factors can lead to job satisfaction and increased motivation [68]. The theory therefore suggests that improving hygiene factors can prevent job dissatisfaction, but to truly motivate employees, organizations need to focus on providing meaningful and fulfilling work experiences that cater to the employees' intrinsic needs and aspirations [68].

1.4.Theories and frameworks on attrition

Before explaining why this PhD elected to apply the Herzberg's Two-Factor Theory and the Human Resources for Health System Development framework, to explore healthcare workforce dynamics, this review notes several alternative frameworks that researchers and policymakers may consider depending on the specific context and objectives of their analysis. Some of these alternative frameworks include:

- **Maslow's Hierarchy of Needs:** Maslow's theory posits that human motivation is driven by a hierarchy of needs, ranging from basic physiological needs to higher-level needs such as self-actualization.[69]. In the context of healthcare workforce management, Maslow's framework may offer insights into the diverse needs and motivations of healthcare workers, guiding efforts to address issues related to job satisfaction, professional development, and well-being.[69].
- **Job Characteristics Model:** Developed by Hackman and Oldham, the Job Characteristics Model identifies core job dimensions (skill variety, task identity, task significance, autonomy, and feedback) that influence employee motivation, satisfaction, and performance.[70]. This framework emphasizes the importance of designing jobs that are meaningful, challenging, and offer opportunities for autonomy and skill development, which can be particularly relevant for enhancing workforce engagement and retention in healthcare settings.[70].
- **Resource-Based View of the Firm:** Originating from strategic management theory, the Resource-Based View focuses on the role of organizational resources and capabilities in achieving competitive advantage.[71]. Applied to healthcare workforce management, this framework emphasizes the importance of investing in human capital, developing specialized skills and competencies, and fostering a supportive organizational culture to enhance workforce productivity and performance.[71].
- **Balanced Scorecard:** The Balanced Scorecard is a strategic management framework that translates an organization's mission and vision into a set of balanced performance

measures across four perspectives: financial, customer, internal processes, and learning and growth.[72]. In the context of healthcare workforce management, the Balanced Scorecard can provide a structured approach to assessing workforce performance, aligning organizational goals with workforce objectives, and monitoring progress towards achieving strategic priorities.[72].

- **Social-Ecological Model:** The Social-Ecological Model recognizes the influence of multiple levels of influence (individual, interpersonal, organizational, community, and policy) on health-related behaviors and outcomes.[73]. Applied to healthcare workforce management, this framework emphasizes the interconnectedness between individual motivations, interpersonal relationships, organizational culture, community context, and policy environment, highlighting the need for multi-level interventions to address workforce challenges and promote workforce well-being.[73].

Upon review, these alternative frameworks did not offer the diverse perspectives and analytical lenses for understanding and addressing healthcare workforce issues when compared to Herzberg's Two-Factor Theory and the Human Resources for Health System Development frameworks in combination.

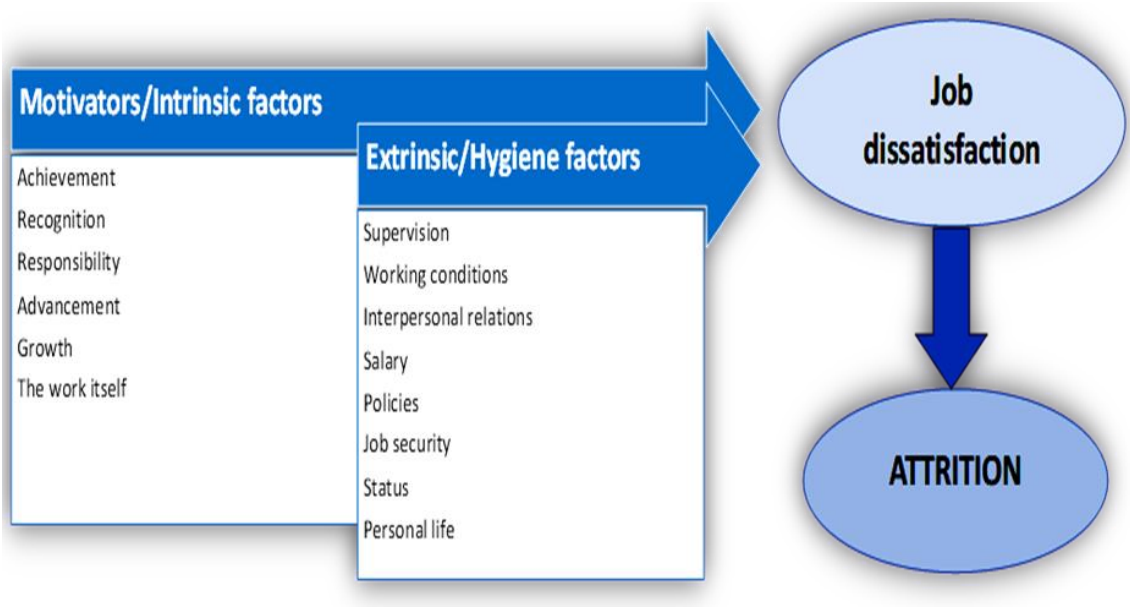

Figure 1 Conceptual framework: Hertzberg Two-Factor Theory

An adaptation of the Hertzberg Two-Factor Theory and themes arising from literature (see Figure 1) was used as the basis of the conceptual framework for exploring attrition. I adapted Herzberg's Two-Factor Theory to understand attrition by examining intrinsic and extrinsic factors that impact dental therapists' job dissatisfaction which contributes to attrition. By identifying and addressing these factors, organizations can pinpoint the root causes of dissatisfaction, implement strategies to improve overall job satisfaction, and consequently, mitigate attrition by creating a more engaging and fulfilling work environment for employees.

The full theory has been applied and is supported by several studies on staff motivation and job satisfaction, including those in the health sector [68]. Herzberg's Two-Factor Theory has significant implications for understanding attrition or employee turnover within organizations. According to Herzberg, job satisfaction and dissatisfaction are influenced by two separate sets of factors: Extrinsic or hygiene factors and intrinsic factors or motivators [68]. Extrinsic factors, which include aspects like salary, working conditions, and job security, can prevent dissatisfaction when adequately addressed but are not sufficient to motivate employees to stay in their roles. On the other hand, intrinsic factors, which encompass elements like recognition, opportunities for growth, and challenging work, are directly related to job satisfaction and can inspire employees to remain committed to their positions. High attrition rates are often linked to deficiencies in motivators and extrinsic factors. When these aspects are lacking, employees may become dissatisfied and more likely to seek alternative employment opportunities, leading to higher turnover rates. Therefore, organizations aiming to reduce attrition should focus not only on addressing extrinsic factors to prevent dissatisfaction but also on enhancing intrinsic factors to create a more engaging and fulfilling work environment that encourages employee retention. This theory has evolved in this PhD and its evolution is discussed in detail in section 3.5 of this thesis.

As detailed in 3.5, while Herzberg's Two-Factor Theory was valuable for pinpointing individual-level elements that impact workplace satisfaction and discontent, it does not explicitly encompass wider systemic or organizational factors that can influence job satisfaction on a more overarching scale, including structural challenges within a healthcare system [68]. Consequently, when assessing and tackling job satisfaction and motivation within a healthcare system or any organization, it is essential to contemplate the added benefits of the Human Resources for Health System Development (HRHSD) framework. to effectively

address systemic issues within the healthcare system [74]. The HRHSD considers the interplay of various factors at the organizational, institutional, and systemic levels that influence healthcare workforce dynamics [74]. This framework allows for an examination of the broader contextual factors (e.g., regulatory environment, workforce policies, education, and training systems) that shape attrition patterns among dental therapists and informs strategies for workforce planning and management.

Both Herzberg's Two-Factor Theory and the HRHSD framework have been widely applied in healthcare settings and have demonstrated relevance to understanding workforce issues in healthcare organizations. Given that dental therapists operate within the broader healthcare system, these frameworks offer a familiar and well-established theoretical foundation for analysing attrition within the dental therapy profession. Both frameworks have empirical support and practical utility, making them valuable tools for researchers, policymakers, and healthcare managers seeking to address attrition among dental therapists. By applying these frameworks, stakeholders can gain insights into the underlying factors driving attrition, identify targeted interventions to improve retention, and develop evidence-based strategies for enhancing the overall effectiveness and sustainability of the dental therapy workforce.

Herzberg's Two-Factor Theory and the HRHSD framework offer complementary perspectives and analytical tools for understanding and addressing attrition among dental therapists. Their focus on motivation, job satisfaction, systemic factors, and practical applicability make them particularly well-suited frameworks for discussing attrition within the dental therapy profession compared to other alternative frameworks.

1.4.Rationale

Marginalized communities face barriers to accessing basic oral health services, while studies on dental therapists have reported that this cadre plays a crucial role in providing basic oral health care and improving health outcomes for these populations. Reports from several countries reported a successful integration of dental therapists into the health system, which resulted in enhanced access to cost-effective oral healthcare and patient satisfaction [24].

South Africa introduced dental therapy four decades ago to address oral healthcare needs, particularly for marginalized groups. However, there are still significant gaps in access to oral healthcare, a large number of unmet treatment needs and the number of practicing dental

therapists remains low [9, 35, 38, 75]. Before this PhD, attrition had been reported among South African dental therapists, with most dental therapists simply choosing to leave the field to pursue other jobs [39], but no national study on attrition had been undertaken.

If attrition is not addressed, South Africa will continue to face limited access to basic oral services, leading to untreated oral health issues and an inability to meet national healthcare objectives which include the oral health strategy, the South African National Human Resource strategy, and the universal coverage strategy implemented through the National Health Insurance. Furthermore, the country will continue to lose resources used to train dental therapists who will eventually leave the profession.

A significant body of research on attrition focuses on doctors and nurses, but there is limited research concerning mid-level healthcare workers, including dental therapists. While the attrition of doctors and nurses has been extensively studied due to its critical impact on healthcare delivery, the factors influencing the retention and attrition of mid-level practitioners like dental therapists remain underexplored. These professionals play a crucial role in improving access to care, especially in underserved areas. Understanding the specific challenges and motivators for dental therapists is essential for developing targeted retention strategies. Addressing this research gap could enhance workforce stability and ensure sustained access to dental care for vulnerable populations. Hence this PhD seeks to understand these factors and provide recommendations, this study aimed to explore attrition among dental therapists throughout the country.

1.6. Research aims and objectives

This PhD had two key aims:

1. To explore the factors contributing to attrition in the dental therapy profession; and
2. To recommend the best strategy to address attrition in the profession.

Specific Objectives

The specific objectives of my study were:

1. To describe the demographic profile and attrition rate in the South African Dental Therapy profession.
2. To explore the factors that contribute to dental therapy profession attrition; and

3. To explore the comprehensiveness of Herzberg's Two-Factor Theory in the context of dental therapy attrition in South Africa.

CHAPTER 2: METHODOLOGY

This chapter outlines the comprehensive methodological framework for PhD research, linking different elements that make up the study. It explains the crosscutting methodological features of the thesis, providing summaries of the specific study methods and designs of the different objectives. Additional information on the specific study methods and designs is presented in Chapter 3 of the thesis. This chapter ends with a description of the ethical considerations.

2.1. Introduction

My study utilised a concurrent mixed methods approach. This involved collecting both qualitative and quantitative data at the same time, which provided depth and breadth of understanding of attrition in the dental therapy profession, and this simultaneously contributed to the validity of the study as the information from the two methods was confirmed [76]. The qualitative data were mostly used to provide meaning to the quantitative data and further enhance the depth of the study results [75]. The quantitative and qualitative data complemented each other, with each approach informing and enriching the other in the research process.

The study was undertaken in three parts. The first part addressed the first objective, through the retrospective time series review of records, which determined the attrition rate and demographic profile of South African dental therapists. The second part used mixed methods to address the second objective; the quantitative component was conducted through an online survey (with closed and open-ended questions), which investigated the factors contributing to attrition from the perspective of registered dental therapists, while the qualitative component involved interviews with former dental therapists and key stakeholders. The qualitative component explored the role of dental therapists within the health system, and factors contributing to attrition in the dental therapy profession from different perspectives. The third part was a framework analysis that explored the comprehensiveness of the Hertzberg Two-Factor Theory in the context of dental therapy attrition, which addressed the third objective **(Figure 2)**.

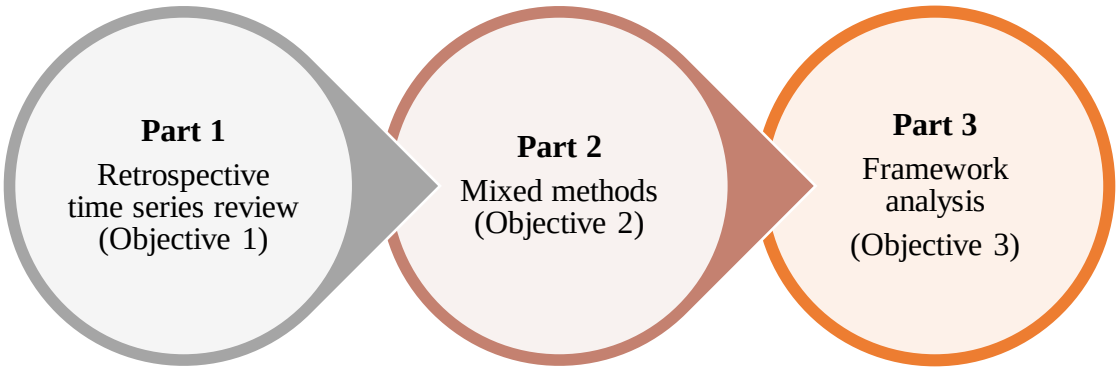

Figure 2 Three parts and related methods of PhD

2.2. Crosscutting methodological features

Dental therapists are trained in two universities (UKZN and SMU), but they work in the private and public sectors nationally; hence, the study was conducted in all nine provinces of South Africa (**Figure 3**). The study population included current and former dental therapy graduates, as well as stakeholders involved in the training, employment, regulation, and management of dental therapists. This included representatives from the Department of Health, academia, HPCSA, and the South African Dental Therapy Association (SADTA).

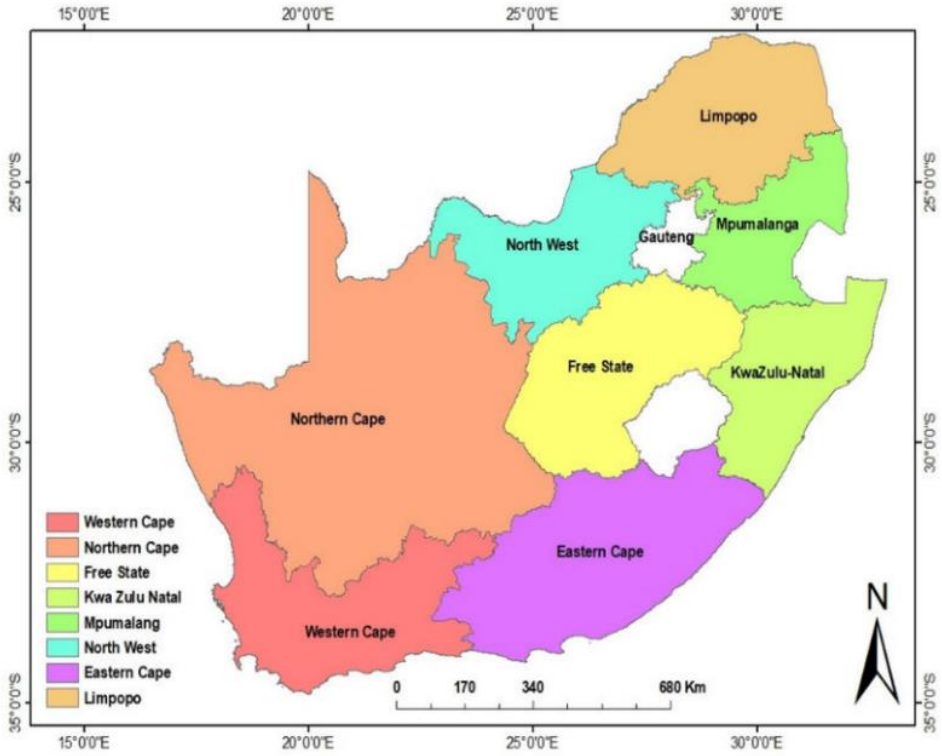

Figure 3 Map of South Africa showing nine provinces of South Africa

Source: http://www.southafrica.info/about/geography/provinces.htm#.VofR__l97IU

2.2.1. Study sampling

In part 1, a retrospective time series review of records included all records of dental therapists who were registered with HPCSA between 1977 and 2019. In the quantitative component of part 2, the calculated minimum sample size for the survey was 198 based on the total number of dental therapists registered by 2019 (714), using a 90% confidence interval and 5% marginal error [77]. A convenience sampling technique was used to recruit the participants, as is detailed in Chapter 3. For the qualitative component of part 2, I used snowball and respondent-driven sampling to recruit former dental therapists, purposive sampling to recruit stakeholders and conducted in-depth interviews until thematic saturation was reached.

2.2.2 Data collection instruments

Multiple data collection tools were utilised in this study. In part 1, a data extraction sheet (Annexure A) was used to extract the data to determine the demographic profile and attrition rate. In part 2, the quantitative component used a self-administered electronic questionnaire (Annexure B) that was adapted and modified from existing previously published studies, some

of which used the constructs of Hertzberg's Two-Factor Theory [27, 28, 39, 78]. These studies captured the predictors of job satisfaction and intention to leave the profession as well as factors contributing to attrition.

The questionnaire captured demographics, individual factors, extrinsic factors, and intrinsic factors as well as job satisfaction and intention to leave. The intention to leave the dental therapy profession and job satisfaction were the outcome variables of interest. Job satisfaction was explored as a binary variable (yes/no), as Hertzberg's Two-Factor Theory identified it as the major factor in the decision to quit or stay in a job or profession [68]. The questionnaire also included an open-ended question to gain insight into participants' reasons behind their dissatisfaction with the dental therapy profession, using their own words.

In the qualitative component, a semi-structured interview guide (Annexures C to F) was used to explore the reasons for attrition of dental therapists. The interview guide was derived from literature and the constructs of Hertzberg two factor theory which included both the intrinsic and extrinsic factors that contribute to job dissatisfaction.

2.2.3. Variables of interest

A snapshot of the variables and how the link to each objective is presented in Table 2. In the first objective, the variables of interest in the time series review were gender, race, geographic location, registration status, and year registered. For the second objective, the variables that were included in exploring the factors contributing to attrition in both the quantitative and qualitative components are explained below:

Outcome variables: Intention to leave and job satisfaction.

Individual factors: age, gender, race, province of residence, highest degree, year of qualification, institution where participants qualified, employment sector, their year of qualification, whether dental therapy was the study participants' first choice, and if the participants were funded for their dental therapy degree.

Extrinsic factors: availability of job opportunities, waiting period to get a job post-graduation, and whether participants felt that the dental therapy profession was valued like other midlevel health professionals in South Africa

Intrinsic factors: awareness of available postgraduate prospects for dental therapists, whether the dental therapy profession received professional growth, satisfaction with the current dental therapy scope of practice, and one nominal variable such as the stage at which participants became aware of dental therapy scope of practice.

Table 2 Summary of PhD methodology

Study objectives	Study Population	Sampling & Size	Design	Key variables*	Data collection method	Data analysis
1. **To describe the demographic profile and attrition rate in the South African Dental Therapy profession over 24 years between 1994 and 2018.**	Records of all dental therapists registered with HPCSA between 1977 and 2019	1232 records of all dental therapists registered with HPCSA between 1977 and 2019	Retrospective time series review of records	Gender, race, geographic location, registration status in 2019, and year first registered	Data extraction sheet	Attrition Rate = Number of dental therapists who deregistered or left the profession divided by the total number of dental therapists registered during the period of interest X 100). Descriptive statistics to describe the demographics of dental therapists.

2. **To explore the factors that contribute to dental therapy profession attrition in South Africa.**	HPCSA-registered dental therapists	Convenience sample n=200	Cross-sectional using quantitative approach.	Outcome variables, individual factors, extrinsic factors, and intrinsic factors	Online survey	Chi-square, t-test, Multivariable binary logistic regression modelling
	Former dental therapists	Snowball sampling n=14	Qualitative exploratory study design	extrinsic factors, and intrinsic factors	In-depth interviews	Thematic analysis using a hybrid deductive and inductive approach
	Stakeholders (representatives from DOH, academia, HPCSA, and SADTA)	Purposive sampling n=13	Qualitative exploratory study design	Extrinsic and intrinsic factors (both first- and second-hand reflections)	In-depth interviews	Thematic analysis using a hybrid deductive and inductive approach
3. **To explore the comprehensiveness of the Herzberg framework in the context of dental therapy attrition in South Africa**						Explains the initial Hertzberg Two-Factor theory and adaptation of the Human Resources for Health System

	Development framework in relation to the PhD.

***See text for specifics on variables included as quantitative factors**

2.2.4. Data collection process

The data collection for this study employed various channels. To address the first objective, the original plan was to obtain data from HPCSA, SMU, and UKZN. However, after obtaining approvals from the two universities, I was informed by both universities that the data for the entire period requested was not available. Some of the data was misplaced during the merger that happened in both these universities. Hence HPCSA was the only source of data used to answer this objective. A data extraction sheet (Annexure A) was used to gather information from the publicly available HPCSA database, on which all dental therapists are required to register to practice in South Africa. Permission was provided by the HPCSA to utilize this data, and they provided the same data available online to me through email.

To address the second objective, for the quantitative aspect, permission was obtained to utilize the SADTA platforms (emails and WhatsApp groups) to distribute the survey link. SADTA had a database of 200 dental therapists during the data collection period. To enhance response rates, participants were encouraged to share the survey link with other dental therapists who might not be SADTA members.

For the qualitative component of Part 2, eligible participants were identified through snowball sampling and were given the option to be interviewed either in person (at their workplaces or homes) or virtually (via platforms like Zoom or Teams). Semi-structured in-depth interviews (IDIs) were conducted by me to explore the reasons for attrition in the dental therapy profession, involving former dental therapists. The interviews, lasting between 20 to 45 minutes, were audio recorded with the participant's consent and conducted in English. Due to COVID-19 restrictions and participant preferences, some interviews were conducted in person, while others were conducted virtually. I took detailed field notes during data collection, and I documented the observed events, conversations, behaviours, and reflections during the IDIs. I concluded the interviews at the point of saturation, where no new ideas or experiences were being raised by the study participants.

The study was conducted nationally, dental therapists that participated came from all provinces, the data that was reviewed was from HPCSA which is a national database, and the stakeholders that were interviewed, e.g. HPCSA, SADTA, represent dental therapists nationally. I only interviewed Oral Health Managers from five out of nine provinces where the permission was granted.

No new data was collected for part 3, but data from part 2 was used to conduct a separate type of analysis.

2.2.5. Data management and analysis

Various data analysis techniques were used to answer the study objectives.

For the first objective, data from the HPCSA database was captured in Excel and transferred to STATA 15, LP, College Station for analysis. Descriptive statistics were used to analyse demographic information. The attrition rate was determined by using the formula (Attrition Rate= Number of dental therapists who left the profession divided by the total number of dental therapists registered during the period of interest (year, decade, or 1977–2019) X 100). The number of those who left was determined by the total number of graduates registered with HPCSA during the considered period minus those who were still registered in 2019, which was the end of the study period. The attrition rate per decade only considered those who were registered and left during that period and excluded those who were registered in periods out of each decade even if they left during the period considered.

For the quantitative component of the second objective, I transferred data from REDCap into Excel for cleaning. Then I transferred the clean dataset to STATA 15, LP, College Station, TX, USA, for analysis. Descriptive statistics such as frequencies were used to describe the study sample in terms of socio-demographics and key participant characteristics. The proportion that was satisfied with their jobs or not, and those who had the intention to leave or not, were also determined using descriptive statistics. Associations between either job satisfaction or intention to leave and participant's characteristics were explored using bivariate analysis. A p-value <0.05 was considered statistically significant. All significant exposure variables were included in the multivariable logistic regression model. The adjusted odds ratios, their corresponding 95% confidence intervals, and p-values were reported.

For the qualitative component, digital recordings of the interviews were transcribed verbatim by a professional service provider. Following transcription, I listened to all the audio recordings while reading the transcripts to ensure the completeness of the data. Thematic analysis was used to analyse the data, following the process detailed by Braun and Clarke, 2006: through gaining familiarity with the data; generating initial codes or labels; searching for themes or main ideas; reviewing themes or main ideas; defining and naming themes or main ideas; and producing the report, this is explained in detail in the manuscripts presented sections 3.3 and 3.4 in the next chapter [18].

For the framework analysis which addressed the third objective, I compared data with the existing variables identified by Hertzberg's Two-Factor Theory. In addition to these variables,

I identified professional identity as something new and arising from this PhD. While useful for description, Hertzberg's Two-Factor Theory was limited as a planning framework given that most identified factors contributing to attrition needed to be addressed at the health system level. Hence, I added the Human Resources for Health System Development framework which addresses the production, deployment, and retention of dental therapists, taking into consideration the policies, stakeholders, and financing. The combined framework is presented in detail in section 3.5 of the next chapter.[2.3.]

2.3. Ethical considerations

Ethical approval for conducting the study was granted by the University of the Witwatersrand's Medical Human Research Ethics Committee (HREC) under certificate #M190686 (Annexure I). Throughout the recruitment process, participants for objective 2 data collection were assured that their participation was entirely voluntary, and their personal information would be treated with strict confidentiality.

For the online survey, participants were presented with a study information page (Annexure G) when they followed the survey link. They were given the option to consent to participate or decline. If they chose to participate, they were directed to the survey, and if they declined, the survey ended. In the qualitative component, I obtained written informed consent (Annexure H) from all participants before conducting the in-depth interviews. Participants were required to provide consent for both their participation in the study and for audio recording (Annexure H) prior to the interviews. In the case of virtual interviews, consent was obtained through a signed document that was emailed to the participants before the interview took place.

To ensure participants' anonymity, unique codes were used instead of their names during data analysis and reporting. This measure was taken to protect their identities and maintain confidentiality throughout the study.

The data from this PhD is stored in a password-locked file and only I have access to the folder. The data will be kept for a minimum of two years for the published work, and six years for unpublished work.

CHAPTER 3: RESULTS

In this chapter, I will present the publications emerging from this PhD, with a primary focus on the attrition of dental therapists and the factors influencing it. Section 3.1 addresses the first objective of assessing the attrition rate among dental therapists in South Africa, while sections 3.2 to 3.4 address the second objective, which explores the factors contributing to attrition. The third and final objective is tackled in section 3.5, which assesses the applicability of the Hertzberg Two-Factor Theory within the context of dental therapy attrition in South Africa. The manuscripts are presented in their published form, with the exclusion of abstracts. The referencing style and the numbering of figures and tables have been adjusted to align with the structure of this thesis. The reintroduction of acronyms reflects the publication format.

3.1. ATTRITION OF DENTAL THERAPISTS IN SOUTH AFRICA - A 42-YEAR REVIEW

This cross-sectional retrospective review determined the attrition rate of South African dental therapists in the 42 years between 1977 and 2019. It also reported the attrition rate for the 10-years period between 2010 and 2019, as well as the demographic profile of South African dental therapists. The published version of the manuscript in the Community Dentistry and Oral Epidemiology Journal can be found at https://doi.org/10.1111/cdoe.12832.

3.1.1. Introduction and background

Professionals leave their positions for varied reasons. Attrition is defined as a gradual reduction of the workforce, which may be due to either voluntary or involuntary factors [79]. Involuntary factors are factors that either the employer or employee has no control over, such as retirement, ill health, or death, while voluntary factors are those that lead to resignation but can be prevented or addressed by the employer [79]. Voluntary factors that influence attrition may include people seeking improved remuneration, better benefits, an improved work/life balance, more opportunities to progress in their careers, time to address personal issues like health problems or relocations, increased flexibility or to escape a toxic environment [40, 79, 80].

Attrition rates in healthcare professions vary from country to country although the highest attrition rates are reported among low and middle-income countries (LMICs) as compared to

high-income countries (HICs) [40, 80]. A global study that reviewed the literature from 51 countries (high, middle, and low-income countries) reported that overall attrition rates ranged between 3% and 44%, while annual voluntary attrition rates ranged between 0.3% and 28% [40]. The highest annual voluntary attrition rate was reported among medical doctors (range between 1% and 10%) followed by nurses (range between 1.4% and 9.3%) [40].

In sub-Saharan Africa, 36 countries reported staff shortages as a crisis, with attrition as the major contributing factor [81]. A South African study estimated a 25% annual voluntary attrition rate among health workers, which excluded an additional 6% involuntary attrition rate [82]. The most cited reasons for high attrition in the above-mentioned studies include low salaries, lack of access to professional development and further education, lack of effective supervision, weak regulatory environments, isolation for those in rural or remote areas, poor working conditions, huge workload, lack of motivation and low job satisfaction [40, 54, 83].

Attrition may lead to staff shortages. Shortages of human resources in the healthcare sector are a major challenge in many African countries, including South Africa [82]. Studies have reported an inequitable distribution of healthcare workers and significant levels of attrition among skilled personnel [82]. This inequitable distribution of healthcare workers poses a challenge to the health, including oral health of citizens as the majority (84-90%) of the population rely on public oral health services, which have small numbers of health personnel [84]. According to Bhayat and Chikte, 2018, the ratio of dental practitioners to the population was 1:8817, which is much lower than the recommended World Health Organization (WHO) dental personnel-patient ratio of one dental personnel for 1,000 patients [15, 84].
This low ratio of oral health professionals to the population may lead to limited access to basic oral health services. Limited or lack of access to basic oral health services leads, in turn, to an increase in the number of untreated diseases.

Oral diseases rank among the most prevalent non-communicable diseases and affect almost 3.5 billion people worldwide [85] Studies have reported prominent levels of oral diseases in South Africa and limited access to basic oral health services [9, 35, 86]. The last South African National Oral Health Survey conducted between 1999 and 2002 reported a high caries rate among children, with the highest rate in the Western Cape, where almost 80% of children required oral health care [9]. These survey findings have important implications for oral health planning in South Africa in terms of human resource allocation [9, 36]. One of the most successful global strategies to improve access to oral health care and to address the inequities

in oral health service provision was the introduction of dental therapists to the oral health team [19, 20, 23, 24, 87]. The inclusion of dental therapists in the oral health workforce started in 1921 in New Zealand and has been adopted by more than 54 countries globally [24, 44]. Global literature revealed that dental therapists play a significant role in providing basic dental services, especially to children and underserved communities globally, at a low cost compared to dentists [24, 44]. One strategy for reducing health disparities is to lower the unit cost of providing services by substituting higher-cost labour associated with hiring dentists, with low-cost labour, such as dental therapists [21, 24, 44]. The dental therapy profession is not a replacement for dentists; however, it is an economically sustainable professional mid-level workforce category where you can employ up to three dental therapists with the salary of one dentist [21, 24].

South Africa was among the countries that adopted the dental therapy strategy during the apartheid era in 1977 with the intention of complementing the oral health team and improving access to basic oral health services, especially in the disadvantaged communities [19, 20, 24, 36, 87, 88]. During implementation, dental therapists were trained only in the so-called "black universities," namely, the University of Kwa-Zulu Natal (UKZN)- the then the University of Durban-Westville in Durban, Kwa-Zulu Natal (KZN), and Sefako Makgatho University (SMU), the then MEDUNSA, in Pretoria, Gauteng [89]. This situation created the perception that Dental therapists were a product of apartheid system , and this has had negative connotations for the dental therapy profession since its inception as a mid-level profession in South Africa [19] During its inception, dental therapists were only permitted to work in government clinics and hospitals. In 2005, however, they were allowed to practice independently because of insufficient posts in the public sector [24, 44]. The South African National Human Resource Development Strategy identified dental therapists as a critical component in the provision of Primary Oral Health Care Services leading to a subsequent call for the expansion of dental therapy training to other dental schools, and an increase in the number of dental therapists to be trained [90]. Although this profession was introduced more than four decades ago in South Africa, disparities in access to basic oral healthcare still exist [9, 36].

Despite dental therapists being trained at UKZN (University of Kwa Zulu Natal) and SMU (Sefako Makgatho University), the numbers of dental therapists registered with the Health Professions Council of South Africa (HPCSA) remain low [38]. All qualified dental therapists are required to register with HPCSA and pay an annual fee to remain in the register; failure to

pay the annual fee will lead to suspension which eventually turns to erasure. Once erased, one is required to pay a fine and annual registration to be restored to the register. Some decide to abandon their annual registration when they change careers, and as a result, they end up being erased [91]. While anecdotal reports indicate that many dental therapy graduates have chosen to leave their profession, limited studies have been conducted among this cohort of oral health professionals. A South African regionally based study in Kwa-Zulu Natal (KZN) reported a high attrition rate among dental therapists [39]. This study reported the misdistribution of dental therapists between private and public sectors, with 47% of UKZN graduates working in private practice while only 9% work in the public sector [39]. This study also reported attrition in the profession, with 26% of dental therapists reported to have left the profession [39]. This regional study further reported that out of the 26% who left the profession, 19% returned to university to study dentistry while 7% no longer work in the dental profession [39]. Attrition of dental therapists was also reported in an Australian study, where 28% of dental therapists left their profession [26]. Based on the data, it is evident that a considerable number of dental therapists have chosen to leave the profession constituting significant attrition in the profession. Limited information exists on the attrition in the dental therapy profession; hence, the aim of this study was to describe the demographic profile and attrition rate in the South African Dental Therapy profession.

3.1.2. Methodology

The study design was a cross-sectional retrospective review. The study population included the records of all dental therapists who were registered with the HPCSA from inception in 1977 to 2019, constituting records over 42 years.

The variables of interest were descriptive variables: gender, race, geographic location, current registration status; and outcome variables: annual, 10-year period, and overall attrition rate and reasons for attrition. These data were extracted from the HPCSA online database which is freely available to the public at https://hpcsaonline.custhelp.com/app/i_reg_form.

The extracted data were captured, cleaned, and analysed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to characterize the demography of dental therapists and attrition rates.

The attrition rate was determined by using the formula {Attrition Rate = Number of dental therapists who left the profession divided by the total number of dental therapists registered during the period of interest (year, decade, or 1977-2019) X 100). The number of those who left was determined by the total number of graduates registered with HPCSA each year/decade minus those currently registered or still active each year, decade, or from 1977 to 2019. The attrition rate per decade only considered those who were registered and left during that period, it excludes those who were registered in periods out of each decade even if they left during the period considered.

Ethical considerations

Ethical approval for this study was obtained from the Wits Human Research Ethics Committee (HREC), certificate number M190686.

3.1.3. Results

Socio-demographic characteristics

Table 3 shows the demographic characteristics of South African dental therapists by 2019. 1232 dental therapists were registered with HPCSA between the years 1977 and 2019. As can be seen from Table 3, the gender of dental therapists is equally distributed between males (50.1%) and females (49.9%). The large majority (64%) of dental therapists registered between 1977 and 2019 were Africans and only 3% were white, with African being an ethnic or racial reference in South Africa that may refer to indigenous South Africans. African race is also used to refer to Black people from other African countries who are in South Africa. The practicing dental therapists (in 2019) were unevenly distributed throughout the provinces with the majority located in KwaZulu-Natal (44%) and Gauteng (27%) while the remaining 29% are spread throughout the seven provinces.

Table 3 Socio-demographic characteristics of South African dental therapists in the 42-year period (1977-2019)

Variable	Category	n (%)
Gender - N = 1232	Male	617 (50.1%)
	Female	615 (49.9%)
Race - N = 1232	African	784 (63. 6%)
	Indian	222 (18. 0%)
	White	37 (3. 0%)
	Coloured	7 (0. 6%)
	Unspecified	182 (14. 8%)
Geographic location of current dental therapists N = 741	KwaZulu-Natal	327 (44.0%)
	Gauteng	202 (27.3%)
	Limpopo	71 (9.6%)
	Mpumalanga	46 (6.2%)
	Northwest	39 (5.3%)
	Free State	26 (3.5%)
	Eastern Cape	13 (1.8%)
	Northern Cape	12 (1.6%)
	Western Cape	2 (0.3%)
	Unspecified	3 (0.4%)

Racial profile of dental therapists for the 42-year period (before and after 1994)

Table 4 shows the racial profile of dental therapists for the 42-years period from 1977 to 2019. The data shows an increase in the number of other races entering the dental therapy profession after 1994, although there was a significant percentage (15%) of the race was not recorded in the HPCSA register, particularly during apartheid (before 1994).

Table 4 racial profile of dental therapists for the 42-year period (before and after 1994)

Race	Before 1994 n (%)	After 1994 n (%)	Total registered between 1977 and 2019 N (%)
African	106 (42)	678 (69)	784 (64)
Indians	27 (11)	195 (20)	222 (18)
Whites	3 (1)	34 (3)	37 (3)
Coloureds	0	7 (1)	7 (1)
Not stated	118 (46)	64 (7)	182 (15)

The attrition rate of dental therapists registered during the 42-year period from 1977 to 2019

Figure 4 shows the total number of dental therapists who registered in each of the 42 years (1977–2019), with lighter bars indicating those who were no longer registered in 2019. Out of 1232 dental therapists that were registered with the HPCSA during the 42 years (between 1977 and 2019), 491 were removed from the register during the same period. Only 741/1232 (60%) remained in the register by 2019. Overall, the attrition rate for the 42 years was 40%. Many of those dental therapists who were registered in earlier years, such as 1986, were no longer registered in 2019 in contrast to more recently registered dental therapists. The lowest attrition was observed in 2019, when only one dental therapist had left. High numbers of dental therapists registered between 1989 and 2003 have left the profession, with higher retention of those who registered thereafter.

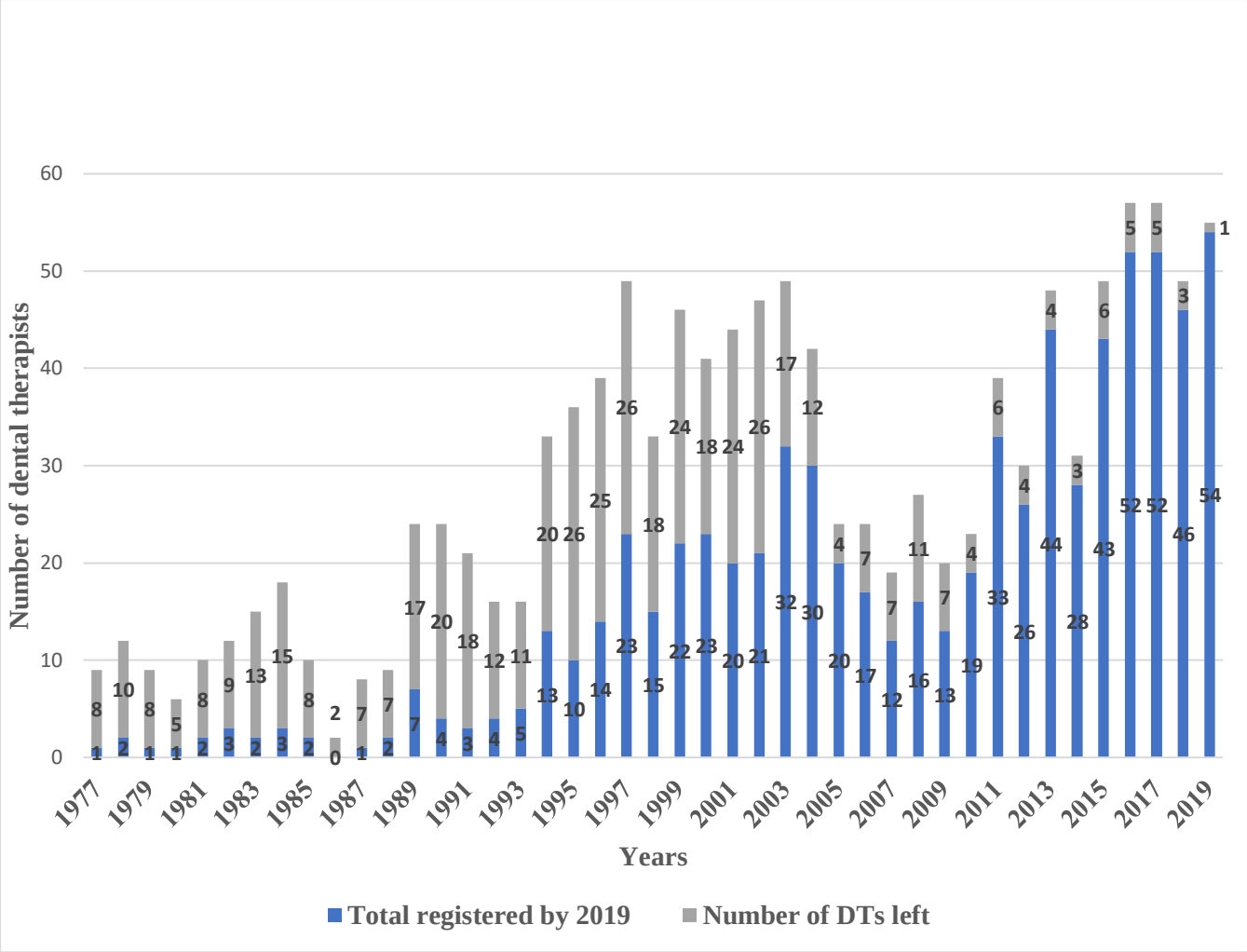

Figure 4 Number of dental therapists registered each year who remained or had left; based on 2019 registration

Attrition rate for the newly registered dental therapists within the last 10-year period of the study (2010–2019)

As attrition is often measured over shorter time periods, we also calculated the attrition rate of dental therapists that were newly registered and left in the 10 years period between 2010 and 2010 (Included in **Figure 4**). Of the 397 newly registered dental therapists within the last 10 years of the study (2010–2019), 9% had left the profession in that same period. This is only the attrition rate for those newly registered during the 10-year period and excludes anyone registered before 2010, who may have also left during that decade.

3.1.4. Discussion

This study described the demographics and attrition rate of dental therapists who were registered between 1977 and 2019 in South Africa. The profession was dominated by African race and most practicing dental therapists were based in KwaZulu-Natal and Gauteng. The overall attrition rate between 1977 and 2019 was 40%, with a figure of 9% for the last 10 years of the study (2010 to 2019) among those newly registered in that decade.

By race, the profession is dominated by those of African descent followed by those of Indian descent. The literature reports that during the earlier years of inception, the dental therapy profession in South Africa was perceived as a Black profession and dental therapists were trained in the so-called "Black universities" [44, 89]. In 2006, the same profession was identified by the South African Department of Health as crucial in the provision of oral services, followed by a call for the expansion of dental therapy training to all the dental schools in the country such as the Universities of Pretoria, Witwatersrand, and Western Cape in order to increase in the production of dental therapists [38]. The findings of the present study identified an increase in the number of other racial groups entering the profession since 1994 (post-apartheid era), which is noteworthy. Although this profession was regarded as a black profession at its inception (during the apartheid era), it has started to attract other racial groups post-apartheid. It is also worth noting that despite the Department of Health identifying dental therapists as crucial in the provision of basic oral health services they were not included in the list of critical skills [92]. This resulted in their exclusion from incentives such as scarce skills allowance and rural allowance provided to professions that were included on the list [93]. This might have contributed to the high attrition rate, as dental therapists may consider themselves as not being recognised within the health system.

The training of dental therapists in the two provinces might have contributed to most dental therapy graduates remaining and working in those provinces after graduation. Currently registered dental therapists are unevenly distributed throughout the provinces, with the majority residing in the provinces where they trained. While acknowledging that it might be possible that some dental therapists remain in those provinces because it is their home provinces; the lack of job opportunities in other provinces, especially in the public sector, could be another reason for the dental therapists remaining in KZN and Gauteng post-graduation. Although the dental therapy profession was designed to serve in the public sector, in the late 90s, dental therapists were allowed to practice independently because the government could not afford to employ them in the public sector [24, 44]. This shift was evident in a study conducted among

UKZN dental therapy graduates, which reported that only 9% of dental therapists work in the public sector [39].

The main reasons for the shift to the private sector, as reported in the literature, include a lack of jobs and promotion opportunities in the public sector, poor salaries, and lack of recognition [27, 39] Another South African study reported that most dental professionals resided in urban provinces and worked in private practice, which has implications in terms of access to oral health services; only 20% of the South African population can afford private health care, a vast majority (84-90%) can only access public health services [36]. Limited access to basic oral health services has led to an increased burden of untreated oral health diseases, which has been reported in South Africa, especially among school children [9, 35, 86].

In contrast, studies from New Zealand, the United States, Canada, Hong Kong, Malaysia, and Australia, have reported the effectiveness of dental therapy services in improving access to oral health services and reducing the burden of untreated diseases at a low cost as compared to employing a dentist, especially among school children [24]. This calls for the government to create more vacancies for dental therapists in all the provinces to improve access to basic oral health services, and to integrate oral health services into the existing programs such as school health services as well as maternal and child health.

The findings of our study reported an overall attrition rate of 40% for the 42 years (1977-2019). Whilst acknowledging that this rate may be inflated due to involuntary factors such as retirement ad death, especially among those registered in the earlier years of inception, the rate remains concerning. Apart from involuntary factors, a plausible reason for this high attrition rate could be due to voluntary attrition where a conscious decision is taken by dental therapists to permanently leave the profession. Indeed, similar South African studies reported that dental therapists leave their profession to pursue other careers such as dentistry because they are not satisfied with their jobs or because of a lack of positions in the public sector, lack of career pathing, and poor salaries [27, 28]. On a more positive note, the attrition rate for dental therapists registered in the most recent 10-year period between 2010 and 2019 was 9%. This rate is comparable with the conducted among other health care professionals, such as nurses who experienced an annual attrition rate ranging between 1.4% and 9.3% and doctors with an annual attrition rate ranging between 1% and 10% and is more likely due to reasons of voluntary attrition [40].

Based on previous studies, there is a need for more dental therapists in the public sector. The data from previous studies reported almost 40% of unmet oral health treatment needs (especially among schoolchildren) of which 80% require treatment within the scope of a dental therapist, hence the attrition of midlevel health professionals such as dental therapists from our study is concerning [9]. Midlevel health professionals were introduced with the aim to speed up the production of the health workforce to enhance the transformation of the health system to be primary health care driven, this includes the reorientation of health care workforce and to ensure improved access to basic health services, especially among the disadvantaged population [23]. The imminent implementation of the National Health Insurance (NHI) in the country also focuses on the mid-level category as the "core" to deal with the huge unmet treatment needs which includes extractions, fillings, scaling and polishing and preventative interventions, which is dental therapist scope of practice [93]. Global literature has confirmed the effectiveness of dental therapists in improving access to basic oral health services and the huge reduction of unmet treatment needs [24]. Hence, any voluntary attrition of dental therapists in South Africa may lead to the reduction of the oral health workforce, in turn impacting goals to achieve Universal Health Coverage. Further investigation into factors contributing to attrition among dental therapists will support the formulation of strategies to recruit and retain more dental therapists into the health system to achieve universal coverage.

A limitation of this study is that it relied on the data from HPCSA, which is captured when practitioners register. This data reports on practitioner registration, demographics, suspensions, terminations, and erasures; it does not include information on those who was restored back to the register after being suspended, and it does not provide the year of removal from the register. Furthermore, the data might be inaccurate in reporting the residential location of dental therapists since a practitioner has to update their residential address when they relocate. If they do not update their details, the data will display the residency captured on registration.

3.1.5. Conclusion

Most South African dental therapists who were registered in 2019 belonged to the African race and more than half resided in Gauteng and KZN provinces where dental therapists are trained. The attrition rate during the 42 years (1977–2019) was 40%, and 9% for the latest 10-year period (2010–2019). Although the dental therapy profession is dominated by the African race, an improvement has been observed in terms of the inclusion of other racial groups post-apartheid. The uneven geographic distribution of dental therapists poses a threat to equitable

oral health coverage in the country. The dental therapy profession in South Africa experiences a high overall rate although the 10-year attrition rate is comparable with other healthcare professionals. This attrition warrants a more detailed exploratory study to determine the factors that are driving this phenomenon as this can seriously negate attempts to increase the numbers of dental therapists by expanding the training of these professionals at other dental schools.

3.3. DENTAL THERAPIST JOB SATISFACTION AND INTENTION TO LEAVE: A CROSS-SECTIONAL STUDY

This cross-sectional study determined the job satisfaction and the intention to leave among South African graduate dental therapists. It also reports on reasons for job dissatisfaction which were captured through the survey with closed and open-ended questions. The published version of the manuscript in the South African Dental Journal, can be found at https://doi.org/10.17159/sadj.v78i07.17072.

3.2.1. Introduction and background

Dental therapy is a midlevel oral health profession that was introduced to the South African health system more than four decades ago during the apartheid era to address inequities in oral health service provision and to meet the oral health needs of the underserved non-White population [19, 20, 44]. However, even with the dismantling of apartheid and the creation of a democratic state, disparities in access to basic oral healthcare persist [19]. Local studies have reported limited access to oral health services, especially among the disadvantaged and vulnerable population groups where the highest burden of oral diseases has been reported [9, 35, 86].

The scope of dental therapists includes treating and preventing the most prevalent oral health problems in South Africa, such as dental caries [19, 20, 35, 86]. Globally, dental therapists play a significant role in providing basic dental services at a low cost compared to dentists, especially to children and underserved communities [21]. One strategy for reducing health disparities is to lower the unit cost of providing services by substituting higher-cost labour associated with hiring dentists, with low-cost labour, such as dental therapists [21]. The dental therapy profession is not a replacement for dentists; however, it is an economically sustainable professional mid-level workforce category where you can employ up to three dental therapists with the salary of one dentist [21]. Despite the need for this professional group, anecdotal data reveals that fewer dental therapists are being trained compared to dentists. Furthermore, there is imminent attrition among dental therapists which threatens the profession and limits the benefits conferred by this category of workers.

Attrition among dental therapists is a threat to the potential benefits of this category of worker. A study conducted among dental therapists in Western Australia reported that 28% of dental therapists were no longer working within the profession due to new careers, family commitments, relocation, poor pay, injury, or stress [26]. In South Africa, although dental

therapists are trained and produced every year from the Sefako Makgatho University (SMU) and the University of KwaZulu-Natal (UKZN), the numbers of graduate dental therapists registered with the Health Professions Council of South Africa (HPCSA) remain low [38]. A regional study in KwaZulu-Natal (KZN) reported a high voluntary attrition rate among dental therapists [39]. The study reported that 26% of dental therapists left the profession, of whom 19% returned to university to study dentistry while 7% no longer work in the dental profession. A more recent South African nationwide study of dental therapist attrition reported 40% attrition over a 42-year period and attrition of 9% over the 10-year period of 2009 – 2019 [94]. Voluntary workforce attrition is a major public health problem globally, which may lead to staff shortages. Some of the downstream effects of voluntary attrition are increased workload, unavailability of healthcare workers, and limited access to healthcare, leading to a higher burden of untreated diseases. Furthermore, this has a huge impact on a country's economy [40] Voluntary attrition has been identified as an essential issue that needs to be addressed for workforce planning [40]. There are many reasons why a person might voluntarily leave their job. Previous studies have cited low salaries, lack of access to professional development and further education, lack of effective supervision, weak regulatory environments, isolation for those in rural or remote areas, poor working conditions, large workload, lack of motivation, and low job satisfaction as major contributors to voluntary attrition [40, 52, 53, 54, 65, 95, 96, 97]. Furthermore, studies conducted among midlevel health workers reported that these cadres leave because they are becoming demotivated due to poor career development and promotion prospects, lack of positive supervision, feedback, and recognition, which leaves them feeling unsupported and undervalued as professionals [27, 28, 52, 98, 99]. One study conducted among anaesthetists reported that 47.8% of participants had the intention to leave their profession due to low remuneration and lack of opportunities for professional development [100]. Factors contributing to job dissatisfaction and ultimately attrition can be conceptualized using Hertzberg's Two-Factor Theory **(see Figure 5).** According to this theory, intrinsic factors (motivators) such as recognition, achievement, work itself, responsibility, and advancement, will all lead to job satisfaction; whereas factors that lead to job dissatisfaction include the absence of key extrinsic factors (hygiene factors) such as policies and administration, supervisory practices, salary, interpersonal relations, physical working conditions, benefits and job security [68, 101]. Hertzberg's Two-Factor Theory describes intrinsic factors as motivators that contribute to job satisfaction and extrinsic factors as major contributors to dissatisfaction, if absent [68, 101].

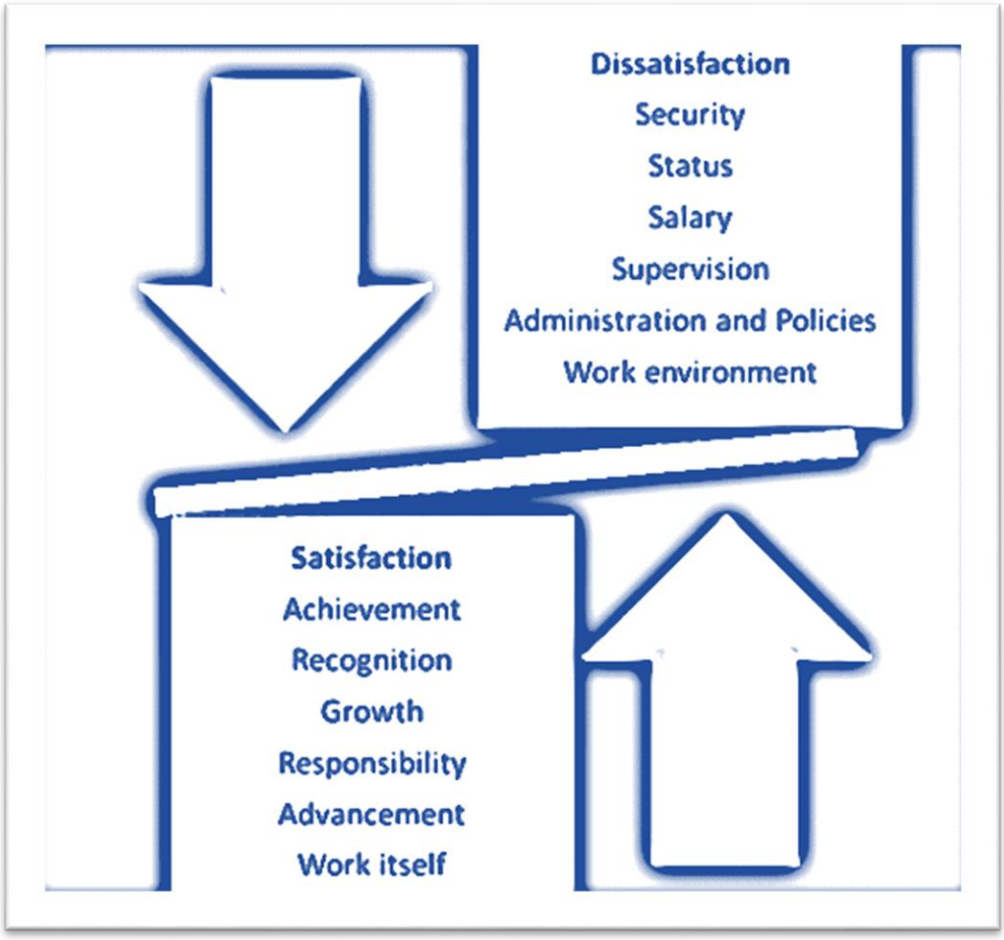

Figure 5 Hertzberg's Two-Factor Theory adapted from literature

A study conducted among different categories of healthcare workers in three countries, including South Africa, reported an association between low job satisfaction and intention to leave [65]. Among the three countries (Tanzania, Malawi, and South Africa), the lowest job satisfaction and the highest intention to leave were in South Africa, where 47.9% of those surveyed were dissatisfied with their current jobs and 41.4% were actively seeking other jobs. Other studies also have reported the intention to leave as the strongest predictor of voluntary workforce attrition [40, 52].

Documenting the factors that contribute to job dissatisfaction, intention to leave and attrition is essential for human resource planning and the development of strategies to reduce voluntary attrition. There is limited information on factors contributing to attrition or an intention to leave the dental therapy profession in South Africa. Hence, the purpose of this study was to investigate factors that impact on job dissatisfaction and the intention to leave the dental therapy profession.

3.2.2. Materials and Methods

Study design

A cross-sectional study was conducted among dental therapy graduates, using an electronic survey instrument called Research Electronic Data Capture (REDCap).

Study population

The targeted study population included all the graduate dental therapists.

Recruitment of participants

Participants were recruited through the online platforms of the South African Dental Therapy Association (SADTA), which had a membership of 200 dental therapy graduates at the time of data collection. The platforms used included emails and WhatsApp groups. Participants were recruited through the link that was generated in REDCap and sent to both their emails and the (SADTA WhatsApp group. Participants were also encouraged to forward the link to other dental therapists who were not members of SADTA. The calculated minimum sample size for this study was 198 based on the total number of dental therapists registered by 2019 (714), using a 90% confidence interval and 5% marginal error [77].

Data collection

The study used a self-administered questionnaire (Annexure B) that was adapted and modified from existing previously validated studies, some of which used the constructs of Hertzberg's two-factor theory of Motivation [27, 28, 78]. These studies captured the predictors of job satisfaction and intention to leave the profession as well as factors contributing to attrition. The questionnaire captured demographics, individual factors, extrinsic factors, and intrinsic factors as well as job satisfaction and intention to leave. The intention to leave the dental therapy profession and job satisfaction were the outcome variables of interest. Job satisfaction was explored as a binary variable (yes/no), as Hertzberg's two-factor theory identified it as the major factor in the decision to quit or stay in a job or profession [52]

Measurement of variables

The questionnaire requested information on sociodemographic characteristics, including age, gender, race, province of residence, highest degree, year of qualification, institution where participants qualified, employment sector, and their year of qualification.

Two additional questions were measured through binary (yes/no) variables: whether dental therapy was the study participants' first choice and if the participants were funded for their dental therapy degree.

Five questions were related to intrinsic variables. These included four binary (yes/no) variables, including the awareness of available postgraduate prospects for dental therapists, whether the dental therapy profession received professional growth, satisfaction with the current dental therapy scope of practice, and one nominal variable such as the stage at which participants became aware of dental therapy scope of practice. Three questions probed extrinsic variables, of which two required binary (yes/no) responses.: These included the availability of job opportunities and whether participants felt that the dental therapy profession was valued like other midlevel health professionals in South Africa, and one numerical variable which included the period that it took for the participants to get a job after graduation. The questionnaire also included an open-ended question to gain insight into participants' reasons behind their dissatisfaction with the dental therapy profession, using their own words. Data were collected between April 2020 and March 2022.

Participation was voluntary and informed consent was obtained electronically from all the participants. The survey link had the information sheet for participants to read and understand the purpose of the study and conditions of their participation which included anonymity and that participation was voluntary; thereafter there was a consent statement informing participants that "by proceeding to complete the survey, they consent to participate in the study.

Data management and analysis

The first author transferred data from REDCap into Excel for cleaning and then transferred the clean dataset to STATA 17, LP, College Station, TX, USA, for analysis [102] Missing cases were excluded from the analysis. Overall, 234 participants participated in the study, of which 34 responses were excluded because they had many missing responses, leaving us with 200 responses. We used descriptive statistics such as frequencies to describe the study sample in terms of socio-demography and key participant characteristics. The proportion that was

satisfied with their jobs or not, and those who had the intention to leave or not, were also determined using descriptive statistics. Associations between either job satisfaction or intention to leave and participant's characteristics were explored using bivariate analysis. All significant exposure variables were included in the multivariable logistic regression model. We reported adjusted odds ratios, their corresponding 95% confidence intervals and p-values. A p-value <0.05 was considered statistically significant.

Thematic analysis was used to analyse the open-ended questions, following the process detailed by Braun and Clarke, 2006: through gaining familiarity with the data; generating initial codes or labels: searching for themes or main ideas; reviewing themes or main ideas; defining and naming themes or main ideas; and producing the report. The first author led this analysis, with support from the last author at the stage of reviewing and defining themes. These findings were then triangulated with qualitative data to verify and elaborate on findings.

3.2.3. Results

The responses of 200 dental therapist graduates were included in the final analysis. **Figure 6** below shows that most participants resided in KwaZulu-Natal and Gauteng (33.0% and 32.0% respectively)

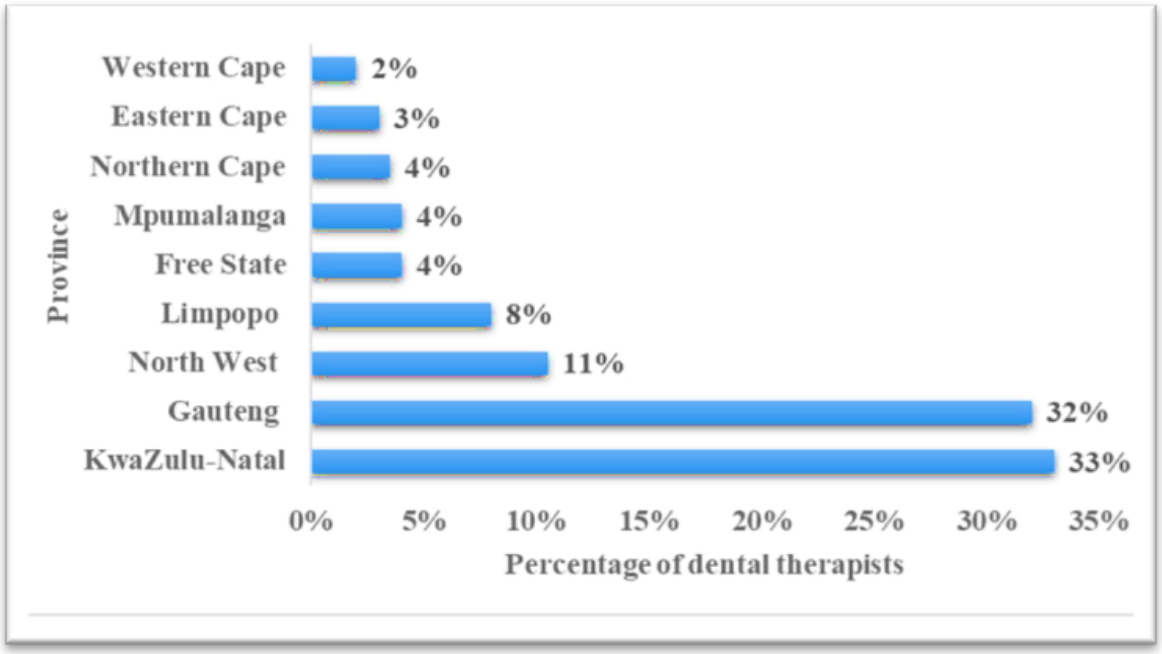

Figure 6 Distribution of the dental therapist by province

Table 4 shows that the average age of the participants was 38 years. The sample was dominated by females (62.0%), those self-identified as African races (74.5%), and those who never had dental therapy as their first choice at the time of enrolment (52.5%). Just above half (53.5%) reported that they had no job opportunities after graduation. More than two-thirds (78.5%) were unaware of the dental therapy scope of practice until after enrolment, with 67.5% reporting dissatisfaction with the dental therapy scope. Most (67.9%) worked in the private sector, while only 24.6% had a postgraduate qualification. A vast majority 90.5% believed that the dental therapy profession did not support career development, and 93.0% indicated that the profession was not valued in South Africa. Job dissatisfaction was high at 69.5% and over half (51.5%) expressed their intention to leave their profession.

Table 4 Key characteristics of the study sample of dental therapists

Variables	**Categories**	**Totals** **n (%)**
Gender	Female	124 (62.0)
	Male	76 (38.0)
Race	African	149 (74.5)
	Indian	51 (25.5)
	Coloureds	0
	Whites	0
* Which institution did you qualify?	UKZN	100 (50.8)
	Smu	97 (49.2)
Was dental therapy 1st choice for study?	No	105 (52.5)
	Yes	95 (47.5)
Was your dental therapy degree funded?	No	91 (45.5)
	Yes	109 (54.5)
*When did you qualify?	1977 – 1999	56 (28.4)

	2000 - 2009	80 (40.6)
	2010 – 2019	61 (30.9)
* Did you have a job post-graduation	No	106 (53.5)
	Yes	92 (46.5)
When did you get aware of dental therapy scope of profession?	Before registration	43 (21.5)
	After registration	157 (78.5)
Are you satisfied with dental therapy scope?	No	135 (67.5)
	Yes	65 (32.5)
*Where do you work?	Private	129 (67.9)
	Public	61 (32.1)
*Are you aware of postgraduate opportunities for dental therapists?	No	110 (55.3)
	Yes	89 (44.7)
*What is your highest qualification?	Bachelor's only	150 (75.4)
	Post bachelors	49 (24.6)

*Do dental therapists get career development like other mid-level health professionals?	No	180 (90.5)
	Yes	4 (2.0)
	Do not know	15 (7.5)
Are dental therapists valued like other mid-level health professionals	No	186 (93.0)
	Yes	14 (7.0)
* Are you satisfied with your job?	No	137 (69.5)
	Yes	60 (30.5)
Do you intend to leave dental therapy profession?	No	97 (48.5)
	Yes	103 (51.5)

*Varying total because of missing values.

Job satisfaction among the dental participants

As shown in **Table 5**, several factors were associated with job satisfaction in bivariate analysis. There was an association between job satisfaction and the institution where participants qualified; those who qualified from SMU were more satisfied with their jobs as compared to those who qualified from UKZN (66.1% vs 33.9%). The majority of those who never had dental therapy as their first choice in university were more satisfied than those whose first choice was dental therapy (66.7% vs 33.3%). Those who had job opportunities available after graduation were more satisfied with their jobs as compared to those who had no jobs (68.3% vs 31.7%). There was a significant association between awareness of and access to postgraduate opportunities, the majority (67.8%) of those who were aware of postgraduate opportunities were satisfied with their jobs.

In contrast, a large majority (81.8%) of those who only became aware of dental therapy scope of practice after enrolling for the degree, were dissatisfied with their jobs. Surprisingly, more than two-thirds (76.7%) of those who were not satisfied with the scope of practice were satisfied with their jobs. Almost all (97.8%) of those who believed that dental therapists are not as valued as other mid-level health professionals in South Africa were dissatisfied with their jobs.

Table 5 Job satisfaction among the dental participants

Characteristic	**Category**	S**atisfied** with your job				
		no		yes		P value
		N	%	N	%	
***Age**	Mean	38.4	9.84	39.1	10.4	0.64
***** Gender	Female	84	61.3	37	67.7	0.96
	Male	53	38.7	23	38.3	
***** Race	African	106	77.4	42	70.0	0.27
	Indian	31	22.6	18	30.0	
* Which institution did you qualify?	UKZN	79	58.5	20	33.9	**0.002**
	Smu	56	41.5	39	66.1	
* Was dental therapy your first the choice for study	No	64	46.7	40	66.7	**0.01**
	Yes	73	53.3	20	33.3	
*Was your dental therapy degree funded?	No	57	41.6	31	51.7	0.19
	Yes	80	58.4	29	48.3	
	Bachelor's only	104	76.5	44	73.3	0.63

* What is your highest qualification?	Post bachelors	32	23.5	16	26.7	
* When did you qualify?	1977-1999	39	28.9	17	28.8	0.97
	2000-2009	55	40.7	25	42.4	
	2010-2019	41	30.4	17	28.8	
*Did you have a job post-graduation?	No	86	63.2	19	31.7	**<0.001**
	Yes	50	36.8	41	68.3	
Where do you work?	Private	85	65.4	44	73.3	0.27
	Public	45	34.6	16	26.7	
*When did you get aware of dental therapy scope of profession?	Before registration	25	18.2	18	30.0	**0.06**
	After registration	112	81.8	42	70.0	
*Are you satisfied with dental therapy scope?	No	86	62.8	46	76.7	**0.05**
	Yes	51	37.2	14	23.3	
*Are you aware of postgraduate opportunities for dental therapists?	No	89	65.0	19	32.2	
	Yes	48	35.0	40	67.8	**<0.001**
	No	134	97.8	49	81.7	**<0.001**

*Are dental therapists valued like other mid-level health professionals	Yes	3	2.2	11	18.3	

*Varying total because of missing values.

All characteristics that had a p-value of 0.20 or lower were included in the multivariable logistic regression. As shown in Table 6, some factors were no longer significant after adjustment, such as age, dental therapy being their first choice, whether their studies were funded, and whether they were satisfied with the dental therapy scope of practice. However, many factors remained significant after adjustment. For instance, the odds of reporting job satisfaction were over 2.28 times higher if the individual was a graduate of UKZN (AOR= 2.28, CI (Confidence Interval): 1.06-4.91), and 3.87 times higher among those who had job opportunity available after graduation ad (AOR=3.87, CI: 1.73-8.69). Reporting awareness of postgraduate opportunities available for dental therapists was associated with much higher odds of job satisfaction (AOR=2.28, CI: 1.05-4.96). Unsurprisingly, those who believed that their profession was valued also had significantly higher odds of job satisfaction (AOR= 6.19, CI: 1.45-26.36). Conversely, those who only became aware of the dental therapy scope of practice after enrolment had significantly lower odds of reporting job satisfaction (AOR=0.31, CI: 0.12-0.81).

Table 6 Predictors of job satisfaction among the dental therapists: multivariable regression model

Characteristic	**Categories**	**Adjusted or**	**95% CI**	**P-value**
Age	Mean (SD (Standard Deviation))	0.99	0.96-1.03	0.72
Which institution did you qualify?	SMU	1		
	UKZN	2.28	**1.06-4.91**	**0.04**
Was dental therapy your first the choice for study?	No	1		
	Yes	0.72	0.32-1.61	0.42
Was your dental therapy degree funded?	No	1		
	Yes	0.89	0.41-1.96	0.78
Did you have a job post-graduation?	No	1		
	Yes	3.87	**1.73-8.69**	**0.001**
When did you get aware of dental therapy scope of profession?	Before registration	1		
	After registration	0.31	0.12-0.81	**0.02**
Are you satisfied with dental therapy scope?	No	1		
	Yes	0.53	0.21-1.30	0.17
Are you aware of postgraduate opportunities for dental	No	1		
	Yes	2.28	**1.05-4.96**	**0.04**
Are dental therapists valued like other mid-level health professionals?	No	1		
	Yes	6.19	**1.45-26.36**	**0.01**

The responses to open-ended questions about job dissatisfaction provided additional insights on what was contributing to their feelings, with the responses corresponding to the quantitative results that emphasized issues like career opportunities and whether they felt valued. We classified these themes into broad intrinsic and extrinsic factors as stipulated in the Hertzberg framework.

Intrinsic factors

There were three themes related to intrinsic factors: lack of respect, limited responsibility, and limited career growth. While these all related to lack of recognition as professionals, which was also significant in the quantitative analysis, the qualitative responses enabled us to explore the reasons underlying their responses.

Participants believed that their role within the health system was not well understood; hence, other health professionals undermined and took advantage of them. A common theme that emerged from their responses was the **lack of respect or appreciation** afforded to those in the dental therapy profession. This included allusions to the racialised nature of the profession and its historical role in the apartheid government:

> *Leadership viewed us as second-class dentists, who are also incompetent. Everyone looked down upon us: employers, government, dentists, medics, institutions, including other races (we are mostly black).* (Female,54)

> *We are seen as robots and enslaved people and get undermined a lot. The way other professions think of dental therapists and react to them demonstrates a disregard for the profession. The State as the employer sees dental therapists as instruments or cheap labour just as apartheid aimed it to be.* (Male, 34)

Participants linked this disrespect to a second theme of being given **limited responsibility**. For instance, some described being overlooked for management positions or promotion opportunities. Reinforcing the idea of being treated as 'second-class' citizens, one female dental therapist (age 28) complained: *"We are hardly recognized and given responsibility. Always expected to work under a dentist."*

Limited career growth was a third theme that caused great dissatisfaction among dental therapists. They felt that they played a critical role in-service provision, yet they perceived few career growth opportunities, going beyond what the survey measured. One explained:

Options to study further are mainly in public health and when you are done there are no posts that are designed for dental therapists who did MPH (Master of Public Health) (master's in public health), or anything related to that. Even if you do the postgraduate diploma in dental public health, there will be no post for you in government. You are supposed to apply for the ordinary post like any person with an undergraduate degree (Male, 32)

Extrinsic Factors

We identified five themes related to extrinsic factors: limited job opportunities, inequitable remuneration, unfair medical aid practices, government disregard, and poor interpersonal relations.

While these all related to job satisfaction, which was also significant in the quantitative analysis, the qualitative responses enabled us to explore the reasons beyond their job satisfaction. The intrinsic sense of frustration about career growth opportunities was reflected in the extrinsic theme of there being **limited job opportunities**. The following example highlights how the absence of jobs in the public sector has driven some to shift into the private sector, despite the need for dental therapists in the public sector.

[There are] no job opportunities in the public sector and demand for mid-level workers to provide primary health care is high. The implementation of NHI (National Health Insurance) will need the mid-level worker to strengthen oral health promotion and prevention in the integrated school health programme. Because no one, not even our own Government, and the Department of Health has space for us. We are trained so that post-graduation we fend for ourselves in the private sector, which predisposes us to be underpaid and overworked (Female, 51)

The other themes related to extrinsic factors focused on dental therapists' exclusion from or poor implementation of policies and regulations, particularly in relation to remuneration and recruitment. The most common source of dissatisfaction related to **inequitable remuneration**, with dental therapists often comparing their earnings to those of others. For instance, one female dental therapist (age 30) complained, *"In medical aids reimbursement, we do the same procedures with dentists that require same materials, but we get paid less."* This dissatisfaction was expressed from dental therapists in all sectors (academic, public, and private). For instance, participants from the academic sector were not happy about earning the same salary as those

in the public sector, while doing both academic and service delivery duties. Even within the public sector, there was a sense that low salary and benefits undermined their role:

> *Recently I checked the OSD (Occupational Service Dispensation) scale only to learn that oral hygiene entry-level post pays a lot more than a dental therapy post…. Salary levels and other benefits are not aligned with other health professionals in public institutions. The question is what informs the salary scale of professions if not the scope of practice (Male, 30)*

A closely related theme had a narrow focus on the practices of unfair medical aid schemes, which focused on how participants believed that medical aid schemes are unfair to dental therapists in terms of remuneration. In one case, a study participant left the profession as a consequence: *I felt abused by the system with less remuneration in all aspects, at both public and private sectors. In government, it was worse. …The unregulated medical aid schemes were also not remunerating us according to the work done, but less or no payments due to the fact that we are therapists. I felt that we were not protected by anyone against this abuse. I had to leave the profession (Female, 54).*

Some of the complaints about medical aid structures were very specific:

> *Medical aids dictate what should be done by therapists, e g. you can't treat more than 4 teeth in a year while patients might require more. These limitations are not there for other professionals* (Female, 30)

Participants felt that dental; therapy profession was **disregarded by the government.** Two examples were mentioned by participants who believed that dental therapists were excluded from policies such commuted overtime and community service where other health professionals were included:

> *The government refuses to give us community service programme immediately after graduation in the public sector but instead provides it to other professions. We are thus not recognized and not taken seriously.* (Male, 23)

Finally, intricately linked to the intrinsic theme of lack of respect, some participants also reported **poor interpersonal relations**. One female dental therapist (age 30) lamented: *"There is hatred and discrimination against the dental therapy profession everywhere, from dentists, management, medical aid administrators, etc."* Other dental therapists used words like 'discrimination' and 'oppression' to describe the way they were treated. As one explained, this type of treatment also affected their relationship with patients:

We are taken for granted and there is so much oppression. We are also believed to not know or carry out our scope of practice with excellence that leads to patients not trusting us (Female, 31)

Intention to leave among the dental participants

Table 7 shows the bivariate analysis of intention to leave and its correlates. There was a significant association between intention to leave and age, race, funding for dental therapy degree, highest qualification, year of qualification, and job satisfaction. Younger participants had the intention to leave their jobs than the older participants. Those participants who identified as African race reported high intention to leave (83.5%). High intention to leave was reported among those participants who were funded for their dental therapy degree (63.1%). More than two-thirds (81.4%) of participants did not have post-graduate qualifications. High intention to leave was reported among those participants who qualified between the years 2000-2009, and between 2010-2019 (43.1% and 41.2% consecutively). The majority (82.2%) of participants who were not satisfied with their jobs reported high intention to leave. Finally, although not significant, high intention to leave was reported among the majority of participants who reported that the dental therapy profession was not valued in South Africa (96.1%).

Table 7 Intention to leave among the study participants

Characteristic	Categories	no		yes		P-value
		N (%)	%	N	%	
Age	Mean	41.8	10.7	35.2	8.29	**<0.001**
Gender	Female	57	58.8	67	65.0	0.36
	Male	40	41.2	36	35.0	
Race	African	63	65.0	86	83.5	0.003
	Indian	34	35.0	17	16.5	
***** Which institution did you qualify?	UKZN	49	51.6	51	50.0	0.82
	Smu	46	48.4	51	50.0	
***** Was dental therapy your first choice for study**?**	No	56	57.7	49	47.6	0.15
	Yes	41	42.3	54	52.4	
Was your dental therapy degree funded	No	53	54.6	38	36.9	**0.01**
	Yes	44	45.4	65	63.1	
***** What is your highest qualification**?**	Bachelor's only	67	69.0	83	81.4	**0.04**
	Post bachelors	30	30.9	19	18.6	
*****Which year qualified?	1977-1999	40	42.1	16	15.7	**<0.001**
	2000-2009	36	37.9	44	43.1	
	2010-2019	19	20.0	42	41.2	
***** Did you have a job post-graduation**?**	No	52	53.6	54	53.5	0.98
	Yes	45	46.4	47	46.5	

***** Where do you work?	Private	64	67.4	65	68.4	0.87
	Public	31	32.6	30	31.6	
When did you get aware of dental therapy scope of profession?	Before registration	25	25.8	18	17.5	0.15
	After registration	72	74.2	85	82.5	
Are you satisfied with dental therapy scope?	No	65	67.0	70	68.0	0.89
	Yes	32	33.0	33	32.0	
***** Are you satisfied with your job?	No	54	56.3	83	82.2	**<0.001**
	Yes	42	43.7	18	17.8	
***** Are you aware of postgraduate opportunities for dental therapists?	No	53	54.6	57	55.9	0.86
	Yes	44	45.4	45	44.1	
Are dental therapists valued like other mid-level health professionals?	No	87	89.7	99	96.1	0.07
	Yes	10	10.3	4	3.9	

* Varying totals because of missing values.

Predictors of the intention to leave.

All variables that had a p-value of 0.20 or lower were included in the multivariable logistic regression. As shown in Table 8 some factors were no longer significant after adjustment, such as having dental therapy as first choice of study, being funded for dental therapy degree, highest degree obtained, year of qualification, awareness of dental therapy scope of practice, and reporting that dental therapy profession is valued in South Africa. However, other factors remained significant after adjustment. For instance, the odds of reporting the intention to leave lower if the individual was older (AOR= 0.93, CI: 0.86-0.99); from the as Indian race group (AOR=0.30, 95% CI: 0.13-0.72), and satisfied with their jobs (AOR= 0.25, CI: 0.21-4.16).

Table 8 Intention to leave among the dental participants: multivariable regression model

Characteristic	Categories	Adjusted or	95% CI	P-value
Age	Mean (SD)	0.93	**0.86-0.99**	**0.04**
Race	African	1		
	Indian	0.30	**0.13-0.72**	**0.01**
Was dental therapy your first choice?	No	1		0.74
	Yes	0.89	0.44-1.78	
Was your dental therapy degree funded	No	1		0.22
	Yes	1.55	0.76-3.16	
What is your highest qualification?	Bachelor's only	1		0.72
	Post bachelors	1.86	0.38-1.97	
Which year did you qualify?	1977-1999	1		
	2000-2009	1.62	0.52-5.02	0.41
	2010-2019	1.28	0.21-7.64	0.78
When did you get aware of dental therapy scope of profession?	Before registration	1		0.48
	After registration	0.72	0.29-1.78	
Are you satisfied with your job?	No	1		**0.001**
	Yes	0.25	**0.11-0.57**	
	No	1		

Are dental therapists valued like other mid-level health professionals?	Yes	0.93	0.21-4.16	0.93

3.2.4. Discussion

The study explored job satisfaction and intention to leave among South African dental therapists. The results indicated that only 30.5% of the participants reported being satisfied with their jobs, while 51.5% expressed their intention to leave the profession. The study also found a significant association between job satisfaction and the intention to leave. Those who reported higher job satisfaction were less likely to consider leaving their jobs, which aligns with Hertzberg two-factor theory. Therefore, the study suggests that employers should prioritize employee satisfaction to reduce attrition.

Our study sample was dominated by African race (74.5%). This was expected as it is aligned with the South African racial profile, where 81% of citizens are Africans [103]. Another plausible reason is the fact that dental therapists in South Africa are only trained at two Historically Black Universities. Similar studies conducted amongst a 10-year cohort from these two Universities reported that 78.8% of students from UKZN and 93.3% from SMU belonged to the African race [44, 104]. A recent South African national review of HPCSA records also revealed that most South African dental therapists (64%) were Africans [94].

This study revealed that dental therapists in our sample predominantly resided in KZN and Gauteng, which are the only two provinces where training is provided. These findings are consistent with a recent review of HCPSA records, showing an unequal distribution of dental therapists across South African provinces, with a majority located in KZN (44%) and Gauteng (27%) [94]. To ensure equitable distribution of dental therapists throughout the country, it is crucial to expand training of dental therapists to other provinces to ensure a more balanced distribution of dental therapists throughout the country.

Most of our participants worked in the private sector, similar to a previous study on UKZN dental therapy graduates where 47% were in private practice 10. This trend is also seen among dentists, with 70%-80% working in the private sector, which serves about 20% of South Africa's population [36]. The shift towards the private sector is partly due to limited job opportunities in the public sector and other contributing factors related to job dissatisfaction, as mentioned in the qualitative responses of our study. To address dissatisfaction among public sector dental therapists, government efforts should focus on reviewing and properly

implementing policies related to recruitment, retention, and remuneration to attract and retain more dental therapists.

Most participants in our study expressed job dissatisfaction. Factors influencing our participants' job dissatisfaction included the institution where participants qualified, availability of job opportunities, awareness of scope, and feeling valued. These findings align with similar studies conducted in South Africa, the United Kingdom, and New Zealand [25, 47, 105, 106]. However, Australian dental therapists reported satisfaction in aspects such as the work itself, supportive environment, career development, autonomy, and professional recognition. In contrary to our findings, a study in West Ethiopia also found that greater recognition for outstanding performance correlated with higher job satisfaction [25, 106], consistent with Hertzberg's two-factor theory [107]. Addressing perceptions of "lack of respect" and "poor recognition" can be a cost-effective strategy for retaining experienced healthcare professionals.

The lack of career pathing was a significant factor contributing to job dissatisfaction among our participants. Only one-third had post-graduate qualifications, and most were unaware of available postgraduate opportunities. Those with advanced qualifications (master's and Doctorates) expressed frustration as their qualifications had no impact on their scope of practice or remuneration. This lack of career growth has been linked to job dissatisfaction and the intention to leave in previous studies [26, 40]. Universities should introduce recognized post-graduate programs that expand the scope of practice for dental therapists, aiming to attract and retain more professionals in the field. The University of Rwanda provides a successful example with their honors and masters' programs in dental therapy, which have expanded the scope of practice and resulted in no reported attrition in the country [108].

Availability of job opportunities post-graduation was associated with high job satisfaction in our study. Participants who had jobs after graduation reported higher satisfaction. However, dental therapists are currently excluded from community service that provides jobs immediately after graduation for other professionals. Additionally, community service helps to enhance professional development and career prospects post-graduation. It is crucial for the

government to include dental therapists in community service to improve coverage and address the burden of untreated oral diseases [9].

Poor remuneration was a significant factor contributing to job dissatisfaction among participants in our study across private, public, and academic sectors. Dental therapists in the academic sector felt undervalued as they performed both service delivery and teaching but received the same salary as those solely focused on service delivery. Public sector participants expressed dissatisfaction with low salaries, while those in the private sector faced frustration with smaller reimbursement fees from medical aid compared to dentists for the same procedures within their scope of practice. Similar studies among dental therapists in South Africa have reported similar frustrations with remuneration [27, 28]. These call for improvement of dental therapy salaries and financial benefits for those employed in both public sector and academic sectors.

This study has limitations, including potential selection bias due to the non-representative sample of 200 participants, limiting the generalizability of the findings to the entire South African dental therapy profession. However, a strength of the study is the inclusion of qualitative responses that provide additional insight into participants' answers. Future research should employ a qualitative approach to gather more in-depth information on factors contributing to attrition, particularly from dental therapists who have left the profession.

3.2.5. Conclusion

Job dissatisfaction and intention to leave among dental therapists in South Africa are prevalent issues. This study identified intrinsic and extrinsic factors contributing to job dissatisfaction. The frustration experienced by dental therapists undermines efforts to achieve universal coverage and hinders the utilization of midlevel health workers. The high intention to leave and job dissatisfaction have negative economic implications as resources invested in training dental therapists who ultimately leave the profession are wasted. Managers, universities, policymakers, decision-makers, regulators, and medical aid administrators can address these issues by implementing strategies to recruit and retain dental therapists in South Africa. Addressing these identified modifiable factors is crucial for human resources planning, to retain dental therapists within their profession. Of priority is the need to review and revise policies

around recruitment and retention of dental therapists, career pathing and remuneration of dental therapists in both private and public sectors. Beyond retention of existing dental therapists, South Africa also needs to act on strategies to expand dental therapy training offerings, with particular attention to proactive recruitment strategies for candidates from underserved parts of the country. In acting on the findings of this study, there is an opportunity to ultimately provide increased access to basic oral health services to underserved populations in South Africa.

3.3. EXPLORING REASONS WHY SOUTH AFRICAN DENTAL THERAPISTS ARE LEAVING THEIR PROFESSION: A THEORY-INFORMED QUALITATIVE STUDY

This presents a qualitative study conducted among dental therapists who left the profession to get insight of their lived experiences as dental therapists and factors that contributed to them leaving the profession. The published version of the manuscript in PLoS ONE Journal can be found at https://doi.org/10.1371/journal.pone.0293039.

3.3.1. Background

Dental therapy is a category of mid-level oral health profession that was introduced to the South African health system in 1977 to meet the population's oral health needs and to address inequities in oral health service provision [19, 20, 44]. The scope of dental therapy focuses on the holistic care of patients, which ranges from the prevention of oral disease and oral health promotion to the alleviation of pain, sepsis, and other diseases such as gingivitis, periodontitis, and dental caries [34]. Dental therapists' function is preventive, promotive, and intra-oral restoration of dental tissues, at primary and secondary levels. They treat and prevent the most prevalent oral health problems in South Africa, such as dental caries [9]. They are considered to be economically sustainable mid-level health professional category because the salary of one dentist is equivalent to employing two to three dental therapists [21]. The dental therapy profession falls within the World Health Organization's (WHO) Global Strategy on Human Resources for Health (HRH): Workforce 2030, which acknowledges mid-level health workers as having a critical role to play across all service delivery priorities [109].

Both globally and within South Africa's current context, dental therapists can play an important role in addressing the oral health burden. Many scholars globally argued that dental therapists could be part of the solution to achieving access to basic oral health services and lowering the burden of untreated oral health diseases, especially among underserved populations [9, 19, 20, 35, 86]. The WHO, in 2023, 44% of the population in the African region suffer from oral disease, and the last national South African oral health survey reported that 80% of children have untreated oral diseases (unmet need) [9]. In addition to a high prevalence of untreated oral health diseases, there is also limited access to basic oral health services. A South African study conducted in Western Cape reported that only 31.5% of 128 dental facilities offered the basic treatment package [14]. As set out in the primary health care norms and standards document, this includes the provision of pain and sepsis treatment, basic fillings, scaling and polishing, as

well as prevention and oral health promotion [63]. The major contributing factor to this low oral health service coverage was unavailability of dental professionals, especially in the remote areas, as well as lack of equipment [14]. Western Cape is among the provinces with the highest percentage of dental caries, and it has. There is currently one dental therapist employed in the public sector in the Western Cape province out of the 714 that was registered in SA in 2019 [94]. Only two out of six dental schools in South Africa train dental therapists, which raises concerns about production of this cadre of mid-level oral health professionals [93].

While dental therapy provides a potential way to increase oral health service coverage within a resource constrained context, attrition within the profession poses a potential threat, beyond low production levels. Dental therapist attrition has been reported globally; a study conducted among Australian dental therapists who were registered over a five-year period (1999-2003), reported that 28% of participants left the profession for variety of reasons such as family, career change, poor salaries, relocation, illness and injury, and stress [26]. Attrition and underproduction have been reported by Sodo et.al [94]. The numbers of registered dental therapists remain low because some choose to leave the profession due to dissatisfaction or to start new careers [28, 39]. A recent 42-year (1977-2019) review of South African dental therapists reported low number of dental therapists being registered with the Health Professions Council of South Africa (HPCSA) annually, a 40% attrition rate over the review period and a 9% attrition rate for the ten-year period between 2010 and 2019 [94]. Another South African regionally based study conducted among University of KwaZulu-Natal (UKZN) graduates reported that 26% of dental therapists in their sample left the profession, of whom 19% returned to university to study dentistry while 7% no longer worked in the dental profession due to job dissatisfaction [39].

There are various reasons that contribute to voluntary attrition, with the Hertzberg Two-Factor Theory providing a framework to explore the issue of employee retention in this study. The theory suggests that attrition is influenced by intrinsic (also called motivation) factors and extrinsic (also called hygiene) factors) [68]. According to Herzberg Two Factor Theory, extrinsic factors (such as salary, working conditions, and job security) are essential for preventing dissatisfaction, but they do not directly lead to motivation or job satisfaction [68]. When extrinsic factors are absent or inadequate, employees may experience dissatisfaction and become more prone to leaving the organization. If these factors are not met, employees may feel dissatisfied, unappreciated, or undervalued, which can contribute to their decision to seek opportunities elsewhere. In other words, if extrinsic factors are not addressed, they may

inadvertently increase the risk of attrition. On the other hand, intrinsic factors (such as recognition, challenging work, and opportunities for growth) are crucial for promoting job satisfaction and motivation [68]. When these factors are present, people are more likely to feel fulfilled and engaged in their work, which can reduce the likelihood of attrition. Motivated employees who find their work meaningful and rewarding are more likely to remain within their jobs and contribute to their success.

Although the Herzberg's Two-Factor Theory is useful to identify individual-level factors that influence job satisfaction and dissatisfaction in the workplace, it does not explicitly address broader systemic or organizational factors that might affect job satisfaction at a higher level, such as structural issues within a health system [68]. Therefore, when evaluating and addressing job satisfaction and motivation within a health system or any other organization, it is necessary to consider using other frameworks such as Human Resources for Health System Development (HRHSD) framework to address the health system issues [74].

Various factors have been identified as driving the voluntary attrition of mid-level health professionals and specifically dental therapists. Studies from South Africa and Australia consistently cite the lack of jobs and promotion opportunities, lack of recognition, poor salaries, limited scope, lack of career pathing, poor working conditions, and lack of resources as the main sources of frustration and job dissatisfaction [26, 27, 68]. Several studies have reported that this dissatisfaction led to them leaving the profession [26, 28, 39]. Studies reported that some dental therapists who leave their profession go back to university to study medicine or dentistry, while some ventured into unspecified businesses [28, 39].
None of the above-mentioned study included the dental therapists who left as participants, hence this study sought to explore the reasons why dental therapists in South Africa are leaving their profession. from the perspectives of former dental therapists.

3.3.2. Methods

Study design

This study utilizes an exploratory qualitative design of dental therapy attrition, privileges the first-hand experiences of the subject matter. This study was guided by Hertzberg two-factor theory.

Study setting

The study was conducted in all nine provinces of South Africa, namely, the Eastern Cape, the Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, the Northern Cape, North-West, and the Western Cape.

Study participants

All the dental therapists who have left the profession were eligible to be included in the study.

Sampling and recruitment of participants

The study employed a snowball sampling technique to gather participants from the pool of former dental therapists, a process conducted between March 1, 2020, and June 30, 2022. Initial recruitment involved a combination of participants known to the researchers and those identified through the HPCSA database (for those registered as dentists, medical doctors, or dental specialists). The database had information of participants from all the nine South African Provinces. The first author (PS) took the initiative in searching for contact details of potential participants from various sources such as medical pages. These identified individuals were then contacted and extended invitations to participate in the study. To expand the participant pool, a respondent-driven sampling approach was employed. Following each interview, PS requested participants to help in sharing study information with other former dental therapists. Interested participants were then granted permission by these colleagues to provide their contact details to PS for recruitment purposes. This method aimed to create a network or snowball effect, wherein participants took an active role in recruiting others within their professional circles. This approach facilitated the expansion of the sample size and allowed for a more diverse range of perspectives to be included in the study.

Data collection tool

A semi-structured interview schedule was developed for data collection. The interview guide included questions related to participants' motivation behind choosing a dental therapy career, their lived experiences, as well as their reasons for leaving the profession. The questions asked were based on literature and Hertzberg two-factor theory. After review for content validity and clarity by researchers, the interview schedule was piloted with three former dental therapists who were not included in this study. No changes were made following the pilot.

Data collection process

Eligible dental therapists who consented to participate were given an option to either be interviewed in person (at their workplace/homes) or virtually (on Zoom or Teams). PS, herself a female dental therapist by training who now works as an academic, conducted semi-structured in-depth interviews (IDIs) to explore the reasons for attrition in the dental therapy profession with former dental therapists (see Supplemental File 1). PS is an MPH graduate and a PhD candidate with experience in conducting in-depth interviews, and she had no relationship with the participants prior to the study The interviews lasted between 20-45 minutes and were audio recorded with the participant's permission. All interviews were conducted in English. Some interviews were conducted in person, and some were virtual due to COVID 19 restrictions and based on participants' preferences. Detailed field notes were taken during data collection that contained the events, conversations and behaviours observed during the IDIs, and the researcher's reflections on them. The first author decided to end interviews at the point of saturation, in that no new ideas or experiences were being raised by study participants.

Data analysis

Digital recordings of the interviews were transcribed verbatim by a professional service provider. Following transcription, PS listened to all the audio recordings while reading the transcripts to ensure completeness of the data. A team conducted thematic analysis to analyse the data, following the process detailed by Braun and Clarke, 2006: through gaining familiarity with the data; generating initial codes or labels; searching for themes or main ideas; reviewing themes or main ideas; defining and naming themes or main ideas; and producing the report [110]. PS was aware of her own bias as a former dental therapist, hence three more researchers

who are not dental therapists were involved in the data analysis. The transcripts were read repeatedly for familiarization with the data by four of the authors, PS, YM_K (dental specialist) AM (oral hygienist), and SJ (one of the first author's supervisors who is a non-dental health professional). This permitted the identification of ideas, making observations, and getting insights and inferences. Upon familiarizations with the data, three researchers (PS, YM-K, AM) generated initial codes to guide the development of the coding template that was used for identifying the rest of the codes. Coding was conducted until no further codes were identified and the research team felt that the ideas from the interviews were fully covered. Indexing and charting of the data involved merging the codes into patterns of similarities and differences and aligning them to themes and sub-themes. The data were integrated as we assessed the links among data from participants; this was done and finalised in a meeting by the four researchers (PS, SJ, YM-K, and AM).

3.3.3. Trustworthiness

To ensure trustworthiness, the data was shared with some of the participants to give them an opportunity to clarify the data, and there was no feedback received from participants. This was part of respondent validation and establishing the credibility of data as articulated by Lindheim To ensure the dependability of the findings,[20] the last author (SJ) cross-checked the entire analysis process; any discrepancies were resolved by the co-authors. All the authors (PS, SJ, YK, AM, VY and MN) reviewed the final document.

3.3.4. Ethical considerations

Ethical approval to conduct the study was obtained from the University of the Witwatersrand's Medical Human Research Ethics Committee (HREC), certificate #M190686. During the recruitment process, participants were reassured that the study was entirely voluntary, and their information would be kept confidential. On the day of the interview, PS obtained written informed consent from all respondents for both participation in the study and for audio-recording, consent was signed and emailed prior to virtual interviews. To safeguard participants' anonymity, codes were used instead of names.

3.3.5. Findings

A total of 14 IDIs were conducted with former dental therapists, 11 female and 3 males. While gendered patterns were considered during analysis, nothing was identified to suggest experiences were different by gender, although the gender of participants is noted in verbatim quotes.

Three organising themes (motivation, extrinsic and intrinsic factors) were identified, of which two (extrinsic and intrinsic factors) were deductively from Herzberg's Two-Factor Theory to categorise the data.[68] The first theme, motivation refers to what attracted the participants to the dental therapy profession, at the point of training, while extrinsic and intrinsic themes were used to identify the factors that pushed participants away from the dental therapy profession. Using these organising themes enabled categorisation of additional themes and sub-themes, identified inductively from the data. These themes and sub-themes were expressed directly by the (former) dental therapists. **Figure 7** summarises the main themes and seven related sub-themes identified from qualitative interviews under each of the three organising themes.

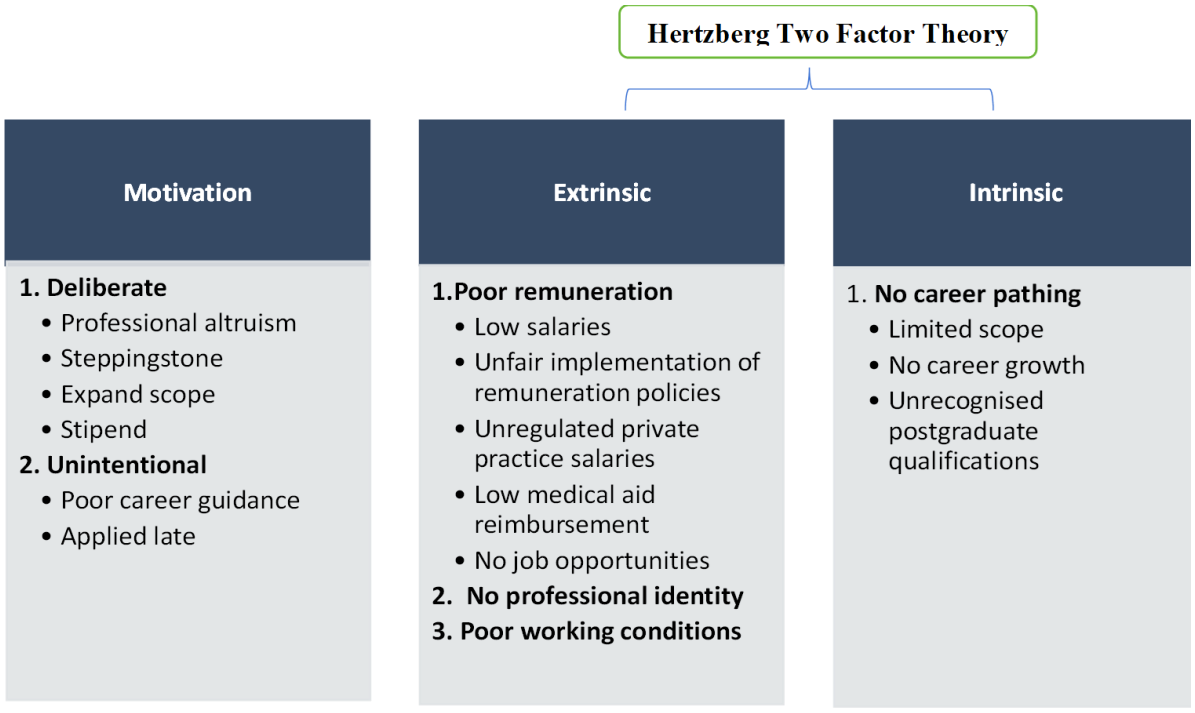

Figure 7 Themes and sub-themes linked to dental therapy job motivation and job dissatisfaction

Themes Related to Motivation

While some dental therapists made a deliberate decision to enrol in the profession, a key finding was that not all participants wanted to be dental therapists. Some found themselves in the profession unintentionally. Those who **deliberately** joined the profession, as denoted in our first theme, had several reasons for doing so.

The first reason was ***professional altruism***. Some participants saw the gap in service delivery from their communities and then took an informed decision to enrol in a dental therapy degree out of their desire to become dental therapists and provide beneficial services for the community. One participant said: *"I came to dental therapy because I love it and I knew that I could do something for my people, so I knew if I could do dental therapy then I would be able to service my community" (DT 8, female).* Many participants also described used dental therapy as a ***stepping stone*** to get into their desired professions. This included former dental therapists who did not obtain satisfactory results or scores to get immediate acceptance to their desired degrees such as dentistry or medicine. These participants had no interest in becoming dental therapists; hence, they obtained their dental therapy degrees and left the profession.

I have always had an interest in a career in dentistry, but what happened when I completed school in matric, I was not able to get straight into dental school. I did not get into Wits, but then I got into the University of UDW (University of Durban Westville) for a degree in dental therapy. I could have gone to do an MSc, the BSc first because I was also accepted at the University of Western Cape, but I thought that maybe starting with this BSc would throw me off and I wouldn't ultimately get into my area of dentistry. (DT 10, female)

Some participants who deliberately chose to get a degree in dental therapy, did so to ***expand their scope***, upgrading their career from a two-year diploma in oral hygiene to a three-year degree in dental therapy. A fourth sub-theme related to a deliberate choice to enter dental therapy was ***stipends***. During the inception of training in dental therapy, students received a monthly stipend for their training. This attracted some participants to the profession. Two participants mentioned that they enrolled in the profession to take advantage of the stipend. One explained: *"They were paying us; there was the stipend, a salary back in the days, which was the motivation" (DT 6, male).*

Apart from those dental therapists who deliberately chose the profession, others ended up studying dental therapy through less intentional pathways, falling under our second theme, **unintentional**. Two sub-themes that we identified were: poor career guidance and applied late. ***Poor career guidance*** during high school played a significant role, leading some students to

study dental therapy due to lack of knowledge. Most of those interviewed got into the profession without knowledge of the scope of practice and some mentioned that they had no knowledge of the existence of the dental therapy course prior to their university admission. At the time of enrolment most study participants could not differentiate between dental therapy and dentistry. This was evident when some participants mentioned during their interviews that they only realised later in the year that they were not doing dentistry, while some thought that they had to do dental therapy first in order to get to dentistry.

> *I wanted dentistry, but I didn't know firstly that you can do, you cannot do BDS (Bachelor of Dental Science) (Bachelor of dental science) or dentistry, pure dentistry. But I was not really sure that what I was doing was not really BDS per se. So, I thought I was doing dentistry, but then I found out when I was doing, I think my second year. One of our lecturers told us that by the way you are not, you will not be dentists, you won't be called doctors, so I think it is poor career guidance. (DT 11, male)*

Some people found themselves in the profession unintentionally because they ***applied late*** and therefore had to enrol for any available course in the institution. As one participant explained: *"I didn't even know about it, I was just told that there's only a space for dental therapy." (DT 9, female)*

What was noteworthy about the interviews was that participants were passionate when talking about their previous role as dental therapists, referring to their skills and service delivery, although they were frustrated about the issues that led them to leave. Despite this passion, they still left because of the challenges they faced in South Africa. Many expressed a belief that it is the responsibility of government to support the sustainability of the profession. One participant explained:

> *There's a high need for it (dental therapy profession). I still believe that there really is a high need for it. However, the support from government is not really there in terms of seeing that this profession is sustained in this economy." (DT 5, female).*

Theme 2: Extrinsic factors

Although most participants expressed their great enjoyment in the dental therapy profession, they also expressed dissatisfaction with various aspects thereof, which drove them away. The

five themes identified were: poor remuneration, no career pathing, no job opportunities, no professional identity, and poor working conditions.

Poor remuneration was the most salient theme among all participants. When referring to poor remuneration, participants who worked in the public sector spoke about all financial benefits such as salaries, policies such as overtime, occupational specific dispensation (OSD), and retention allowances; while participants who worked in the private sector focused on unregulated salaries and low medical aid reimbursement fees.

All participants who worked in the public sector expressed their frustration with ***low salaries*.** They felt that the remuneration policies were unfair and discriminatory against dental therapists, resulting in their decision to leave the profession. Dental therapists were not happy with earning the same salary as oral hygienists who held a two-year diploma while they held a three-year degree and had a broader scope of practice in the public sector.

> *As much we deserve to be treated better and yet but it did not make sense to me because I (as an oral hygienist) did a diploma which was two years and as a dental therapist you will do three years, which is a degree, and they pay this person the same amount. I mean these two get paid the same amount. For me it did not make sense and I felt like it was not fair and in the public sector a therapist. (DT 1, female).*

Participants further expressed their frustration with the ***unfair implementation of remuneration policies*** in the public sector. They felt that they were treated differently as compared to other midlevel health professionals in the public sector such as physiotherapists, occupational therapists, and dieticians. They lamented exclusion from remuneration policies such as rural allowance, scarce skills allowance, and OSD policies, which benefited all other healthcare professionals, including midlevel health professionals.

> *The fact that as a dental therapist, honestly, we are not really taken seriously. Most allied health workers get a rural allowance. We do not. So those kinds of things and then you start to wonder ukuthi kanti [where are we?], where does the government really put us. (DT 2, female)*

Like those in the public sector, salary was also a concern for those in the private sector, leading them to leave.

> *I became discouraged; I felt a lot of discrimination. I did not have money. The money that we were paid then was not enough. I was getting something like R7 000 and then*

the money that I was getting I just could not cope with that it was in the private sector. (DT 8, female)

Participants who were employed in the private sector felt that they were discriminated against because of the low salaries they earned. Most left the profession because they felt that the salary was too low to cater for their living expenses.

Study participants who worked independently in private practice also expressed their frustration with ***low medical aid reimbursement fees*** for the services they render. They compared themselves with dentists and felt that they should be paid the same fees for the same procedures performed, whether by the dentist or dental therapists. Their frustration was because both dentists and dental therapists use the same materials and the same equipment for those procedures, yet they were paid less.

If you have to claim for a mask as a therapist, you get paid less, and then a dentist gets paid more for gloves and masks, which is not...ya. And an exam for a dentist is more expensive for a therapist, but all we did was examine the mouth, we have not done any...it is something that I can do…examining of the mouth, though a dentist does it, it is the same way the therapist will do it. (DT 2, female)

Participants mentioned that they are not involved in decision-making regarding the reimbursement fee structuring, which created discrepancies in their reimbursement because someone else is making decisions on their behalf.

Lack of job opportunities was another common theme. Whether they got into the profession deliberately or unintentionally, participants mentioned that the lack of job opportunities, especially in the public sector, contributed to their decision to leave the profession. An altruistic desire to serve communities in the public sector was undermined by a lack of job opportunities, leading some to seek employment in the private sector. One participant said:

I was forced to go and work in the private sector and even then, I was not prepared, I just did not like the private sector. I did not care much about money; I cared much about going back and serving the community. (DT 8, female)

In contrast, the participants who received funding from the Department of Health for their dental therapy degree did not struggle to find jobs in the public sector because of their contractual agreement to serve in the public sector following their graduation.

Lack of professional identity (which was not part of Hertzberg Two-Factor Theory) was another trending theme among former dental therapists. This common perception around lack of identity was expressed clearly by the following study participant:

> *Dental therapy is a career struggling with its own identity, you are trying to be a dentist and you are running away from being an oral hygienist…. So, you fall somewhere within the cracks. You cannot be a dental therapist because the temptation is always very broad that you want to do some of the things that dentists do. (DT 6, male)*

Another complaint was raised by a participant who had been practicing for more than 20 years. He bemoaned that people still do not understand his scope of practice or role in the clinical space:

> *We get tired of fighting and having to justify for everything that you do, or you know even to explain yourself. I mean I am 43 years now. If somebody asks me what you do dental therapists get for degree, it is more like you are asking who I am, something that I have been doing for 20 years and you are asking me after 20 years what I am doing or who am. (DT 11, male)*

Lack of professional identity affected their ***sense of belonging***. They felt this led to a lack of unity among the dental team because dental therapists are not perceived as team members. One former dental therapist said,

> *I think the reason why we (oral health team) are not improving is that as dentists and therapists and oral hygienists, we are not one family. We're just under one umbrella, but the way we're behaving we are not really fighting for each other. I think that's the challenge. (DT 1, female)*

Lack of awareness about the dental therapy profession has also contributed to feeling a lack of professional identity. Some study participants described how members of the public expect to find a dentist instead of a dental therapist. Gaining a sense of belonging and professional identity associated with dentistry or other professions was one reason these participants decided to leave the profession.

Most participants who worked in the public sector were demotivated by **poor working conditions** in their facilities, which was identified as another theme. Most cited the ***lack of resources*** or poor maintenance of equipment, which limited them in terms of practicing their scope of the profession. Lack of support from the management contributed to their frustration because most participants felt that dental services were not prioritised, while some got tired of

doing only dental extractions due to lack of equipment to perform other procedures within their scope.

> *The only problem now becomes when you are in the public sector and they don't provide equipment and materials for you to do other things, it's really tiring and also it gives you...it de-motivates you into enjoying your profession because now I didn't really...for years all I did was extractions and probably you know give medication for abscesses and what not, you know, pain management, but that's not all I went to school for. (DT 2, Female)*

This lack of resources also affects most citizens who rely on public oral health services, as they do not have access to preventive services such as cleaning and restoring teeth.

Theme 3: Intrinsic factors

Apart from the extrinsic factors that were related to job dissatisfaction, participants also mentioned the lack of motivating factors that brings fulfilment in their career, and this pushed them away from the dental therapy profession. Lack of career pathing was another common theme. Former dental therapists felt that they were stagnant in their profession. They were frustrated by the fact that the dental therapy ***scope was limited***, and they could not further their studies within dental therapy profession even if they liked what they did. Limited scope for them meant that you must refer your patients, in the process losing patient trust when you cannot offer what they need: *"Besides being a therapist, like for me, it's like I was limited, once I'm there I'm there, I'm stuck, and I cannot go anywhere" DT 4, female.*

Participants further explained that the dental therapy profession offered ***no career growth,*** with no postgraduate program in dental therapy. Participants described the dental therapy profession as a dead-end career. Although they had access to some postgraduate training in other fields like public health, these qualifications were not recognised in the profession and had no influence on their scope of work or remuneration. Participants who worked in both public and private sector mentioned that dental therapists do have access to some postgraduate opportunities such as Maters in dental therapy or public health; however, they felt these ***postgraduate qualifications were not recognised*** and had no influence on either their scope of practice or remuneration.

There are post-grad courses that we can do, but they're not taking you to a level that you want, it's like you're still...you are just doing them for yourself but not really growth in terms of your career. (DT 1, female)

3.3.6. Discussion

This study provides a summary of the key challenges with attracting and retaining dental therapists in South Africa from the perspective of former dental therapists. Most participants expressed that they never intended to be dental therapists; however, once qualified, they enjoyed the profession. These findings are similar to those of the South African longitudinal study conducted among the final-year health science students that reported that although 36.4% of participants were not studying towards their first-choice programs, but 95.9% were happy to be serving and helping the community [111]. All participants appreciated the skills they acquired as dental therapists, and most of them still draw on the same skills acquired as dental therapists in their new professions or careers. They believed that dental therapy is fit for purpose, especially in the South African context with the high burden of unmet oral health treatment needs. Despite almost all participants expressing their love for dental therapy profession, they all left the profession. Most left due to intrinsic and extrinsic factors that lead to job dissatisfaction as stipulated in the Hertzberg Two-Factor Theory, while some left because they never intended to practice as dental therapists.

The Hertzberg Two-Factor Theory helped to identify the extrinsic and intrinsic factors contributing to the attrition of dental therapists. Based on the findings, most factors that contributed to attrition were dissatisfaction with aspects of the health system; hence our recommendations were based on the house model, also known as the HRHSD framework [74]. The HRHSD, developed by the WHO, uses a visual representation of a house to depict the key components of a comprehensive and well-functioning health workforce [15, 74]. The HRHSD provides a holistic framework for analysing and addressing challenges in human resources for health. It emphasizes the interconnectedness of the different pillars and the need for a comprehensive approach to ensure a well-performing health workforce [15, 74]. By assessing and strengthening each pillar, policymakers and health system stakeholders can work towards improving the availability, competence, performance, and support of the health workforce, ultimately contributing to the delivery of quality healthcare services [15, 74]. Moreover, the HRHSD framework supports the development and implementation of targeted strategies and interventions to address these challenges. It emphasizes the importance of evidence-based

decision-making and the use of data to inform workforce planning, policy formulation, and resource allocation. This ensures that interventions are tailored to specific workforce needs and have a higher likelihood of success [15, 74].

The two frameworks used in this study complement each other in this context of attrition of dental therapists, as the Herzberg's Two-Factor Theory focuses on individual-level factors that impact job satisfaction and dissatisfaction. while the HRHSD framework provides a holistic approach to analysing and addressing various dimensions of the health workforce, which includes production, deployment, and retention [68]. (see **Figure 8**).

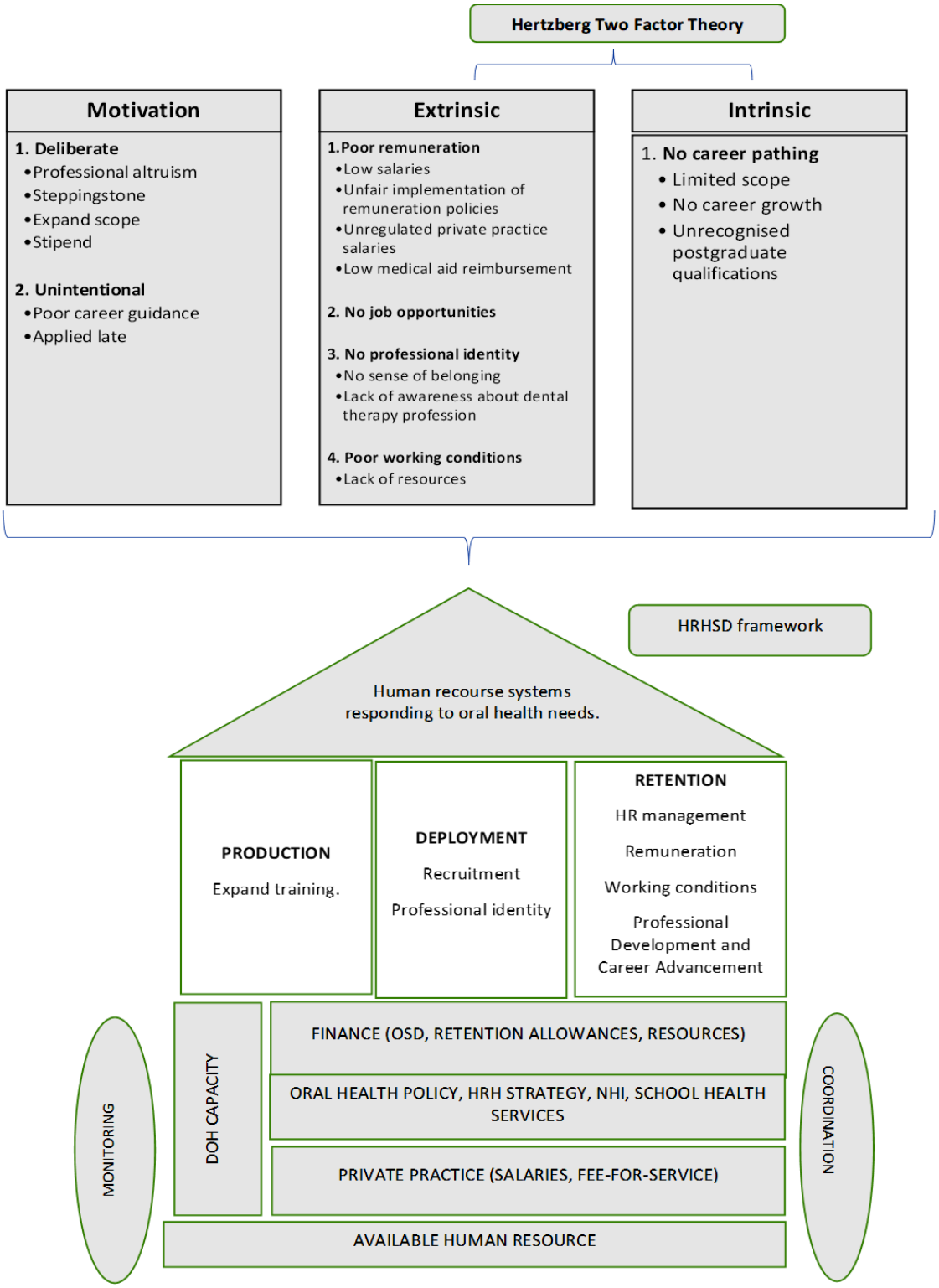

Figure 8 Current situation according to Hertzberg and recommended interventions according to the House Model

Increasing the production of dental therapists is a key feature of our framework to address the issue of underproduction and low numbers caused by attrition of dental therapists. This would be not only economically beneficial, but it would also have the potential of improving the access to basic oral health services in South Africa [21]. This is in line with the universal coverage that is intended in South Africa through national health insurance (NHI) [112]. Increasing the annual production of dental therapists is not a new concept, it was first recommended by the South African Department of Health in 2006, although there is still resistance to respond to the recommendations to expand training to all dental schools [92].

In terms of production, the participants in our study provided unique insights into what led them into the dental therapy profession. With only two universities training dental therapists in South Africa, the finding that many dental therapists did not intend to enrol for the degree is concerning, particularly for other universities that may consider offering dental therapy training [44]. Training institutions need to consider how to make this profession more attractive to prospective students to address issues of underproduction which have been flagged in the recent 42-year review of dental therapy profession in South Africa [94]. There is also a need to expand training to other dental schools in other provinces to increase the annual production of dental therapists and increase geographic coverage. Increasing the production of dental therapists will, however, not be viable if the current extrinsic and intrinsic factors that have been identified in our study as the main contributing factors to attrition are not addressed. These factors can be addressed by making provision for deployment as well as designing and implementing strategies to attract and retain dental therapists within their profession.

Increasing the production of dental therapists is interconnected with deployment which involves their availability and their distribution within the healthcare system, this will close the gap of lack of job opportunities since lack of job opportunities was another reason for attrition in the study, which is common across all professions and industries. This is exacerbated by South Africa's official unemployment rate of 44.4% in 2021, which is the highest in the world [113]. Deployment refers to the process of assigning dental therapists to specific positions or locations where their services are needed within the healthcare system. It involves strategically placing them in areas with a shortage of dental services or underserved populations. The deployment process should consider factors such as population needs, geographic distribution, oral health disparities, and availability of dental care facilities [8]. Deployment should be based on the oral health needs assessment of the population, which involves the analysis of the oral health status, disease burden, demographic factors, and healthcare service utilization patterns

since the last national oral health survey was in 2002. Oral health needs assessment will help to determine the types and numbers of oral healthcare professionals required to address the population's health needs. Based on the findings of the needs assessment, workforce planning should be conducted to identify the necessary oral health professionals required to provide comprehensive care, considering other factors such as skill mix, competencies, and specialties. Once the oral healthcare workforce requirements are identified, recruitment should follow. Deployment of dental therapists should go beyond the traditional dental care settings, they should be integrated to all health programs such as school-based health programs, maternal and child health, community/primary health care clinics, geriatric facilities, as well as and many other public health programs where there is an opportunity to promote oral health. Collaboration, coordination, and integration among different healthcare providers and programs is essential to improve access to basic oral health services.

Integrating dental therapists with other health programs might contribute to the enforcement and recognition of their professional identity, since it was identified as a contributing factor to attrition in our study. This has led to the perceived and perhaps real undermining and exclusion of dental therapists in many aspects of the health system. Our participants felt that they did not belong to the same health system because their existence and their scope was not known by other health care professionals and the community. This lack of identity has alienated many dental therapists from their profession. This could be one of the contributing factors to the attrition rate reported in a recent South African national study [68]. Hence, the inclusion of dental therapy services in diverse health programs helps solidify the professional identity of dental therapists as integral contributors to overall health and well-being.

Deployment has the potential to support retention strategies by providing dental therapists with opportunities for professional growth, skill development, and diverse work experiences. Strategic deployment that aligns with the career aspirations and developmental needs of dental therapists can contribute to their job satisfaction and commitment to staying within their profession. Our participants expressed dissatisfaction with the lack of career pathing, which they mentioned as one of the reasons they left the profession. Our findings are similar to that of a study conducted among allied healthcare workers, which reported lack of career structure in their professions, and this led to dissatisfaction and attrition [114]. Some of our participants tried to upgrade their qualifications by enrolling in postgraduate programs up to the level of a doctorate. However, they expressed disappointment with the fact that their post graduate qualifications did not contribute to their career growth within their profession, hence they left

to pursue other careers with good postgraduate prospects. Addressing the lack of career pathing among dental therapists requires a proactive approach from health systems, hence, I recommend that the key stakeholders, such as dental therapists, professional associations, academic institutions, public sector, private sector, and regulators should work together in identifying the areas of specialization or advanced skills that are in demand and align with the evolving oral health needs of the country to understand the specific areas where postgraduate training is needed. Based on the identified needs, the academic institutions, and regulators such as South African Qualifications Authority (SAQA), and HPCSA should develop postgraduate qualifications and funding for dental therapists. These curricula should be designed to provide advanced knowledge and skills in specialized areas of oral healthcare and research. By offering postgraduate opportunities for dental therapists, health systems can enhance their skills, knowledge, and career prospects, ultimately contributing to their job satisfaction and retention within the profession. These programs not only benefit individual dental therapists but also strengthen the overall capacity and quality of oral healthcare services.

To ensure the sustainability of the deployment strategy, continuous monitoring and evaluation of the deployed dental therapists is crucial to assessing their performance, identifying challenges, and making necessary adjustments. This will promote retention, which is a critical aspect of deployment. Other strategies that should be considered to promote retention include providing competitive salaries and benefits, offering career development opportunities, ensuring a supportive work environment, and recognizing and rewarding their contributions of which all these factors were identified as the factors that pushed our participants away from the dental therapy profession. Poor remuneration was the leading factor influencing the participants' decision to leave the dental therapy profession. These results are similar to those reported in a study conducted among Australian oral health therapists, which mentioned low remuneration as a barrier to the recruitment and retention of dental therapists [92]. In contrast, another study conducted among non-working dental therapists in Australia reported family commitments and career change as the leading reasons for attrition, while only 14% of participants left the profession due to poor pay [26]. Although South African dental therapists earn the same salary as other midlevel health workers such as physiotherapists, occupational therapists, and dieticians in South Africa, participants were not happy with earning the same salary as oral hygienists who held a two-year diploma while they had a three-year degree[94]. This was also highlighted in a South African regionally based study of dental therapists, where participants felt that dental therapists should be paid at a higher level than oral hygienists given their wider scope of practice and additional year of training [28]. The oral hygiene qualification

has, however, been rectified in recent years, as it is now also a three-year university degree [115].

While comparing themselves with other mid-level health workers in South Africa, our participants mentioned the poor implementation of remuneration policies. They reported that they were excluded from benefits or incentives that were enjoyed by all other midlevel health professionals, such as rural allowances and retention allowances. This exclusion might be due to poor implementation of policies by the institutions or districts. Poor implementation of remuneration policies such as OSD could also be a key reason why former dental therapists felt that their profession was stagnant and that they were not treated equally to other midlevel health professionals. OSD was meant to provide career progression for all health professionals within their own professions [116]. For example, through OSD, a professional could move from a clinical position to a management position, such as a director. However, implementation gaps in OSD policy have been reported in South Africa [117]. Addressing poor implementation of remuneration and retention policies within the context of Human Resources for Health System Development requires a comprehensive approach that focuses on identifying and rectifying the underlying issues. This involves a thorough review of existing remuneration and retention policies to identify gaps or shortcomings in their implementation. Assess whether the policies align with the needs and expectations of dental therapists. If gaps are identified, necessary revisions or updates to address any deficiencies and ensure that the policies are clear, transparent, and fair should be implemented to promote retention.

Participants who worked independently in the private sector left because they felt that they were discriminated against by medical aid. They were frustrated because the reimbursement fees were lower than those of dentists for the same procedures that they performed. Similar South African studies have also highlighted the significant difference in medical aid reimbursement fees for the same procedure between dentists and dental therapists [27, 28]. While acknowledging their frustration, it is worth noting that dentists studied for five to six years while dental therapists studied for three years, which could be the reason why the medical aids recommend higher fees for dentists as compared to those of dental therapists. Additionally, the medical aid administrators only publish the recommended fees; hence, the practitioners (including dental therapists) are allowed to charge what they feel their services are worth, in agreement with the patient. For example, if the medical aid recommends that the consultation is worth R200, the practitioner can decide to charge a reasonable fee above the one recommended by the medical aid, but this must be reasonable and agreed upon by the patient prior to the consultation since the extra amount will be covered by the patient. Furthermore,

other stakeholders that are responsible for decision regarding remuneration should work collaboratively with dental therapists to ensure that remuneration policies and processes within the private sector are transparent, fair, and clearly communicated. Dental therapists should have a clear understanding of how their remuneration is determined, including salary scales and fee for service. Collaboration and transparent policies will help build trust and confidence in the remuneration system, addressing potential dissatisfaction, and promoting retention.

Finally, our participants expressed dissatisfaction with poor working conditions, and they cited it as one of the reasons they left the dental therapy profession. Poor working conditions are not unique to dental therapists but have been reported by other health professionals as well [14]. A lack of resources such as equipment and support from managers has been reported in other studies conducted among dentists. A South African study conducted in the Western Cape reported that only less than a third of dental facilities had the resources to offer the basic treatment package; most clinics only offered extractions [14]. The poor working conditions, especially in public facilities, may hinder the oral health professionals from practicing their scope and offering the full basic oral health treatment package and this has a potential to exacerbate attrition. This can be addressed through the allocation of sufficient funds and resources to support the implementation of oral health programs, which includes budgetary provisions for dental equipment and consumables.

In summary, effective governance structures and policies are essential for the successful deployment and retention of human resources for health [74]. Hence, we recommend a strong governance to ensure accountability, quality assurance, and ethical practice in increasing the production, deployment, retention of dental therapists, and improving access to basic oral health services and achieving the universal coverage. Deployment of dental therapists and retention are interconnected and mutually influential within the context of Human Resources for Health System Development.

Addressing all the recognized intrinsic and extrinsic factors has the potential to enhance the efficiency of producing, deploying, and retaining dental therapists. This effort would also align with the objectives outlined in the oral health policy, emphasizing preventive measures and oral health promotion [118]. Moreover, it resonates with the national human resource policy's recognition of dental therapists as a pivotal workforce in delivering fundamental oral health services [92]. Additionally, it supports the aspirations of universal health coverage through national oral health insurance, cantered on reshaping healthcare services towards primary health care [112]. Furthermore, an increased retention rate of dental therapists would yield

economic benefits for the nation [21]. This is attributed to the cost-effectiveness of training and employing dental therapists in comparison to dentists [21]. The cumulative effect of these improvements would contribute to a comprehensive enhancement of the oral healthcare system, promoting better oral health outcomes for the population.

The study acknowledges potential limitations, notably the risk of social desirability bias from participants as well as researcher bias from those authors with oral health backgrounds, particularly in dental therapy. Robust participant responses, as reported in the results, suggest that social desirability was not at play. Potential researcher bias was addressed through the involvement of co-coders without dental therapy backgrounds and oversight from a supervisor who is not a dental health professional, with no personal stake in the results. Another potential limitation is that the perspectives of some former dental therapists may have been missed. To reduce this risk, a multi-pronged sampling strategy was applied.

3.3.7. Conclusion

This study revealed key factors influencing dental therapist attrition in South Africa, which are mostly related to job dissatisfaction due to lack of extrinsic and intrinsic factors mentioned in the Hertzberg Two-Factor Theory. Most of these factors can be addressed through targeted interventions to that focus on specific issues related to production, deployment, and retention of dental therapists, including consideration of the cross-cutting areas of finance, policies, and the private sector. Addressing these factors is likely to improve production and retention of dental therapists, which will lead to improved access to basic oral health services. Ultimately, this improved access to oral health services may result in better oral health outcomes for the population in the country.

3.3.8. Ethics approval and consent to participate

Ethical approval for this study was obtained from the Human Research Ethics Committee, certificate number M190686 and permission was obtained from the provincial ethics committees.

After reading and understanding the information about the study, participants who volunteered to participate in it signed the consent to participate and to record the interviews.

3.4. STAKEHOLDER'S PERSPECTIVE OF ATTRITION IN THE DENTAL THERAPY PROFESSION

This presents a qualitative national study conducted among stakeholders involved in the training, employment, and regulation of dental therapists to explore their perspective on attrition of dental therapists. The stakeholders include representatives from the academic department of health, HPCSA, and SADTA. This section has not been prepared for a specific journal and is being presented for external review for the first time through this thesis as part of the PhD material that will be discussed comprehensively in the integrated narrative.

3.4.1. Introduction

Attrition presents a widespread challenge in public health, extending across various healthcare professions. This complex issue results from a multitude of factors related to motivation and job satisfaction, which the external and internal pressures might drive. Managers, regulators, and other stakeholders play a crucial role in ensuring the sustainability of professions through training, deployment, and retention, which contribute to the improvement of the health status of the population. Globally, the production and retention of dental therapists has been a challenge throughout the years, with many dental therapists leaving the profession for reasons such as poor remuneration, unclear career paths, lack of recognition, and lack of jobs [25, 26, 28, 39, 119].

The goals of Human Resources for Health (HRH) are centred around ensuring that a healthcare system has an adequate and competent workforce to meet the healthcare needs of its population, improve access to health services, and achieve universal coverage. These goals typically include training, recruiting, and retaining skilled healthcare professionals, including dental therapists, to address shortages and distribution gaps. Such issues have been identified in South Africa, with most dental therapists residing in only two out of nine provinces, and some provinces with less than ten dental therapists [94]. HRH strategies also aim to improve the quality of healthcare services by providing ongoing training and professional development opportunities for healthcare workers. However, South African studies reported that dental therapists do not have access to further training within their profession, which has contributed to many dental therapists leaving their profession for other disciplines with clearer career prospects [28, 39].

To achieve these HRH goals, especially in the dental therapy profession, there is a need to address the known underlying factors contributing to attrition [26, 27, 28]. This can be achieved by drawing on existing research and conducting novel attrition research to develop comprehensive mitigation strategies. Such research can also identify strategies to attract and retain more dental therapists to the profession. This will strengthen a healthcare system's capacity to deliver high-quality care, improve health outcomes, and promote more equitable access to healthcare services for all community members.

While there is a growing literature on attrition of dental therapists in South Africa, studies focusing on other stakeholders or managers are limited. This study aimed to explore key stakeholder perspectives on dental therapist attrition [94, 120, 121].

3.4.2. Methodology

Study design

This study utilizes an exploratory qualitative design.

Study setting

The study was conducted in five out of nine provinces of South Africa where the permission to conduct the study was granted and participants agreed to participate in the study, namely, the Eastern Cape, the Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, the Northern Cape, North-West, and the Western Cape. Furthermore, some participants such as the representatives from Universities, HPSCA and SADTA were interviewed who had jobs with a national scope.

Study participants

The participants included the provincial oral health managers/coordinators, dental therapy program managers/coordinators from the two universities that train dental therapists (UKZN & SMU), a representative from SADTA as well as representative from the HPCSA Board of Dental Therapy, Oral Hygiene, and Dental Assisting.

Sampling and recruitment of participants

Purposive sampling was used to recruit the participants from the 1st of March 2020 to the 30th of June 2022. After obtaining the permissions, I (PS) contacted and invited the participants to participate in the study. All oral health managers were included in the study. No sampling was done.

Data collection

A semi-structured interview schedule was developed for data collection. The interview guide included questions related to the role of dental therapists in the health system, and the manager's perspective on attrition of dental therapists. The questions were based on literature and Hertzberg's Two-Factor Theory. The supervisors reviewed the data collection tool for content validity and clarity prior to data collection.

Data collection process

Managers who consented to participate were allowed to be interviewed in person (at their workplace) or virtually (on Zoom or Teams). As a female dental therapist by training, MPH graduate, and a PhD candidate who now works as an academic with experience in qualitative research, I conducted semi-structured in-depth interviews (IDIs) to explore the managers' perspectives on attrition of dental therapists.

I had no relationship with the participants before the study. The interviews were conducted in English and the took between 25 to 40 minutes. All interviews were audio recorded with participants' consent. Interview were conducted either face-to-face or virtually depending on participant's preferences. I took detailed field noted during the IDIs which recorded the occurrences, discussions, observed behaviours, as well as my reflections on these interactions.

Data analysis

An independent transcriber transcribed the interviews verbatim, thereafter I cross-referenced the audio recordings with the transcripts for data accuracy. Then, I and three other researchers engaged in thematic analysis, following the method outlined by Braun and Clarke in 2006. Being aware of personal bias as a former dental therapist, I involved four researchers not associated with dental therapy in the data analysis because I aware of my personal bias as a former dental therapist. The team, comprising myself, YM-K (a dental specialist), TR (an oral hygienist), and SJ (a non-dental health professional), reviewed the transcripts for familiarization and insights. The initial codes were then developed by the team to form the first codebook which was further expanded until no new codes emerged and the team felt comprehensive coverage of interview ideas. Trends, themes, and sub-themes were developed by merging codes and aligning similarities and differences in the data. An integration of data assessed links between participant information, finalized collectively in a meeting where the entire team was involved. To guarantee dependability, the last author, SJ, cross-verified the final analysis, collaboratively resolving any discrepancies. Ultimately, all authors participated in reviewing the document thoroughly to ensure its completeness and accuracy.

3.4.3. Ethical considerations

Ethical approval to conduct the study was obtained from the University of the Witwatersrand's Medical Human Research Ethics Committee (HREC), certificate #M190686. The study also received approval from the six provincial ethics committees (Eastern Cape, Free State, Western Cape, Northern Cape, and Kwa-Zulu Natal). During the recruitment process, participants were reassured that the study was entirely voluntary, and their information would be kept confidential. The participants were informed that the information will be shared in scientific meetings and publications, and the research will be anonymous. On the day of the interview, I obtained written informed consent from all respondents for participation in the study and for audio-recording consent, which was signed and emailed prior to virtual interviews. To safeguard participants' anonymity, codes were used instead of names.

3.4.4. Findings

A total of thirteen key stakeholders participated in the study, which included eight females and five males. Participants included five provincial oral health coordinators, six university dental therapy program managers/coordinators, one representative from SADTA, and one

representative from HPCSA board of dental therapy, oral hygiene, and dental assisting. Additional details are not provided to protect the anonymity of study participants.

Themes arising from the data

Deductive themes structured a more inductive coding process. These included the two broad themes of 1. Dental therapist roles in the health system and 2. Reasons for attrition. The reasons for attrition were deductively classified into extrinsic and intrinsic themes, derived from Herzberg's Two-Factor Theory [16]. The first theme, the role of dental therapists, pertains to the managers' comprehension of the role played by dental therapists within the South African health system. On the other hand, extrinsic and intrinsic themes were used to uncover the factors contributing to attrition of dental therapists through the inductive coding process, through which the research team identified sub-themes. The participating managers directly articulated these themes and sub-themes. **Table 9** below provides an overview of the primary (deductive) themes, three organizing themes and the seven associated sub-themes identified through qualitative interviews.

Table 9 Themes arising from the data

Theme		**Subtheme**	**Description**
Role of dental therapists in the healthcare system		Role in Primary Healthcare	When participants describe the role played by dental therapists in the healthcare system, especially in the Primary Healthcare setting
Reasons for attrition	Hygiene/ extrinsic factors	Gaps in policy implementation	When describing the exclusion of dental therapists in some human resource policies
		Poor remuneration	When describing low salaries for dental therapists in public sector, and low medical aid reimbursement in private sector.
		No recruitment	Description of recruitment of oral health professionals in the public sector
		No professional identity	Referring to group identity which talks to sense of belonging within the oral health team
	Motivators/ intrinsic factors	No career growth	When referring to growth within the dental therapy profession, advancing into managerial positions
		No career pathing	When referring to the postgraduate prospects of dental therapists

Theme 1: Role of dental therapists

Most managers recognized the substantial role played by dental therapists within the health system, particularly in the realm of ***primary healthcare*** and acknowledged the prominent role dental therapists can play. They recognised South Africa is contending with a considerable oral health challenge and underscored the need for an expanded dental therapist presence. Those who worked with dental therapists praised their expertise and job knowledge, emphasizing their capabilities in primary healthcare settings. One manager said:

> *I think the therapists can make a huge difference because South Africa is very big, hey? And the disease profile is not getting any better. So, for us to be where we want to be as a country, to be able to control the oral health diseases. I think we need dental therapists. (Participant H)*

Additionally, managers held the view that the scope of the dental therapy profession is well-suited for the South African context, given its alignment with the population's requirements. *"And I also feel that a majority of our population needs basic dentistry which is what the therapist does. So, that should be important to note yeah." Participant G*

The statement emphasises the importance of dental therapists within the healthcare system from a managerial perspective. One specifically advocated for their more deliberate recruitment into the public sector, as follows:

> *If I were to be in charge, I would employ more therapists permanently in the government sector and let the dentists come for community service. But for permanent posts, I would recommend that we get more dental therapists. Participant C*

Some managers drew a link between the roles played by dental therapists and the successful implementation of the upcoming National Health Insurance (NHI) in South Africa. They maintained the perspective that dental therapists can make a substantial impact on achieving the goals of the NHI, with a particular emphasis on the overarching aim of establishing healthcare access for all.

> *So dental therapists are very critical to our health care in South Africa and with the introduction of the National Health Insurance System, it becomes even more critical because remember that the NHI is aimed at primary health care. Participant F*

Conversely, a non-oral health manager demonstrated a lack of awareness regarding the responsibilities of dental therapists. She indicated that her managerial role primarily oversees service delivery and ensures staff attendance.

Remember, that I am not in the dental profession. I got to take over seeing but am not actually looking at every individual post…. Because of their scope of practice, they know about it. For me it is monitoring the delivery issue so that wherever they are needed they are there, so the actual role within the team…. I wouldn't be really specific about it, because I'm not in service delivery level I am in policing and strategic level. Participant E

Theme 2: Reasons for attrition

Extrinsic themes

1. **Gaps in policy implementation**

While South Africa has policies to facilitate career advancement, their execution leaves much to be desired. ***Gaps in implementing*** these policies results in a vacuum within the dental therapy profession's policy landscape. Notably, one manager contended that provinces are not obliged to implement these policies. As an illustration, the OSD (Occupational Specific Dispensation) policy is designed to elevate any mid-level professional including dental therapists to deputy director roles; however, certain provinces opt out by abstaining from creating these positions or adhering to the policy's directives.

Now, where a province can create posts at the Assistant Director and Deputy Director level for people doing clinical jobs, there will be an advantage. But then if you are in a province where such posts happen because of how the dispensation makes provision for that, it's up to the provinces to create such posts. If the provinces did not create such posts, then it means they won't be in a position to go up to that level. Participant C.

One manager acknowledged the challenges with implementing the human resource development policies that are meant to be implemented at the district level.

Much as our Head Office has forwarded a detailed training plan. There is still a serious challenge in the implementation of the Human Resource Development policies at the district level that would allow them to do advanced courses such Simple Endo in anterior teeth/ Plastic dentures or (*Advanced trauma life support) ATLS in case of emergencies for career pathways, including oral health management. Participant A*

2. Poor remuneration

Another prevalent theme was ***poor remuneration***, particularly in the context of dental therapists who practice independently within the private sector. Managers drew comparisons between dental therapists and dentists, noting that dental therapists receive lower fees for the services they provide through medical aid. In contrast, dentists receive higher compensation for performing the same procedures.

> *We know even in private sector, they will highlight an issue of saying we are performing the same duties, buying the same material but the codes you find that sometimes it is 35% less if not 30% less. I am unsure how they are, but I know the rates are not the same. For the same restoration that the dental therapist would perform and the one that the dentist performs, the payments are not the same from the medical aid. Participant J*

However, another manager argued that the dental therapists are paid lesser than dentists because the number of years each cadre (dentist or dental therapist) spends in training is considered when deciding on remuneration.

> *So, what I am saying is when they explain the differentiation between the professions who take into consideration the years that one is trained, the period of one trained. Like for BDS they were trained for let me say five years and for dental therapist three years so they will say that the remuneration cannot be the same, because there is weighting in terms of your entry points and everything. Even though you are going to perform the same responsibilities or if not duties, so they qualify that in terms of the one period that one has spent at university level. Participant G*

One manager felt that some remuneration policies exclude dental therapists. For an example, although dental therapists work overtime in the public sector, the commuted overtime policies were designed to accommodate only dentists and doctors. In contrast, dental therapists are placed under ordinary overtime with all the cleaners, general workers, and administrative staff. Another participant further argued that dental therapists often see an equal or greater number of patients during overtime, compared to dentists, yet receive lower remuneration in the public sector.

> *I know is that committed overtime is a document developed in the bargaining council, and it is for medical officers and dentists or dental practitioners as they*

> *call them according to HPCSA. So those rates are higher than the one of the ordinary overtime, in a nutshell. Participant J*

Another manager said

We do overtime and as we do overtime duties what they are saying sometimes we see more patients but when we look at the remuneration, the remuneration for a dentist it is more, and for dental therapist it is lesser, or lesser to that of the dentists. Participant F

3. No recruitment for dental therapists

The managers acknowledged that dental therapists perform most of the procedures performed by dentists and highlighted their capacity to provide essential dental care services. This perspective further strengthens the argument for considering dental therapists as key contributors to the public healthcare system, particularly in efficiency.

> *And the ideal person for primary and preventative health care would be your therapist, because we must admit that more than 90% of oral health related work is within the ambit of the dental therapist. It's your basic fillings, cleaning for extractions. So dental therapists, and to an extent, hygienists, can fulfil 90 to 95% of primary health care needs within the public sector. So, they play an absolutely critical role. Participant F*

Certain managers indicated that they cannot take action to facilitate the recruitment of dental therapists, as their current priority lies in deploying community service dentists and absorbing them upon completing their mandatory one-year community service.

> *There is little to nothing (in terms of jobs) especially at a district level. From our office, we tried our level best, but from HR perspective the focus is mainly on Community Service Dentists who later become absorbed into permanent positions. The employment of DT/OH / DA (dental therapists, oral hygienists, and dental assistants) is a big challenge much as they are bursary holders, since they do not do community service. Participant A*

Despite the evident demand for dental therapy services within the public sector, the government's plans do not account for the inclusion of these professionals. This absence of job opportunities directly impacts recent graduates who aspire to contribute within the public

sector. One manager pointed out that there was a year when no graduates found positions in the public sector, leading them to gravitate toward the private sector instead.

> *So, ja, and then some people decide that there's not enough job satisfaction and especially when you graduate and you don't have a job because now, you know, last years' graduates, none of them had any posts in the public sector. So, it was incumbent on the private sector to now employ forty people or fifty therapists who are now, no provision was made in public sector for them which is quite appalling if you look at it? And it's not like there's no need for these young graduates in the public sector. There's an immense need, just that the jobs haven't been made available to them. Participant I.*

However, per a certain manager's viewpoint, the initial purpose behind establishing the dental therapy profession was to address the requirements of the public sector. This manager asserted that conferring dental therapists with the freedom to practice independently has resulted in most of them working in private sector due to scarcity of job opportunities in the public sector.

> *I think the Department of Health, initially when therapy came about, was for therapists to work in public service and the only reason they went into the private sector was because there went enough jobs. So, the government had to eventually give them the opportunity to go into private practice, which personally, I think was the biggest mistake that they made. So, infrastructure is important. Participant G.*

Consequently, managers believed that most dental therapists, even those with a genuine passion for the profession, were compelled to return to school to pursue alternative careers due to the scarcity of job opportunities.

> *Those who want to be therapists cannot progress because there're no posts. So, maybe they should wait for me to die, or to resign, then they'll get my post. And in a class of twenty, only one will succeed. So, what's happening to the rest? They go back to school. They turn to other professions. Participant H*

As evidence of the limited recruitment of dental therapists, a manager highlighted that within his province, only one dental therapist was employed within the public sector.

4. No professional identity

The dental therapy profession is grappling with issues concerning its ***professional identity***. One provincial manager highlighted that within their authority, there is a lack of awareness regarding the dental therapy profession and its associated scope of practice.

> *I don't think even people know who they are. I don't even think people know what a dental therapist is, what is his scope of practice, what is the difference between dental therapist and a dentist. And what is it that they can do for us. And how they can save us some revenue, you know. No one knows about them, but they really could add a little bit of value if they were to be known. And I think maybe other provinces are handling it better. I am talking about my province. Participant D*

Intrinsic themes

1. **No career growth**

Some managers expressed concern with the fact that in some provinces, there is ***no career growth*** for dental therapists, they are not considered for managerial positions. While dental therapists may not be considered for managerial roles in certain provinces, one manager concurs that they can effectively oversee clinic operations, he said *"They (dental therapists) will always run the dental clinic when there is no dentist, which is unfair" Participant E* Moreover, building upon this, another manager stressed that the prospect of dental therapists being regarded as potential candidates for managerial roles is rather limited, primarily because they are commonly perceived as junior professionals.

> *You will never be, you work hard, but you will never be recognised to be a senior manager because of your scope of practice. You are always junior (laughing). So, I think before they have to work on it because I mean, there is no value on an individual to cater for oral hygienists, dental therapists, unless they become a dentist. Participant F*

Their belief was rooted in the notion that a dental therapist would only be deemed eligible for a managerial position if they were to pursue further education in dentistry.

> *Dental therapists can be in a position to upgrade to the next level if they can get a little bit of a post grad to be upgraded to a dentist, I think that will make it even much better. Participant F*

Their (managers') perspective revolves around the idea that the dental therapy profession lacks the necessary qualities to merit recognition for managerial roles.

2. No career paths

As per managers' perspective, the responsibility of formulating ***career pathways*** for dental therapists' rests with universities, in collaboration with Health Professions Council of South Africa (HPCSA).

> *"One, I know that in terms of career pathing, HPCSA has the role to regulate the scopes, that is one. And universities are there to create the space or the environment for career pathing to be practical." Participant J*

One manager attributed the public sector's deficiency in supporting career advancement for dental therapists, to their exclusive emphasis on fostering growth opportunities for dentists. *"This is one of the weaknesses in the public sector to facilitate/ prepare the opportunities for Dental Therapy Profession to grow other than for the Dentists only." Participant A*

3.4.5. Discussion

The study focused on identifying factors contributing to attrition among dental therapists from the perspective of oral health stakeholders, many holding managerial roles. Stakeholders highlighted the crucial role dental therapists play in improving access to basic oral health services, particularly in primary healthcare settings, advocating for increased recruitment in this field. Studies reported that recruiting more dental therapists does not compromise service quality; they are well-equipped to provide education and preventive interventions to mitigate oral health issues [24]. Literature has reported on the quality of services dental therapists provide, which are equivalent to or higher than those offered by dentists [24].

Participants emphasized the proficiency and job-related understanding of dental therapists, emphasizing their suitability for addressing South Africa's oral health challenges. Given their cost effectiveness and skills in preventive care and basic dental procedures, dental therapists are poised to significantly impact oral health and overall well-being, highlighting the need for a strategic healthcare planning and resource allocation approach. Given the size of South Africa and the persistence of oral health challenges [9, 14, 88]. it is evident that a comprehensive and adaptable strategy is

required. Additionally, integrating dental therapists into the existing programs within the healthcare workforce (such as maternal and child health) can provide a practical solution to improve access to oral health services.

Our participants believe that dental therapists will contribute to the achievement of the NHI, which focuses on universal access to quality healthcare, particularly primary care [121, 122]. However, they also mentioned policy implementation gaps, poor remuneration, and lack of career advancement opportunities which need to be addressed as they have been identified as key reasons for therapist attrition. These gaps arise when there is a disconnection between the formulation of policies and their effective execution on the ground. In a study conducted with South African dental therapists who had left the profession, dental therapists confirmed that policy implementation gaps impacted their job satisfaction and, consequently, attrition [121]. Gaps in human resource policy implementation have been independently reported in South Africa [117], which has led to job dissatisfaction. South Africa has implemented several policies to retain and advance healthcare workers, however, our research indicates deficiencies in their effective implementation, particularly within the dental therapy field. This shortfall has resulted in an evident gap in the policy structure specific to dental therapy. Our participants suggest that this shortfall in policy implementation is largely due to the lack of obligation of provinces to enforce these policies. For instance, the OSD policy, designed to facilitate the career progression of dental therapists, remains unimplemented in certain provinces due to the discretion granted to individual provinces in creating these positions. Similar shortcomings in implementing the OSD policy have been echoed in the literature [115].

Participants highlighted the need for collaborative efforts among organizations, managers, and policymakers to address these disparities and establish an environment conducive to professional advancement and job satisfaction for dental therapists. Unclear career paths and exclusion from community service policies were also cited as a contributing factor to attrition that needs to be addressed to retain more dental therapists.

Like other countries globally, South Africa is faced with attrition of the health workforce, which results in a shortage of human resources and limited access to basic health services [94]. If this attrition is not addressed, it may lead to a higher burden of diseases. Addressing these challenges requires the establishment of comprehensive career pathing systems and strategies to improve remuneration and policy implementation.

3.4.6. Conclusion

The study emphasizes the vital role of dental therapists in enhancing oral health services access, particularly in primary healthcare settings, according to stakeholders. Their proficiency highlights the necessity for strategic healthcare planning and resource allocation, especially in South Africa's context of persistent oral health challenges. Policy-wise, addressing implementation gaps in human resource management is crucial for retaining dental therapists, alongside reforms integrating them into community service programs and ensuring fair compensation policies. Programmatic implications suggest establishing clear career pathing systems, offering advanced training, and promoting professional identity to enhance therapist retention. Further research is needed to assess the impact of policy reforms and programmatic interventions on therapist retention, with comparative studies across healthcare settings providing valuable insights. These findings can guide interventions by healthcare authorities, universities, regulators, and policymakers, ensuring sustainable and effective oral health services delivery in South Africa.

3.5. COMPREHENSIVENESS OF THE HERZBERG'S TWO-FACTOR THEORY AS A FRAMEWORK IN THE CONTEXT OF DENTAL THERAPY ATTRITION IN SOUTH AFRICA

This explores Hertzberg's Two-Factor Theory as a framework used in this thesis in line with the third PhD objective. It also introduces the Comprehensive Human Resource Retention Framework, designed to address the attrition of dental therapists in South Africa.

3.5.1. Introduction

Herzberg's Two-Factor Theory details the elements affecting job satisfaction and dissatisfaction contributing to attrition [68, 123]. These two elements are extrinsic factors (also known as hygiene factors) and intrinsic factors (also known as motivators). Extrinsic factors, such as salary, working conditions, and company policies, serve to avert job dissatisfaction but do not inherently boost satisfaction [68, 123]. Conversely, intrinsic factors, including opportunities for growth, recognition, and challenging work, foster job satisfaction and motivation [68, 123]. Adopting this theory to explore factors contributing to dental therapy attrition was helpful; it was aligned with the unique circumstances of this profession in South Africa. In addition to all the identified extrinsic factors, a new theme that emerged from this PhD was the lack of professional identity, which also contributed to the attrition of dental therapists, as described in section 3.1 to 3.4 of this thesis. **Figure 9** below illustrates the intrinsic factors (career advancement, achievement, growth opportunities, and recognition) and extrinsic factors (remuneration, working conditions, policies, supervision, and interpersonal relations) that can contribute to either job satisfaction when present or job dissatisfaction when absent. Job dissatisfaction may lead to demotivation, fostering the intention to leave, ultimately resulting in attrition**.**

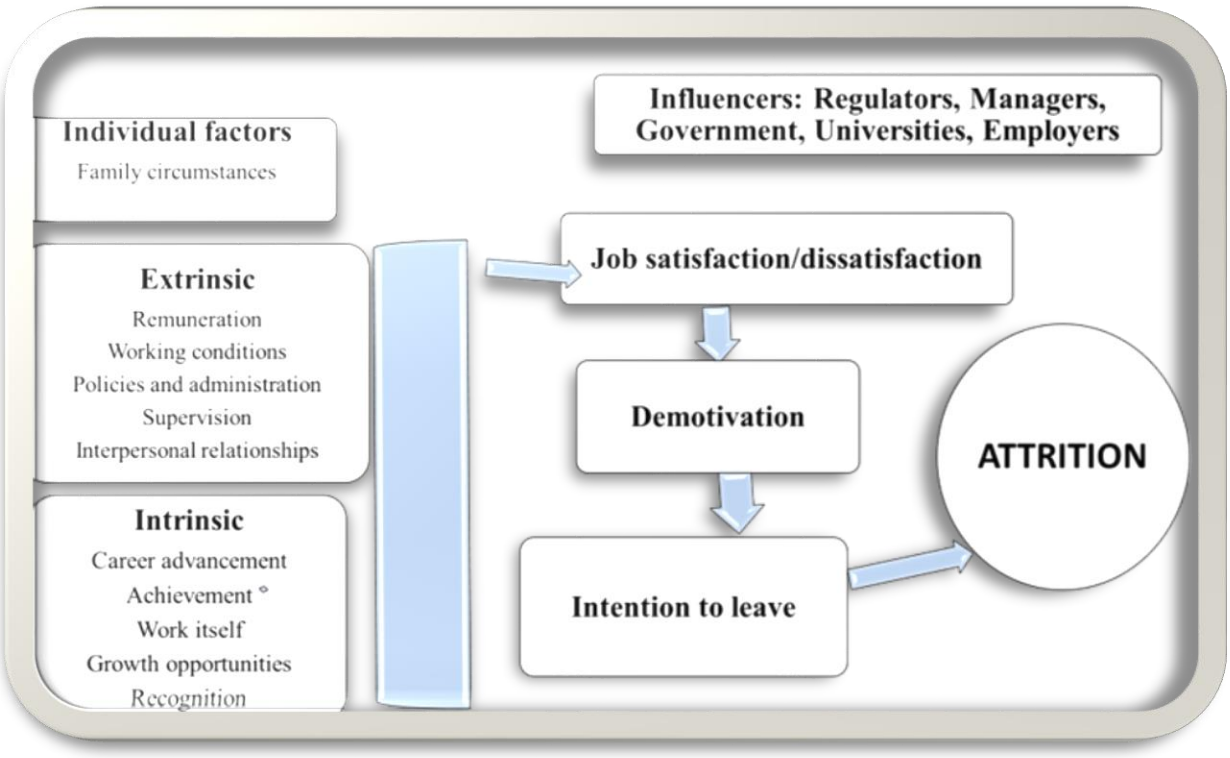

Figure 9 Intrinsic and extrinsic factors arising from the study

Nevertheless, this framework should be complemented with understanding of broader systemic issues affecting healthcare professionals in South Africa, including disparities in healthcare access and public-private sector dynamics.

3.5.2. **Addressing attrition in the dental therapy profession**

While recognizing the unique challenges and motivators within the dental therapy profession, Herzberg's Two-Factor Theory was not comprehensive enough to guide efforts to improve job satisfaction, reduce attrition, and ultimately enhance patient care. Hence, the Human Resources for Health System Development framework [74] was incorporated to form the **Comprehensive Human Resource Retention Framework**, which is designed to respond to the oral health needs of the South African population, taking into consideration the availability of human resources, the finance and budgeting, policies in place, and the collaboration between the public and private sector through addresses the production, deployment, and retention of dental therapists **(Figure 10).**

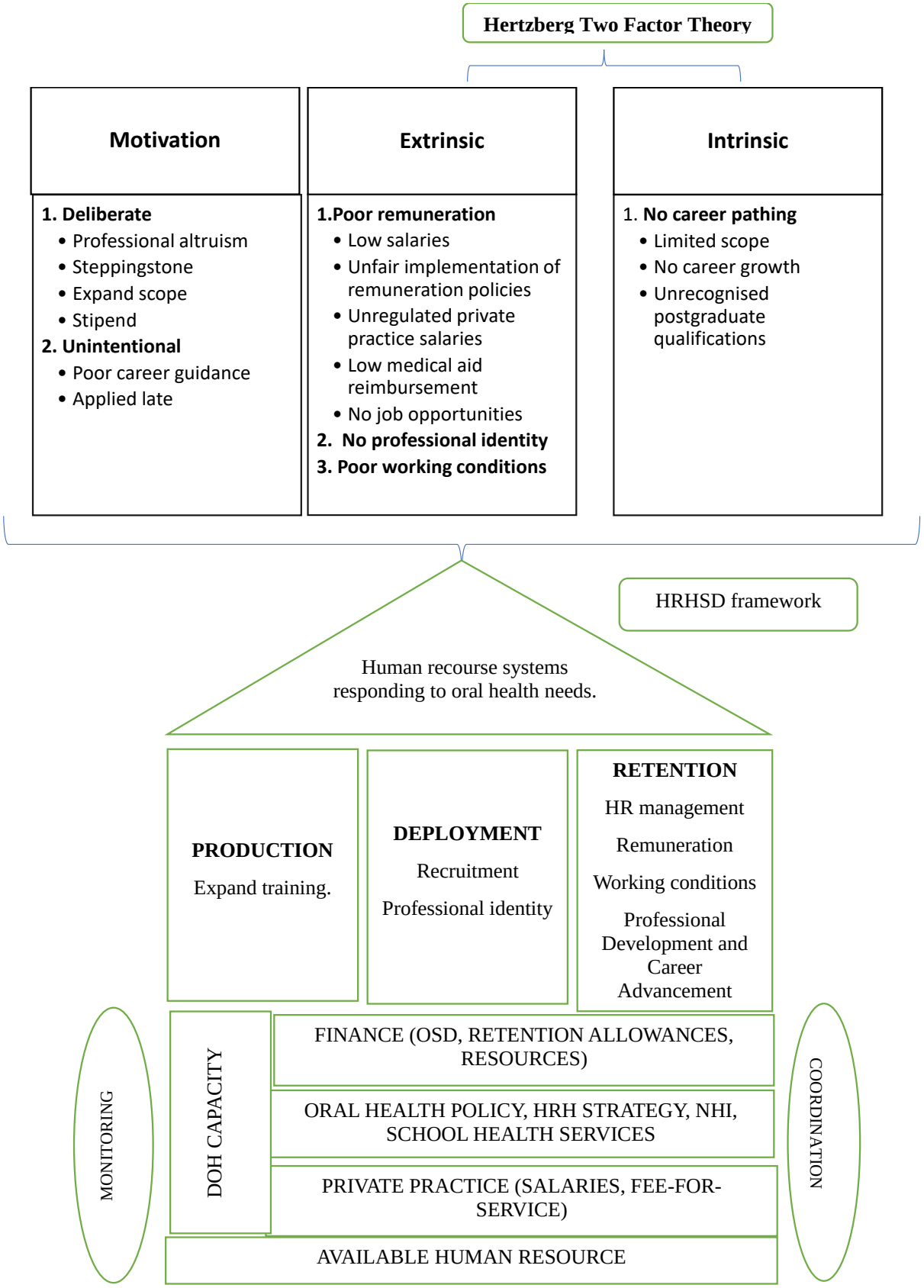

Figure 10 Comprehensive human resource retention framework

Comprehensive human resource retention framework is recommended to understand and address factors contributing to attrition, which should start with the comprehensive surveys and interviews within the healthcare system to understand intrinsic and extrinsic factors that leads to job dissatisfaction among staff. Utilizing the insights from Herzberg's Two-Factor Theory will distinguish between extrinsic and intrinsic factors, which should be aligned with the Human Resource for Health (HRH) framework's pillars [68, 74]. The framework includes a new theme of professional identity that arise from the findings, which is not unique to dental therapists, but also reported by other midlevel health workers such as clinical associates [124]. The HRH framework comprises several pillars essential for ensuring the effective functioning of healthcare systems worldwide. These pillars include education and training, workforce management, policy development, infrastructure, and financing. Education and training focus on preparing healthcare professionals with the necessary skills and competencies to meet population health needs. Workforce management involves strategic planning, recruitment, deployment, and retention strategies to optimize the distribution and utilization of healthcare workers. Policy development aims to create supportive regulatory frameworks and incentives to attract and retain skilled professionals. Infrastructure encompasses the physical and technological resources necessary for healthcare delivery, including facilities, equipment, and information systems. Lastly, financing mechanisms ensure adequate funding for education, workforce management, and infrastructure development to sustain a robust healthcare workforce. Together, these pillars form the foundation of the HRH framework, facilitating the provision of high-quality healthcare services and improving health outcomes globally. The HRH pillars enable the development of HR human resource strategies that address basic needs like fair compensation and adequate resources and emphasize intrinsic motivators such as recognition, growth opportunities, and meaningful work, which were identified in the findings of this PhD. These findings can be incorporated into workforce planning, education, recruitment, retention, and performance management strategies outlined in the HRH framework. Regular feedback should be established to continually review these strategies, ensuring they resonate with the evolving needs of healthcare professionals while systematically nurturing a motivated and skilled workforce within the healthcare system.

3.5.3. Conclusion

In summary, Herzberg's Two-Factor Theory provided a valuable lens through which it examined the attrition among dental therapists, and the Human Resources for Health System Development framework helped address the systemic issues identified, which led to the

development of the comprehensive human resource retention framework. However, achieving long-term success in recruiting and retaining dental therapists requires ongoing implementation of this framework, dedication to research, feedback, and adaptation to the evolving landscape of the profession.

CHAPTER 4: INTEGRATED DISCUSSION

In this chapter, I revisit the overall aim and objectives of the thesis against what was found. This begins with a summary of how each publication (or draft) presented in Chapter 3 answered the thesis research objectives. I then update the theoretical framework based on empirical evidence, which, as the integrating heart of the thesis, discusses key findings. This is done by highlighting cross-cutting themes and filling in gaps not overtly addressed in the individual publications. These include the attrition rate, demographics, and factors contributing to the attrition of dental therapists in South Africa. Study limitations are also discussed in this chapter.

4.1. Summary of PhD findings

This PhD research set out to determine the attrition rate and to explore the factors contributing to attrition in the South African dental therapy profession. In summary, the study shows that the overall attrition rate from the inception of the dental therapy profession in 1977 to 2019 was 60%. We thought this might be exaggerated by involuntary factors such as death and retirement. Hence, we also determined the ten-year attrition rate from 2010 to 1019, which was 9%. In addition to attrition, the number of registered dental therapists in South Africa was low; according to the data, only 714 dental therapists were registered in 2019. This could be attributed to underproduction since dental therapists are only trained in the two universities in /South Africa, alongside attrition. Training of dental therapists in these two universities also has contributed to the maldistribution of dental therapists among the nine South African provinces, with the majority residing in the two provinces where dental therapists are trained (KZN and Gauteng). The universities where dental therapists are trained have a racial history that is intricately connected to the larger context of apartheid and racial segregation within the South African historical landscape [125].

This was apparent in the study, which noted that a significant portion of dental therapists belonged to the African racial group. However, the inclusion of individuals from other racial backgrounds was observed post-apartheid. It is also important to note that the intersection of race and the dental therapy profession in South Africa is a complex and historically significant aspect of the country's healthcare landscape [125]. Section 3.1 (Paper 1) of this thesis provides more detailed information on the demographic profile and attrition rate.

While attrition is acknowledged, Section 3.2 (Paper 2) also highlights a high intention to leave among registered dental therapists. Chapter 3, delving into the factors contributing to attrition,

underscores that job dissatisfaction is the driving force behind attrition or intention to leave. Sections 3.2 – 3.4 4-5 (Papers 2 to 4) of my PhD research identified several factors contributing to job dissatisfaction, subsequently leading to either intention to leave or actual attrition. These factors, as reported in Chapter 3, include poor remuneration, lack of jobs, lack of professional identity, poor working conditions, lack of career pathing/progression, and gaps in policy implementation. Diverse groups have articulated these concerns, including current and former dental therapists, managers, regulators, academics, and professional associations. Several studies conducted among dental therapists have reported similar factors as the reasons behind attrition [25, 26, 27, 28].

As shown in Table 10, the three research objectives were addressed through a series of manuscripts.

Table 10 Summary of findings

PhD Objectives	Results Chapter	Key findings
Objective 1: To describe the demographic profile and attrition rate in the South African Dental Therapy profession	**Chapter 3 (3.1):** Attrition of dental therapists in South Africa - a 42-year review	• The number of HPCSA-registered dental therapists is low (714 in 2019). • Dominated by African race – 64%. • Majority resided in KZN (44%) and Gauteng (27%) where dental therapists are trained.
Objective 2: To explore the factors that contribute to dental therapy profession attrition	**Chapter 3, sections 3.2 – 3.4** Explored job satisfaction, intention to leave, and factors contributing to attrition from the perspective of registered dental therapists, former dental therapists, and stakeholders involved in the management, employment, regulation, and training of dental therapists.	• Dental therapists enrolled for different reasons, some unintentional and some deliberate. • All former dental therapists, including those who enrolled unintentionally, enjoyed practicing their profession; they took pride in their skills and their role in PHC. • Most left the profession due to job dissatisfaction (69.5%) • 51.5% expressed their intention to leave, and 82.2% of those unsatisfied with their jobs expressed their intention to leave.

		• All stakeholders acknowledge the role played by dental therapists, especially in the PHC; they advocate for the recruitment of dental therapists in the PHC. • Stakeholders admit that there is weakness in the health system, • Factors contributing to attrition include gaps in the implementation of human resource policies, poor remuneration, lack of jobs, no career path and progression, poor working conditions, and lack of professional identity
Objective 3: To explore the comprehensiveness of the Herzberg framework in the context of dental therapy attrition in South Africa	Chapter 3 (3.5): The comprehensiveness of the Herzberg framework in the context of dental therapy attrition in South Africa	• Hertzberg's Two-Factor Theory helped identify intrinsic and extrinsic factors contributing to attrition. • Hertzberg's Two-Factor Theory focuses on an individual level but is not broad enough to address the identified factors at the health system level. • The Human Resources for Health System Development framework was

		brought to address the identified factors at the health system level. • The comprehensive Human Resource Retention Framework was developed, adapted from Hertzberg's Two-Factor Theory and Human Resources for Health System Development framework.

4.2. Crosscutting themes

In this discussion, the individual manuscript findings are not repeated but instead built upon in line with the broader literature by presenting the three key cross-cutting themes and the Comprehensive Human Resource Retention Framework (adapted from Hertzberg Two Factor Theory and Human Resource System Development framework).

Three main themes emerged across the research, as shown in Table 10, which provides a matrix of the themes found in the four papers. The themes that emerged are:

1. **Identity of dental therapists** – personal and professional identity of dental therapists.
2. **Supply (Production and Attrition)** – description of production, attrition, and intention to leave.
3. **Reasons for attrition** – factors contributing to intention to leave and attrition.
4. **Data limitation** – availability and accuracy of data regarding dental therapists.

These themes are discussed further in sections 4.2.1 through 4.2.4

Table 11 Cross-cutting themes

Results	Section 3.1	Section 3.2	Section 3.3	Section 3.4
Identity of dental therapists	Africans – 64% KZN & GP (44% & 27%)	Africans – 74.5% KZN & GP	Lack of professional identity (intrinsic & extrinsic)	Lack of professional identity (extrinsic)
Supply (Production and Attrition)	Low number The attrition rate was 42 yrs. 60% and 9% for ten years. Training in only two universities	51.5% had the intention to leave		Only one DT in 2 provinces and 6 in another
Reasons for attrition		69.5% were not satisfied with their jobs. The high odds of job satisfaction were among those who qualified in UKZN, had a job post-graduation, were aware of PG prospects, and who felt valued.	Job dissatisfaction was due to poor pay, lack of jobs, lack of professional identity, poor working conditions, and lack of career pathing	Job dissatisfaction was due to gaps in policy implementation, poor remuneration, lack of jobs, lack of professional identity, and lack of career pathing

		The low odds of job satisfaction were among those who enrolled without knowing the scope of the profession. Reasons for job dissatisfaction included poor remuneration, lack of career pathing, lack of career progression, and lack of job opportunities.		
Data limitations	Data inaccuracy, incomplete data.	Small sample		

4.2.1. Theme 1: Identity of dental therapists

The study has identified a trend in race and geographic location of demographics, where most dental therapists were African, with the majority residing in the two provinces where dental therapists are trained (Chapter 3, sections 3.1 and 3.2). As such, extending the training to other provinces will increase the chances of equitable distribution of dental therapists in all nine provinces of South Africa. Although racial transformation has been observed after democracy (1994) in South Africa, the profession is still dominated by African and Indian races; hence, the PhD recommends the extension of dental therapist training to other universities. This will not only increase the production of dental therapists, but it will also increase the chances of recruiting students from other racial groups, such as whites and coloureds, which will cultivate a more inclusive, responsive, and effective healthcare system that caters to the diverse needs of patients. Dental therapists lack professional identity, described in sections 3.2 – 3.3 as a lack of sense of belonging within a dental team and the health system. Their lack of identity also extends to the fact that dental therapists lack identity in the community because their existence is unknown by the communities they serve.

4.2.2. Theme 2: Supply (Production and Attrition)

Chapter 3, Section 3.1 reported low numbers of registered dental therapists and attrition of dental therapists in South Africa. The low supply is due to dental therapists being trained from only two universities, and over and above this low number, most leave the dental therapy profession to pursue other professions or venture into business [39]. This has left gaps in terms of the availability of dental therapists in other provinces. For example, in Section 3.4, some provincial managers reported having only one dental therapist, and another big province reported having only six because the majority left the profession. The implication for this is that it may lead to staff shortages and a high burden of unmet treatment needs, as reported in some South African studies. However, a compounding factor is that the public sector is reportedly not opening sufficient posts to absorb existing graduates. This lack of posts leaves many graduate dental therapists without jobs despite the many untreated diseases reported in South Africa and disparities in access to basic oral health services [14, 39]. Additionally, it worsens equitable access to dental services, particularly in underserved areas where the public sector plays a vital healthcare role.

4.2.3. Theme 3: Reasons for attrition

In Sections 3.1 to 3.4, job dissatisfaction was the predominant driver behind the intention to leave and the actual attrition of dental therapists in our study. These findings are similar to those of other studies conducted among dental therapists [25, 26, 27, 28]. This dissatisfaction was a common thread among all participant categories. Job dissatisfaction has been reported in other health professionals by a regionally based South African study conducted among health professionals. It also reported that more than half of the participants were not satisfied with their jobs [126] Their cited reasons for job dissatisfaction were job security, standard of care, career growth, poor remuneration, workload, and working conditions, which are similar to our findings [119]

The good news is that all the factors contributing to job dissatisfaction can be prevented or effectively addressed through the strategies detailed in the comprehensive human resource retention framework outlined in, Section 3.5. Failure to address these factors would perpetuate the loss of resources invested in training dental therapists who ultimately decide to leave the profession. Additionally, as highlighted in several South African studies, the burden of unmet treatment needs would persist [13, 14] Taking proactive measures to address these factors is not just advisable but a strategic imperative. Doing so will help recover the costs associated with training dental therapists who might otherwise depart and enhance retention rates. This will improve access to basic oral health services, aligning with our broader goal of achieving universal healthcare access.

4.2.4. Theme 4: Data limitations

The study encountered significant constraints and limitations associated with data availability and quality. In Chapter 3, Section 3.1, I had to rely solely on a single data source. This limitation arose because data from the universities for the specific period under consideration was not accessible.

This data constraint impacted the comprehensiveness and depth of our analysis in Section 3.1. It limited our ability to triangulate findings from multiple sources, potentially affecting the robustness of our conclusions. Acknowledging this limitation and interpreting the results given the constrained data availability is essential. Despite this limitation, I have strived to make the most of the available data to draw meaningful insights and contribute to our research objectives to the best extent possible.

Addressing the factors contributing to the attrition of dental therapists is essential for retaining them within the healthcare system. The findings from this PhD research, along with global literature on dental therapists, highlights the significant role these professionals play in making oral health services accessible and affordable. This holds immense significance in both global and national discussions on oral health, especially for middle-income countries like South Africa. Dental therapists have been proven to effectively deliver basic oral health services, such as cleanings, fillings, and extractions, often in underserved communities where access to basic dental care is limited [24]. Their role in extending oral healthcare to remote and marginalized populations aligns closely with the goal of achieving Universal Oral Health Coverage, as outlined in the WHO Oral Health Resolution (WHA 74.5) [127].

In countries like South Africa, where oral health disparities are prevalent and access to dental care remains a challenge for many, the utilization of dental therapists can play a crucial role in bridging the gap. By deploying dental therapists in primary healthcare settings, school health services, and community outreach programs, countries can enhance access to basic oral health services for all citizens, regardless of their socioeconomic status or geographic location. This aligns directly with the WHO's call for comprehensive oral health coverage, ensuring that everyone has access to affordable, quality dental care when needed [1].

Furthermore, the cost-effectiveness of dental therapists makes them a practical solution for resource-constrained healthcare systems, such as those found in many middle-income countries. By training and employing dental therapists, countries can maximize their healthcare workforce's efficiency and capacity to address oral health needs effectively. This approach not only improves oral health outcomes but also contributes to overall public health and well-being, aligning with the broader goals of the WHO Oral Health Resolution [127].

4.3. Contribution of the PhD

This PhD substantially contributes to the existing knowledge on attrition in the dental therapy profession. It offers valuable insights into an under-researched area, enhancing our understanding of the factors influencing workforce retention and turnover within the dental therapy profession. Here are several ways in which this PhD contributed to existing knowledge:

- Identifying Key Determinants of Attrition: Through rigorous empirical research, this PhD identified the key determinants of attrition among dental therapists, shedding light on the factors that contribute to workforce turnover within the profession. By

examining both individual-level factors (e.g., job satisfaction, career aspirations) and systemic factors (e.g., regulatory environment, workforce policies), this PhD provided a comprehensive understanding of the complex dynamics underlying attrition.

- Exploring Context-Specific Challenges: This PhD explored the unique challenges and barriers to retention faced by dental therapists in South Africa. By conducting comparative analyses across diverse settings, this PhD has elucidated the contextual factors that shape attrition patterns and informed targeted interventions tailored to the South African contexts.
- Informing Policy and Practice: Findings from this PhD provided evidence-based recommendations for policy makers, healthcare administrators, and other stakeholders involved in workforce planning and management. By highlighting effective strategies for retaining dental therapists and addressing attrition-related challenges, this PhD informs the development of policies, programs, and initiatives aimed at strengthening the dental therapy workforce and improving oral healthcare delivery.
- Advancing Theoretical Frameworks: this PhD contributed to theoretical frameworks and conceptual models related to workforce retention and turnover, expanding our theoretical understanding of the mechanisms driving attrition among dental therapists.

In summary, this PhD has made a significant contribution to existing knowledge, addressing important gaps in the literature and generating evidence to inform policy, practice, training, and future research in this area.

CHAPTER 5 – CONCLUSION AND RECOMMENDATIONS

In this chapter, I provide the concluding summary remarks of the entire thesis and the key proposed recommendations based on the findings.

5.1. Conclusion

This PhD emphasized the crucial role played by dental therapists within the healthcare system, highlighting the alignment of their scope and skills to the primary healthcare (PHC) setting. Notably, while many individuals may not have initially intended to pursue a career in dental therapy, and some entered the profession with limited prior knowledge, their journey led to the development of robust professional altruism. However, a significant portion of dental therapists left the profession due to various factors rooted in job dissatisfaction, resulting in a substantial attrition rate that has persisted since the profession's inception in 1977. Furthermore, the study revealed the post-apartheid transformation in the racial composition of the dental therapy profession, though it remains African-dominated. Geographic disparities in the distribution of dental therapists across South Africa's nine provinces were also brought to the forefront, with the majority residing in the provinces with the largest populations and where the only two South African dental therapy training universities are situated. This comprehensive national study is the first to examine dental therapist attrition in South Africa. Notably, the identified factors contributing to attrition are preventable and modifiable through collaborative efforts involving higher education institutions, policymakers, regulators, and professional associations. The proposed strategies, as detailed in the comprehensive human resource retention framework, encompass enhancements in dental therapist production, deployment, and retention, working towards ensuring a robust and sustainable dental therapy workforce in South Africa.

5.2. Recommendations

5.2.1. Recommendations for Policymakers

Several gaps in policy implementation have been identified in the literature, and this PhD. Additionally, inconsistency in the inclusion of dental therapists in policies, as well as the policy-making processes, were identified. Hence, I recommend the review and inclusion of dental therapists in the following policies:

- **OSD:** Gaps in the implementation of OSD have been identified in the literature and this study. Our study revealed that in some provinces, dental therapists cannot grow within their careers as stipulated in the OSD. Hence, most dental therapists left their profession to pursue other careers where there is career growth. This calls for a policy review to ensure that all provinces implement the OSD effectively, allowing dental therapists to be afforded an opportunity to be promoted to director positions in all provinces. We also recommend regular review and monitoring of the implementation of this policy.

- **Community service:** The participants of this PhD, especially the managers, associated the lack of jobs for dental therapists with the fact that dental therapists are not included in compulsory community service. They further stated that their focus was to create positions to absorb those in community service into the health system when they complete their 12 months of compulsory service. Given that the availability of jobs post-graduation was significantly associated with job satisfaction, we recommend the inclusion of dental therapists into the community service policy to enhance their deployment post-qualification. However, including dental therapists in community service programs offers a potential solution to oral healthcare disparities, especially in underserved areas. However, challenges in placing and absorbing healthcare professionals into these programs need careful consideration. Current struggles in healthcare placement and absorption highlights the systemic issues, exacerbated by budget cuts. Adding dental therapists may encounter similar obstacles due to specific infrastructure and resource requirements. Integrating them would demand additional investments, potentially unfeasible in the current economic climate. Moreover, post-community service absorption depends on available positions and resources, posing challenges similar to those faced by doctors. Addressing underlying systemic issues and resource constraints is crucial, requiring targeted investments in infrastructure, workforce planning, and financial resources. Policymakers may also need to explore

innovative funding mechanisms and partnerships to support the expansion of dental therapy services in underserved areas.

- **Rural allowance:** Our findings reported inconsistency in the allocation of some incentives, such as rural allowance for those midlevel health professionals working in rural facilities. Some dental therapists who worked in rural facilities did not receive a rural allowance, while other midlevel health professionals working in the same facilities received the incentives. Hence, we recommend the review of these incentives to include dental therapists and ensure consistency across all provinces.
- **Overtime**: According to the findings of this PhD, there is no overtime policy for dental therapists. The participants alluded to the fact that dental therapists refer to the same policy used by the administrative staff and cleaners. Hence, we recommend developing an overtime policy for mid-level health professionals, including dental therapists, or including them in the commuted overtime.

5.2.2. **Recommendations for Higher Education Institutions**

This PhD research has identified the gaps in the production and attrition of dental therapists, evidenced by a low number of registered dental therapists. It has notably pinpointed the absence of clear career paths as a significant factor contributing to attrition within the dental therapy profession in South Africa. Consequently, I strongly advocate for expanding dental therapy training programs and the proactive development of the profession. These initiatives are crucial to attracting and retaining more dental therapists, addressing the current shortage, and fostering a sustainable future for the profession.

- **Expand training geographically**: To enhance the production of dental therapy professionals, there is a need to expand the training of dental therapists to other universities and provinces. The findings of this research provided evidence that dental therapists tend to stay in the provinces where they are trained, as seen through many dental therapists residing in those provinces where they were trained. Expanding training to other universities/provinces was also recommended by the Department of Health in 2006 [92].
- **Develop post-graduate qualifications:** Literature has also reported that the majority of dental therapists left their profession because of unclear career prospects in the dental therapy profession. Hence, we recommend that the universities work with the regulators such as HPCSA, South African Qualifications Authority (SAQA), and Council on Higher Education (CHE) to develop post-graduate qualifications for dental therapists

to enhance their career growth. This includes developing training linked to their scope to either expand the scope or develop a specialization in areas within their scope. For example, these could include restorative dentistry, minor oral surgery, or research. This can be benchmarked in other countries, such as Rwanda, where postgraduate training of dental therapists is linked with expanding the scope of practice [108].

- **Establish vertical articulation from dental therapy to dentistry:** Previous studies alluded that some dental therapists left the profession to study dentistry.[39]. However, there is no vertical articulation from dental therapy to dentistry in South Africa; dental therapists have to start from the first year. Hence, we recommend that the South African universities benchmark from other universities, such as Fiji National University, that offer a flexible program with single undergraduate entry and multiple exits [128]. This model allows all dental professionals to have one entry level but exit at different levels, either as oral hygienists, dental therapists, or dentists. Additionally, this model allows dental therapists to re-enter in the fourth year should they decide to return and study dentistry. This is not a new concept in South Africa. It is also implemented in the medical profession in the form of a graduate entry medical program (GEMP), where suitably qualified applicants who completed their undergraduate university degree at a minimum of Bachelor's or Bachelor of Technology degree level with an average of at least 60% over the final two completed years of study, can enter into the third year of the Bachelor of Medicine, Bachelor of Surgery (MBBCh) degree [129].
- **Proactively support previously disadvantaged students:** Our findings confirm that some dental therapists enrolled in the profession because they identified gaps in service delivery in their communities, and they desired to get the qualification and return to serve their communities. Hence, we recommend offering financial support to previously disadvantaged students (from quantile 1-4 schools, which should encourage them to return to serve their communities post-qualification.

These recommendations empower universities to contribute significantly to the growth and quality of the dental therapy profession.

5.2.3. Recommendations for regulators (HPCSA)

The PhD revealed that most dental therapists leave their profession because of the limited scope of practice. To improve the retention of dental therapy professionals, the HPCSA can consider several recommendations:

- **Review and update the scope of practice regulations:** It is essential to regularly review and update the scope of practice regulations to reflect the evolving needs of the

healthcare system, allowing dental therapists to provide a broader range of services; this will help the universities to plan the career pathing for dental therapists. Almost all dental therapists who left the profession, or those who expressed the intention to leave, cited unclear career paths and limited scope as the main reasons for their decision to leave. This has also been reported by other studies conducted among dental therapists. South Africa can set benchmarks from other countries like Rwanda, where the scope of practice is linked to postgraduate qualifications.[38]. For example, the honors and master's qualifications expand the dental therapists' scope to include some limited prosthodontics and orthodontic work. Thus, we recommend that HPCSA work with universities to design a scope for further training of dental therapists to the honors and master's degree levels.

- **Increase engagement with stakeholders:** The HPCSA should actively engage with dental therapy associations and stakeholders to ensure that policies and regulations align with the profession's growth and development, ultimately fostering a more supportive and attractive environment for dental therapy professionals in South Africa.
- **Regular update of the database:** The data of dental therapists from HPCSA is captured only on registration, and it's up to dental therapists to update their address when they relocate or their practice status when they shift between the private and public sectors. Additionally, there is no updated data on those who have retired or are deceased because if they or their families don't report to HPCSA, their status remains suspended. Hence, I recommend that HPCSA update its database annually when dental therapists renew their annual registration. I also recommend that the HPCSA collaborate with other sectors, such as home affairs, so their system automatically updates when one is deceased.

5.2.4. Recommendations for Government (Department of Health)

The PhD has highlighted various factors contributing to attrition among dental therapists, notably issues concerning recruitment and retention. Therefore, I strongly advise the Department of Health to formulate a comprehensive strategy aimed at both recruiting and retaining dental therapists:

- **Funding or bursaries for disadvantaged students:** To bolster the production of dental therapy professionals, the government can consider offering bursaries as a strategic investment. First and foremost, these bursaries should target students from underserved and poor backgrounds and address healthcare disparities. The government

should collaborate with educational institutions to establish clear criteria for eligibility, ensuring that bursaries are awarded to students committed to practicing dental therapy, especially in underserved areas post-graduation. Moreover, the government can offer incentives such as loan forgiveness programs for bursary recipients who fulfil a predetermined service commitment in underprivileged communities, thus enhancing access to oral healthcare where it is needed most [130]. By providing financial support through bursaries and associated programs, the government can make dental therapy education more accessible and attractive, ultimately increasing the number of qualified dental therapy professionals to meet the nation's oral healthcare needs.. This was evident in this PhD through those dental therapists attracted to the profession by the stipend they used to fund their qualifications.

- **Deployment of dental therapists in PHC programs:** The deployment of dental therapists in all PHC programs will not only create job opportunities for dental therapists but can significantly enhance access to oral healthcare services, especially in underserved and rural areas. Literature has shown a high rate of unmet treatment needs among specific population groups, such as children under the age of 6 years in South Africa [9]; hence, the integration of dental therapists into PHC settings and programs such as maternal and child health will ensure early prevention and treatment of oral health diseases, which are often closely linked to overall health. This approach aligns with holistic healthcare and interprofessional collaboration principles, ensuring that oral health is considered an integral part of overall well-being. By incorporating dental therapists into the PHC programs, the government can take a significant step towards addressing oral health disparities and promoting comprehensive healthcare for all.
- **Recruit dentists/dental therapists/oral hygienists as oral health managers:** Previous studies, including this PhD, reported poor working conditions, and in some cases, this is attributed to the fact that in some provinces, the oral health managers are non-oral health professionals, with no clear understanding of dental programs. Therefore, I recommend recruiting dental therapists, dentists, or oral hygienists as oral health managers to support dental programs since they can potentially represent a strategic approach to enhancing oral healthcare services. With their clinical expertise and deep understanding of oral health, these professionals are well-equipped to oversee and improve dental programs [131]. They bring a wealth of knowledge to program development, focusing on evidence-based practices, preventive care, and early intervention. Their ability to allocate resources effectively, enforce quality standards, and foster interprofessional collaboration ensures patients receive high-quality care.

Additionally, their role in data analysis, advocacy, and community engagement might contribute to the success and sustainability of dental programs, ultimately benefiting both patients and the broader community by promoting comprehensive and patient-cantered oral healthcare.

5.2.5. **Recommendations for future research**

Future research that has not been addressed in this PhD should focus on:

- Include managers from all universities to explore a holistic understanding of the intentions, challenges, and opportunities associated with training dental therapists.
- **Exploring the career intentions of current dental therapy students to understand their aspirations and motivations within the dental profession**. This research delves into factors influencing students' career choices, such as their interest in various specialties, preferences for practice settings (e.g., public health, private practice), and desires to work in underserved communities. It also examines their long-term goals, including pursuing advanced degrees, engaging in research, or becoming educators in the field. This insight helps educational institutions tailor their curricula and support services to align with students' career aspirations, ultimately ensuring that the dental therapy workforce is well-prepared and motivated to address the evolving oral healthcare needs of diverse populations,
- **Conducting oral health needs assessment to assess the demand for oral healthcare services and subsequently determining the appropriate types and quantities of oral healthcare professionals required to address a population's health needs.** By thoroughly evaluating oral health status, healthcare utilization patterns, and access barriers within a community or region, policymakers and healthcare organizations can identify disparities, service gaps, and areas with limited oral healthcare resources. This data-driven approach enables informed decision-making regarding which types of professionals, whether dentists, dental therapists, dental hygienists, or others, are best suited to meet the specific needs of various population groups. It also guides resource allocation, workforce planning, and the development of policies to optimize the distribution of oral health professionals, ultimately ensuring that communities receive timely and effective oral healthcare services tailored to their unique requirements.

- **Exploring the cost-effectiveness of training and employing dental therapists:** Research focused on the cost-effectiveness of training and hiring dental therapists is needed for various reasons. Firstly, it aids in understanding how investing in dental therapy programs impacts resources, assisting the policymaker's inefficient allocation. This insight will guide healthcare planning, revealing potential savings associated with employing dental therapists. Comparative studies enable efficient resource use while analysing their impact on access to care, especially in underserved regions. Long-term financial assessments help forecast sustainability. Evidence-based findings will inform policy formulation, influence funding and workforce planning, and ultimately ensure optimal patient care and resource utilization within the dental care sector.
- **Effectiveness of dental therapy services:** Research into the effectiveness of dental therapy services is essential for assessing the impact and quality of care delivered by dental therapists. This research will encompass various aspects such as understanding clinical outcomes, preventive maintenance, and access to oral healthcare, which will help to determine the dental therapist's effectiveness in improving patient health and addressing disparities, especially in underserved areas. Assessing the long-term impact and quality of care dental therapists provide ensures sustained benefits and high standards. This empirical research will assist in making informed decisions, formulating policies, and optimizing the utilization of resources, ultimately enhancing patient outcomes, and refining the role of dental therapists in oral healthcare.

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ANNEXURE A: DOCUMENT REVIEW CHECKLIST

UKZN & SMU	• Intake lists from 1977 to 2019. • Graduation lists from 1977 to 2019. • (Lists includes race and gender)
HPCSA	• Lists registered from 1977 to 2019. (With race, gender, year of registration, registration status)

ANNEXURE B: SURVEY

SECTION A: DEMOGRAPHICS

1. What is your age? ☐

2. What is your gender?

   Male ☐ Female ☐ Other ☐

3. What race do you best identify with?

   African ☐ Colored ☐ Indian ☐ White ☐ Other ☐

4. Where do you currently reside?

   Gauteng ☐ North West ☐ KwaZulu-Natal ☐ Mpumalanga ☐ Western Cape ☐
   Northern Province ☐ Northern Cape ☐ Limpopo ☐ Free State ☐ Other ☐

5. Which year did you qualify as a dental therapist?

   ☐

6. At which university did you qualify?

   UKZN ☐ SMU ☐

SECTION B: INDIVIDUAL FACTORS

7. Was dental therapy your first choice?

   Yes ☐ No ☐

8. If not, what was your first choice?

   BDS ☐ Medicine ☐ Other (Specify) ☐

9. At what level were you aware of the dental therapy scope of practice?

   Before university registration ☐ 1st year ☐ 2nd year ☐ 3rd year ☐ after graduation ☐

10. Were you intending to work as a dental therapist after graduation?

Yes ☐ No ☐

11. Are you currently registered as a dental therapist?

Yes ☐ No ☐

12. Are you currently practicing as a dental therapist?

Yes ☐ No ☐

13. If not, what is your current profession?

Dentist ☐ GP ☐ Dental specialist ☐ Medical specialist ☐

Other (Specify) ☐

14. How many years did/have you worked as a dental therapist since graduation?

I never worked ☐ less than a year ☐ 1 year ☐ Other (Specify) ☐

15. If you are working as a dental therapist, are you intending to leave dental therapy profession?

Yes ☐ No ☐ Not applicable ☐

16. What would be your main reason(s) for leaving/staying?

☐

SECTION C: EXTRINSIC FACTORS

17. What is your employment status? (you can choose more than one answer)

Employed ☐ Unemployed ☐ Studying full time ☐ Employed and studying part time ☐

18. If unemployed, what is the reason?

No job opportunities ☐ studying ☐ Other (Specify) ☐

Not applicable ☐

19. If employed, in which sector do you work?

Private ☐ Public ☐ Academic ☐ Other (Specify) ☐

Not applicable ☐

20. What informed your decision for the above response? (you may tick more than 1 response)

Remuneration ☐ Working conditions ☐ Professional development ☐

Employment opportunities ☐ Other (Specify ☐

Not applicable ☐

21. Were the job opportunities readily available after graduation?

Yes ☐ No ☐ Not applicable ☐

22. How long did it take you to find a job after graduation? ☐

23. Are you satisfied with your current job?

Yes ☐ No ☐

24. What influences your response above? (you may tick more than 1 response)

Salary ☐ Career pathing ☐ Job opportunities ☐ Recognition ☐ Other

25. Do you think Dental Therapists in SA are regarded as valuable as other mid-level health professionals?

Yes ☐ No ☐ Other (Specify) ☐

SECTION D: INTRINSIC FACTORS

26. What is your highest degree earned?

Bachelor's degree PG ☐loma ☐onour ☐ M ☐ers PhD Other

27. Are you aware of any postgraduate study opportunities available for you?

Yes ☐ No ☐

28. In your opinion, is it easy to be admitted to postgraduate education?

☐

Yes ☐ No ☐ don't know

29. In your opinion, do dental therapists get the same career development opportunities as other midlevel health workers in South Africa?

Yes ☐ No ☐ don't know

30. Are you happy with the dental therapists' scope of practice?

Yes ☐ No ☐ don't know

31. In your opinion, is the current dental therapists' scope of practice aligned with the curriculum?

Yes ☐ No ☐ don't know

32. If you were to start your career afresh, would you still consider Dental Therapy?

Yes ☐ No ☐

33. What can be done to improve dental therapy profession in South Africa?

ANNEXURE C: IN DEPTH INTERVIEW GUIDE FOR DENTAL THERAPISTS WHO LEFT THE PROFESSION

Good morning/afternoon. My name is Pumla Sodo, and I am a PhD candidate at the University of Witwatersrand. I am conducting my PhD study on Attrition in the Dental Therapy Profession: an exploration of the contributing factors and possible solutions, which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health. I appreciate your participation in this study. Before we start, I would like your permission to record this interview, so that I will later be able to create a transcript of our conversation. If, at any time during this interview, you would like me to stop recording, please feel free to let me know. The interview will take no more than 45 minutes. Your responses will be kept confidential. I will use your responses to develop a better understanding of your views of dental therapy professionals leaving the profession, in other words attrition. Your participation in this interview is voluntary and that you may withdraw your consent to participate at any time.

Do you have any questions or concerns before we get started?

We will begin with the interview now, with your permission.

1. What motivated you to study for a degree in dental therapy?

2. How did your study experiences match your expectations in terms of preparing you for a career in dental therapy?

3. What was your experience as a dental therapist, if you ever practiced?

    3.1 What are your views of working as a dental therapist in the private vs. public sector?

    3.2. What are your views about the dental therapy profession in South Africa?

4. What influenced your decision to leave the dental therapy profession?

    4.1 Employment opportunities?
    4.2 Job satisfaction? Elaborate
    4.3. Remuneration?
    4.4. Working conditions?
    4.5. Recognition?
    4.6 Career pathing?
    4.7 Scope?
    Regulation?

1. To what extent does your current employment draw on skills you learned as a dental therapist?

2. What would make you go back to the profession, if anything?

3. What can be done to improve dental therapy profession in South Africa?

4. What else would you like to share with me that we have not covered?

Thank you for your time and insights.

ANNEXURE D: ORAL HEALTH MANAGER'S INTERVIEW

Good morning/afternoon. My name is Pumla Sodo, and I am a PhD candidate at the University of Witwatersrand. I am conducting my PhD study on **Attrition in the Dental Therapy Profession: an exploration of the contributing factors and possible solutions,** which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health. I appreciate your participation in this study. Before we start, I would like your permission to record this interview, so that I will later be able to create a transcript of our conversation. If, at any time during this interview, you would like me to stop recording, please feel free to let me know. The interview will take no more than 45 minutes. Your responses will be kept confidential. I will use your responses to develop a better understanding of your views of attrition in the dental therapy profession. Your participation in this interview is voluntary and that you may withdraw your consent to participate at any time.

Do you have any questions or concerns before we get started?

We will begin with the interview now, with your permission.

1. In your opinion, what is the role of Dental Therapists within the South African health system?
    a. Role within the dental team?
    b. Role in primary health care?
2. What is the status for Dental Therapists in your province?
    a. How many Dental Therapist do you have in your province?
    b. How many Dentists do you have in your province?
3. How are Dental Therapists recruited in South Africa?
    a. How are vacancies identified?
    b. How easy or difficult is it to get Dental Therapists posts funded?
    c. What are other challenges in recruiting Dental Therapists?
4. What are the retention strategies in place for Dental therapists?
    a. What are the actual retention rates like for dental therapists?
5. How do Dental Therapist work conditions compare with other mid-level workers in South Africa?
    a. Remuneration
    b. Benefits Professional development?

c. Allowances?

d. Opportunities?

6. What is the future of Dental Therapy profession in South Africa?

   Please elaborate.

7. What can be done to improve Dental Therapy profession in South Africa?

8. What else would you like to share with me that we have not covered?

Thank you for your time and insights.

ANNEXURE E: Academics Interview Guide

Good morning/afternoon. My name is Pumla Sodo, and I am a PhD candidate at the University of Witwatersrand. I am conducting my PhD study on **Attrition in the Dental Therapy Profession: an exploration of the contributing factors and possible solutions,** which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health. I appreciate your participation in this study. Before we start, I would like your permission to record this interview, so that I will later be able to create a transcript of our conversation. If, at any time during this interview, you would like me to stop recording, please feel free to let me know. The interview will take no more than 45 minutes. Your responses will be kept confidential. I will use your responses to develop a better understanding of your views of attrition in the dental therapy profession. Your participation in this interview is voluntary and that you may withdraw your consent to participate at any time.

Do you have any questions or concerns before we get started?

We will begin with the interview now, with your permission.

1. What do you see as the role of a Dental therapist in South African health system?
2.
3. What training model do you use to prepare Dental Therapists in your institution?
    a. How prepared are dental therapists for the training you provide?
    b. How do you support Dental Therapists to develop academically?
    c. How do you support candidates to develop professional skills?
4. What are the career paths you observe for Dental therapists?
    a. What are the postgraduate opportunities currently in place for dental therapists?
    b. What career opportunities do your graduates pursue?
5. What plans, if any, do you have to improve the training of Dental Therapy professionals?
    a. Career pathing
    b. Post graduate opportunities!
6. What can be done to improve Dental Therapy profession itself in South Africa?
7. What else would you like to share with me that we have not covered?

Thank you for your time and insights.

ANNEXURE F: SADTA/HPCSA BOARD INTERVIEW

Good morning/afternoon. My name is Pumla Sodo, and I am a PhD candidate at the University of Witwatersrand. I am conducting my PhD study on **Attrition in the Dental Therapy Profession: an exploration of the contributing factors and possible solutions,** which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health. I appreciate your participation in this study. Before we start, I would like your permission to record this interview, so that I will later be able to create a transcript of our conversation. If, at any time during this interview, you would like me to stop recording, please feel free to let me know. The interview will take no more than 45 minutes. Your responses will be kept confidential. I will use your responses to develop a better understanding of your views of attrition in the dental therapy profession. Your participation in this interview is voluntary and that you may withdraw your consent to participate at any time.

Do you have any questions or concerns before we get started?

We will begin with the interview now, with your permission.

1. Historically, can you please tell me your views of why dental therapists was introduced in South Africa?
2. What patterns have you observed in terms of registration and deregistration of dental therapists?
3. Why do you think dental therapists are leaving the profession?
    a. How does recognition of dental therapy profession recognition compare with other midlevel health workers in South Africa?
    b. What are the career paths for dental therapists in South Africa?
    c. What are the challenges faced by dental therapists in South Africa?

    .
4. What has been done to lower the attrition rate in the dental therapy profession in South Africa, if anything?

5. What is the role of dental therapists in of the oral health team?

6. What else would you like to share with me that we have not covered?

Thank you for your time and insights.

ANNEXURE G: INFORMATION SHEET

STUDY INFORMATION DOCUMENT

Study title: Attrition in the Dental Therapy Profession: an exploration of the contributing factors

Good Day

Introduction:

I am conducting my PhD study on **Attrition in the Dental Therapy Profession: an exploration of the contributing factors,** which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health.

The aim of this study is to explore the factors contributing to attrition in the Dental therapy profession in order to recommend the suitable strategies to address attrition in the profession and the objectives are as follows:

1. To describe the demographic profile and attrition rate in the South African Dental Therapy profession.
2. To explore the factors that contribute to dental therapy profession attrition
3. To explore the comprehensiveness of the Herzberg framework in the context of dental therapy attrition in South Africa.

Invitation to Participate: I am inviting you to take part in a research study (survey attached).

Should you consent to participate in the study, you must please sign the consent form provided and hand it in to the researcher, who will provide you with a survey to complete. Once you've completed the survey, please place it in a sealed box provided. The box will remain sealed until the principal investigator analyses the surveys.
The survey will consist of demographic information as well as questions related to factors contributing to attrition which include individual factors, extrinsic factors, and intrinsic factors.

The questionnaire comprises of 32 questions. This questionnaire should take less than 20 minutes of your time. Please answer all questions to the best of your knowledge.
The survey/interview is completely anonymous and no identifying information will be collected. Your responses will be kept strictly confidential.

Risks of being involved in the study: There are no anticipated risks for participating in the study.

Benefits of being in the study: There is no direct benefit for participating in the study.

Participation is voluntary, Participation in this study is voluntary and you have the right to refuse to participate or withdraw from participation with no consequences.

Reimbursements for "out of pocket" expenses there is to be no payment or cost associated with participation in the study.

Confidentiality: All personal information will be treated in the strictest confidence and will only be available to the Principal Investigator (PI) and her supervisors.
The only exceptions - and all of them are rare - would normally be:

1. personal information may be disclosed if required by law.
2. the Human Research Ethics Committees of the University may exceptionally require personal data to respond to a formal complaint, or for a compliance audit.

If results are published, this may, exceptionally, lead to cohort, or more rarely, individual identification. All data collected in the course of the study will be securely retained for two (2) years, if a scientific publication arises from the study and six (6) years, if there is no publication. Thereafter it will be destroyed accordingly.

Anonymity the surveys will be completely anonymous – it will not ask for your name or contact details.

Contact details of researcher/s: Should you have any more questions regarding the study or survey, please contact:

Miss Pumla Sodo, Principal Investigator, telephone no. 0834733252, or by e-mail at pumla.sodo@wits.ac.za; Prof. S Nemutandani, Supervisor 1, on telephone no. 011 717 2447, or by e-mail at **Simon.Nemutandani@wits.ac.za,** Prof. V. Yengopal, Supervisor 2, on telephone no. 011 717 2593, or by e-mail at **Veerasamy.Yengopal@wits.ac.za** or Dr. S.J. Nieuwoudt, Supervisor 3, on telephone no. 011 717 2173, or by e-mail at **sara.nieuwoudt@wits.ac.za**

The results of the study will be shared with you once the study is completed.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg (M190686). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.
If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Thank you for reading this Study Information Sheet.

Date:

WITS UNIVERSITY

STUDY INFORMATION DOCUMENT

Study title: Attrition in the Dental Therapy Profession: an exploration of the contributing factors

Good Day

Introduction:

I am conducting my PhD study on **Attrition in the Dental Therapy Profession: an exploration of the contributing factors,** which I will present in the fulfilment of the requirements to complete my PhD degree in Public Health.

The aim of this study is to explore the factors contributing to attrition in the Dental therapy profession in order to recommend the suitable strategies to address attrition in the profession and the objectives are as follows:

1. To describe the demographic profile and attrition rate in the South African Dental Therapy profession.
2. To explore the factors that contribute to dental therapy profession attrition
3. To explore the comprehensiveness of the Herzberg framework in the context of dental therapy attrition in South Africa.

Invitation to Participate: I am inviting you to take part in a research study. Your participation will involve the interview to explore the factors contributing to attrition in the dental therapy profession.

Should you consent to participate in the study, you must please sign the consent form as well as the consent form for audio recording which is provided. Once you've completed the consent forms, please hand it in to the researcher, who will interview you.

The interviews will be conducted in English by the researcher and recorded with your permission. Interviews will take 45 minutes to an hour.

Risks of being involved in the study: There are no anticipated risks for participating in the study.

Benefits of being in the study: There is no direct benefit for participating in the study.

Participation is voluntary, Participation in this study is voluntary and you have the right to refuse to participate or withdraw from participation with no consequences.
Reimbursements for "out of pocket" expenses there is to be no payment or cost associated with participation in the study.

Confidentiality: All personal information will be treated in the strictest confidence and will only be available to the Principal Investigator (PI) and her supervisors.
The only exceptions - and all of them are rare - would normally be:

3. personal information may be disclosed if required by law.
4. the Human Research Ethics Committees of the University may exceptionally require personal data to respond to a formal complaint, or for a compliance audit.

If results are published, this may, exceptionally, lead to cohort, or more rarely, individual identification. All data collected in the course of the study will be securely retained for two (2) years, if a scientific publication arises from the study and six (6) years, if there is no publication. Thereafter it will be destroyed accordingly.

Anonymity: your name will not be attached to the interview, instead, pseudo names will be used in the interview data.

Fate of recordings:

- The recording will be stored in a secure location (a locked cupboard or password protected computer) with restricted access to the researcher and the research supervisors.
- The recording will be transcribed and any information that could identify me will be removed,

- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research.
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Contact details of researcher/s: Should you have any more questions regarding the study or survey, please contact:

Miss Pumla Sodo, Principal Investigator, telephone no. 0834733252, or by e-mail at pumla.sodo@wits.ac.za; Prof. S Nemutandani, Supervisor 1, on telephone no. 011 717 2447, or by e-mail at **Simon.Nemutandani@wits.ac.za,** Prof. V. Yengopal, Supervisor 2, on telephone no. 011 717 2593, or by e-mail at **Veerasamy.Yengopal@wits.ac.za** or Dr. S.J. Nieuwoudt, Supervisor 3, on telephone no. 011 717 2173, or by e-mail at **sara.nieuwoudt@wits.ac.za**

The results of the study will be shared with you once the study is completed.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg (M190686). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Thank you for reading this Study Information Sheet.

Date:

ANNEXURE H: INFORMED CONSENT

WITS UNIVERSITY

PARTICIPANT CONSENT SHEET

Project Title: Attrition in the Dental Therapy Profession: an exploration of the contributing factors

1. I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto.
2. I was given time to read it, or had it read to me, in the language I best understand.
3. I was given time to ask any questions I wanted to and found any answers given to me to be reasonable and satisfactory.
4. I believe I fully understand why the study is being conducted and what the intended outcomes will be.
5. I understand that there will be no immediate benefit to me, should I agree to participate, nor will I receive any payment; conversely, participation will not cost me anything but my time.
6. I understand that, even if I initially consent to take part in the study, I may subsequently withdraw at any time and would not be required to give any reasons; if that happened, any data collected

about me for the purposes of the study would immediately be destroyed, unless I give consent for it to be retained.

7. I have been given a range of contact details, listed below. If I require further information or become concerned about any aspect of this study, I am free to speak to any of these contacts.

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:

Name of Witness: _____
Signature: _____
Date: _____

Contact details of researcher/s: Should you have any more questions regarding the study or survey, please contact:

Miss Pumla Sodo, Principal Investigator, telephone no. 0834733252, or by e-mail at pumla.sodo@wits.ac.za; Prof. S Nemutandani, Supervisor 1, on telephone no. 011 717 2447, or by e-mail at **Simon.Nemutandani@wits.ac.za,** Prof. V. Yengopal, Supervisor 2, on telephone no. 011 717 2593, or by e-mail at **Veerasamy.Yengopal@wits.ac.za** or Dr. S.J. Nieuwoudt, Supervisor 3, on telephone no. 011 717 2173, or by e-mail at **sara.nieuwoudt@wits.ac.za**

CONSENT FORM FOR AUDIO RECORDING OF STUDY PARTICIPATION

Project Title: Attrition in the Dental Therapy Profession: an exploration of the contributing factors

I hereby consent to audio recording of the interview.

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I understand that:

- The recording will be stored in a secure location (a locked cupboard or password protected computer) with restricted access to the researcher and the research supervisor.
- The recording will be transcribed and any information that could identify me will be removed,
- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research.
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:

Name of Witness: _____
Signature: _____
Date: _____

Contact details of researcher/s: Should you have any more questions regarding the study or survey, please contact:

Miss Pumla Sodo, Principal Investigator, telephone no. 0834733252, or by e-mail at pumla.sodo@wits.ac.za; Prof. S Nemutandani, Supervisor 1, on telephone no. 011 717 2447, or by e-mail at **Simon.Nemutandani@wits.ac.za,** Prof. V. Yengopal, Supervisor 2, on telephone no. 011 717 2593, or by e-mail at **Veerasamy.Yengopal@wits.ac.za** or Dr. S.J. Nieuwoudt, Supervisor 3, on telephone no. 011 717 2173, or by e-mail at **sara.nieuwoudt@wits.ac.za**

ANNEXURE I: ETHICS CLEARENCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Miss P Sodo

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M190868

NAME: (Principal Investigator)	Miss P Sodo
DEPARTMENT:	School of Public Health Dental Therapists, UKZN and SMU
PROJECT TITLE:	Attrition in the dental therapy profession: an exploration of the contributing factors and solutions
DATE CONSIDERED:	30/08/2019
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Prof MS Nemuntandani, Prof V Yengopal and Dr SJ Nieuwoudt
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	21/02/2020

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in **August** and will therefore be due in the month of **August** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date 22/02/2020

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

ANNEXURE J: APPROVAL NORTH WEST

health
Department of
Health
North West Province
REPUBLIC OF SOUTH AFRICA

Cnr Sekame & First Street
New Office Park
Mafikeng, 2745
Private Bag X2068
MMABATHO, 2735

Enq: Nthabiseng Mapogo
Tel: 018 391 4504
NMapogo@nwpg.gov.za
www.nwhealth.gov.za

2030 NDP

POLICY, PLANNING, RESEARCH, MONITORING AND EVALUATION

Name of researcher : **Ms. P.P. Sodo**
University of Witwatersrand

Physical Address
(Work/ Institution) _____
_____
_____

Subject : **Research Approval Letter – Attrition in the dental therapy profession: an exploration of the contributing factors and solutions.**

This letter serves to inform the Researcher that permission to undertake the above mentioned study has been granted by the North West Department of Health. The Researcher is expected to arrange in advance with the chosen facilities, and issue this letter as proof that permission has been granted by the Provincial office.

This letter of permission should be signed and a copy returned to the department. By signing, the Researcher agrees, binds him/herself and undertakes to furnish the Department with an electronic copy of the final research report. Alternatively, the Researcher can also provide the Department with electronic summary highlighting recommendations that will assist the department in its planning to improve some of its services where possible. Through this the Researcher will not only contribute to the academic body of knowledge but also contributes towards the bettering of health care services and thus the overall health of citizens in the North West Province.

Kindest regards.

Mr. L. I. Kolobe
Acting Director: PPRM&E

25-06-2020
Date

Researcher

26/6/2020
Date

Healthy Living for All

ANNEXURE K: APPROVAL WESTERN CAPE

Western Cape Government
Health

STRATEGY & HEALTH SUPPORT
Health.Research@westerncape.gov.za
tel: +27 21 483 0866: fax: +27 21 483 6058
5th Floor, Norton Rose House,, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_202006_008
ENQUIRIES: Dr Sabela Petros

1 Jan Smuts Ave
Braamfontein
Johannesburg
2000

For attention: Ms Pumla Sodo, Prof Simon Nemutandani, Prof Veerasamy Yengopal, Dr Sara Nieuwoudt

Re: Attrition in the Dental Therapy Profession: an exploration of the contributing factors and solutions

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research.
Please contact the following people to assist you with any further enquiries in accessing the following sites:

Prof Neil Myburgh nmyburgh@uwc.ac.za

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).
4. The reference number above should be quoted in all future correspondence.

Yours sincerely

DR M MOODLEY
DIRECTOR: HEALTH IMPACT ASSESSMENT
DATE:
CC

Dr Melvin Moodley
Director: Health Impact Assessment
09 MAR 2021

ANNEXURE L: APPROVAL UKZN

UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZUW-NATALI

21 October 2019

Miss Pumla Pamella Sodo
University of the Witwatersrand
Email: pumla.sodo@wits.ac.za

Dear Miss Sodo

RE: PERMISSION TO CONDUCT RESEARCH

Gatekeeper's permission is hereby granted for you to conduct research at the University of KwaZulu-Natal (UKZN), towards your postgraduate studies, provided Ethical clearance has been obtained. We note the title of your research project is:

"Attrition in the Dental Therapy Profession: An Exploration of the Contributing Factors and Solutions. "

It is noted that you will be constituting your sample by conducting interviews with academic staff members in the Discipline of Dental Therapy on the Westville Campus and/or obtaining anonymized institutional data of the demographics (year of qualification, year of registration and gender) of the Bachelor of Dental Therapy graduates to date from UKZN Institutional Intelligence:

Please ensure that the following appears on your notice/questionnaire: • Ethical clearance number;
• Research title and details of the research, the researcher and the supervisor; • Consent form is attached to the notice/questionnaire and to be signed by user before he/she fills in questionnaire; • gatekeepers approval by the Registrar.

You are not authorized to contact staff and students using 'Microsoft Outlook' address book. Identity numbers and email addresses of individuals are not a matter of public record and are protected according to Section 14 of the South African Constitution, as well as the Protection of Public Information Act. For the release of such information over to yourself for research purposes, the University of KwaZuIu-Natal will need express consent from the relevant data subjects. Data collected must be treated with due confidentiality and anonymity.

Yours sincerely

DR KE CLELAND
REGISTRAR (ACTING)

ANNEXURE M: APPROVAL NORTHERN CAPE

DEPARTMENT OF HEALTH
LEFAPHA LA BOPHELO BO Bon-E
DEPARTEMENT VAN GESONDHEID
ISEBE LEZEMPILO

Enquiries:
Dipatlisiso:
Imibuzo:
Navrae :

Mr. B Mashute

Date:
Leshupeb:
Umhia:
Datun:

Reference:
Tshupelo:
iso:NC 202006 001 Vef"sing:

Wits Medical School
7 York Road, Parktown
2193
OFFICE OF THE HOD
Executive Offices
Northem Cape Department of Health
Private Bag X5049
KIMBERLEY, 8300
Tel: 053 830 2134
Email: BMashute@ncpg.gov.za

15 February 2021

Ms. Pumla Pamella Sodo
University of the Witwatersrand

Project Title: Attrition in the Dental Therapy Profession: An Exploration of the Contributing Factors and Solutions.

Dear Ms. Sodo

The application for gate-keeper's permission to conduct the above-mentioned research in Northern Cape Provincial Department of Health was received and has been reviewed by the Northern Cape Department of Health.

Decision: Approval is granted to conduct this research study in the Northern Cape Department of Health as indicated in your research proposal.

Your Provincial Ethics Reference Number is NC 202006 001, kindly use that reference number in correspondence with the Provincial Health Research Coordinator.

Please note the following:

1. This approval is valid for a period of one year from the date of approval.
2. The researcher must make all necessary arrangement with the office of the identified research respondent/s (as indicated on the research proposal), before visiting the'

office, thus to ensure that the provision of healthcare services is not affected when the project is being conducted.

Please note the following conditions:

1. This research project must be conducted at no cost to the Northern Cape Department of Health.
2. The approval is limited to the research proposal as submitted on the application.
3. There must be no modification or amendments on the research project.
4. The Research Unit may monitor this research project at any time.
5. At the completion of this research project, a copy of the final report must be submitted to the Research Unit.
6. The Northern Cape Department of Health Senior Management must be briefed on the outcome of the study prior publishing.

16/02/2021

Dr Dion Theys
Acting Head of Depart ent Northern
Cape Province
Department of Health

Date

ANNEXURE N: APPROVAL KZN

health
Department:
Health
PROVINCE OF KWAZULU-NATAL

Physical Address: 330 Langalibalele Street, Pietermaritzburg
Postal Address: Private Bag X9051
Tel: 033 395 2805/ 3189/ 3123 Fax: 033 394 3782
Email:
www.kznhealth.gov.za

DIRECTORATE:
Health Research & Knowledge Management

NHRD Ref: KZ_202006_019

Dear Ms P Sodo
(Wits)

Approval of research

1. The research proposal titled **'Attrition in the Dental Therapy Profession: an exploration of the contributing factors and solutions'** was reviewed by the KwaZulu-Natal Department of Health (KZN-DoH).

   The proposal is hereby **approved** for research to be undertaken at KZN-DoH.

2. You are requested to take note of the following:

   a. *All research conducted in KwaZulu-Natal must comply with government regulations relating to Covid-19. These include but are not limited to: regulations concerning social distancing, the wearing of personal protective equipment, and limitations on meetings and social gatherings.*
   b. *Kindly liaise with the facility manager BEFORE your research begins in order to ensure that conditions in the facility are conducive to the conduct of your research. These include, but are not limited to, an assurance that the numbers of patients attending the facility are sufficient to support your sample size requirements, and that the space and physical infrastructure of the facility can accommodate the research team and any additional equipment required for the research.*
   c. *Please ensure that you provide your letter of ethics re-certification to this unit, when the current approval expires.*
   d. *Provide an interim progress report and final report (electronic and hard copies) when your research is complete to* ***HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200*** *and e-mail an electronic copy to hrkm@kznhealth.gov.za*
   e. *Please note that the Department of Health shall not be held liable for any injury that occurs as a result of this study.*

For any additional information please contact Ms G Khumalo on 033-395 3189.

Yours Sincerely

Dr E Lutge
Chairperson, Health Research Committee
Date: 07/07/2020

Fighting Disease, Fighting Poverty, Giving Hope

ANNEXURE O: APPROVAL KZN

health
Department of Health
FREE STATE PROVINCE

15 June 2020

Miss. P Sodo
Dept. of School of Medicine
WITS

Dear Miss P Sodo

Subject: Attrition in the dental therapy profession: an exploration of the contributing factors

- Please ensure that you read the whole document, Permission is hereby granted for the above — mentioned research on the following conditions:
- Participation in the study must be voluntary.
- A written consent by each participant must be obtained.
- Serious Adverse events to be reported to the Free State department of health and/ or termination of the study.
- Ascertain that your data collection exercise neither interferes with the day to day running of Free State Provincial Offices nor the performance of duties by the respondents or health care workers.
- Confidentiality of information will be ensured and please do not obtain information regarding the identity of the participants.
- Research results and a complete report should be made available to the Free State Department of Health on completion of the study (a hard copy plus a soft copy).
- Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the University of the Witwatersrand and to Free State Department of Health.
- Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee of the University of the Witwatersrand and to Free State Department of Health.
- Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificate should be submitted to sebeelats@fshealth.gov.za makenamr@fshealth.gov.za before you commence with the study.
- No financial liability will be placed on the Free State Department of Health
- Please discuss your study with Institution Manager on commencement for logistical arrangements see 2nd page for contact details.
- Department of Health to be fully indemnified from any harm that participants and staff experiences in the study.
- Researchers will be required to enter into a formal agreement with the Free State department of health regulating and formalizing the research relationship (document will follow)

- **As part of feedbac**
  research day

Trust you find the above in ordcr.

Kind Regards

As part of feedback, you will be required to present your study findings/results at the Free State Provincial health

: HEALTH
17/06/2020

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at
e:

Head : Health
PO Box 227. Bloemfontein, 9300
4th Floor, Executive Suite, Bophelo House, cnr Maitland and, Harvey Road, Bloemfotein
Tel: (051) 408 1646 Fax: (051) 408 1556 e-mail: khusemi@fshealth.govza@fshealth.gov.za/chikobvup@fshealth.gov.za www.fs.gov.za

ANNEXURE P: APPROVAL SMU

SEFAKO MAKGATHO
HEALTH SCIENCES UNIVERSITY

Postgraduate Studies, Research Development, Integrity & Ethics
Sefako Makgatho University Research Ethics Committee (SMUREC)

Ms P Sodo
University of the Witwatersrand

Dear Ms Sodo

RE: PERMISSION TO CONDUCT A STUDY AT SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY

SMUREC **NOTED** your letter requesting permission to utilize de-identified student records of at the Sefako Makgatho Health Sciences University.

SMUREC **NOTED** that the researcher has already received provisional approval from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand.

Study Title:	Attrition in the Dental Therapy Profession: an exploration of the contributing factors
Researcher:	Ms PP Sodo
Supervisor:	Prof S Numutandani Prof V Yengopal Dr SJ Nieuwoudt
University:	University of the Witwatersrand
Research Type:	Doctor of Philosophy (Public Health)
Protocol Ref No:	M819086

SMUREC **APPROVED** the request and provided permission to collect data at SMU. A letter from the University Registrar is attached to provide access to de-identified student records at the School of Oral Health Sciences.

Yours Sincerely,

PROF C BAKER
CHAIRPERSON SMUREC

6 December 2019

SEFAKO MAKGATHO
HEALTH SCIENCES UNIVERSITY
SMU Research Ethics Committee
Chairperson
Date: 6th December 2019

Molotlegi Street, Ga-Rankuwa
Pretoria, Gauteng
PO Box 163, Medunsa, 0204
www.smu.ac.za

Telephone: +27 12 521 5617 / 3698
Facsimile: +27 12 521 3749

Email: lorato.phiri@smu.ac.za

SEFAKO MAKGATHO
HEALTH SCIENCES UNIVERSITY

Office of the Deputy-Registrar

Ms P Sodo
Doctoral Candidate
University of Witwatersrand

30 January 2020

To whom it may concern,

This letter confirms that the study entitled: **'Attrition in the Dental Therapy Profession: an exploration of the contributing factors'** has received approval to be conducted at the University, and de-identified student records will be accessed.

In conducting the research, the researcher agrees to adhere to all university regulations for the responsible conduct of research.

This letter, together with the Ethics Clearance Certificate and/or site approval letter from the Sefako Makgatho University Research Ethics Committee (SMUREC) must be available for all research conducted with staff and students at the university. A copy of the dissertation or thesis must kindly be submitted to the Sefako Makgatho Health Sciences University on completion of the study.

Sincerely

Ms Kanyisa Magwentshu
Deputy-Registrar

SEFAKO MAKGATHO
HEALTH SCIENCES UNIVERSITY
2020 -02- 13
DEPUTY REGISTRAR
ACADEMIC ADMIN
PO BOX 197, MEDUNSA, 0204