Healthcare Service Utilization

and Life Satisfaction in South Africa

A Dissertation Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Tamara L. Chavez-Lindell

December 2022

DEDICATION

This dissertation is dedicated to my husband, José Chávez, whose partnership, insights, and belief in me have been constant throughout our quarter century together and especially during the past 4 years; to our children, Elinor and Nate, who have been my constant champions and exhibited patience and flexibility far beyond their years as we navigated international field work, COVID lockdowns, and remote learning together; to my parents, Eric and Mary Ann Lindell, who not only taught me the value of dreams, but also of hard work and service to others; and to my sister, Nissa Norris, whose ears I have filled but whose heart has overflowed with grace. I love you all to the moon and back.

ACKNOWLEDGEMENTS

I would not have been able to complete this arduous process without the support of my mentor, Dr. Agricola Odoi. Through topic changes, theoretical debates, and multiple data obstacles, his steady and uncompromising guidance has helped me persevere. He has challenged me to move beyond my preconceived notions of what an epidemiologist should be and become not only a better researcher, but also more tireless in the pursuit of excellence. For all of this, I am endlessly grateful. I would also like to thank my outstanding committee members, Dr. Marcy Souza, Dr. Cristina Barroso, and Dr. David Ader, whose support and selfless advancement of student research have been incredible models. To my friends in the CEM program and throughout campus who helped me weather the challenges and celebrated every achievement along the way, I offer my enduring thanks. You made the journey fun. Finally, I want to recognize my husband for encouraging me to go back to school and making the time and financial sacrifices necessary to make it happen. You have given me a priceless gift and set an incomparable example of teamwork for our children. To all who have provided encouragement and help along this path, please know that I am deeply appreciative and feel blessed to have you in my life.

ABSTRACT

South Africa has achieved improvements in many health measures over the past 30 years, yet significant disparities in healthcare utilization and health outcomes persist. There is evidence that healthcare utilization has a strong influence on health outcomes and life satisfaction. Unfortunately, rural areas tend to have poorer accessibility and utilization of health services, leading to disparities in health outcomes. In rapidly urbanizing countries such as South Africa, identification of disparities and predictors of public healthcare utilization and life satisfaction may provide information that can be used to guide development of programs aimed at improving population health outcomes, quality-of-life, and overall life satisfaction. Therefore, the objectives of this study were to investigate: (i) rural/urban disparities and sociodemographic predictors of utilization of public healthcare services in South Africa; and (ii) socioeconomic and demographic predictors of life satisfaction among residents of Gauteng province, South Africa.

Retrospective cross-sectional studies were conducted using data from the 2019 South African General Household Survey and 2017-2018 Gauteng Quality-of-Life Survey. Descriptive analyses were performed to assess: (a) characteristics of households using public and private healthcare services, and (b) disparities in healthcare utilization and life satisfaction. Weighted multinomial logistic and partial proportional odds models were used to investigate predictors of public healthcare use and life satisfaction, respectively.

Three-quarters of the households reported using public healthcare services and nearly one-fifth reported a chronic condition among members. Predictors of public healthcare

utilization were lower age of household head, lower educational attainment of household head, larger household size, rural residence, and at least one chronic condition among household members. Similarly, predictors of higher reported life satisfaction were older age, greater educational attainment, smaller household size, living with spouse, good/excellent health, and satisfaction with public health services. Additionally, respondents from suburban and rural municipalities tended to have greater odds of higher life satisfaction than those from urban Johannesburg.

The identified disparities and predictors highlight the critical roles of poverty, education, rural residence, and healthcare accessibility in public healthcare use and life satisfaction. The findings suggest that targeted public healthcare accessibility initiatives may improve both healthcare utilization and overall life satisfaction.

TABLE OF CONTENTS

CHAPTER 1 1
INTRODUCTION 1

CHAPTER 2 5
LITERATURE REVIEW 5
2.1. Association of healthcare utilization and health outcomes 6
2.1.1. Worldwide 6
2.1.1.1. South Africa 7
2.2. Healthcare provision 8
2.2.1. World Health Organization framework 8
2.2.2. South African approach to healthcare provision 9
2.2.2.1. Constitutional guarantee of healthcare services access 9
2.2.2.2. Governmental healthcare provision and subsidies 9
2.2.2.3. Public healthcare services in South Africa 12
2.2.2.3.1. Primary Care 12
2.2.2.3.2. Disease diagnosis 13
2.2.2.3.3. Disease management 13
2.2.2.3.4. Education programs 14
2.2.2.4. Barriers to healthcare provision in South Africa 14
2.2.2.4.1. Barriers in the public healthcare system 14
2.2.2.4.2. Barriers in the private healthcare system 16
2.2.2.4.3. Challenge of non-allopathic healthcare providers 17
2.3. Measuring public healthcare services 17
2.3.1. Availability 18
2.3.2. Accessibility 19
2.3.3. Utilization 20
2.4. Data gaps regarding public healthcare service utilization in South Africa 21
2.4.1. Disparities in utilization 21
2.4.1.1. Predictors 22

2.5. Health outcomes and life satisfaction 23
2.5.1. Measurement of life satisfaction 24
2.5.2. Association of health outcomes with life satisfaction 25
2.5.2.1. Communicable and non-communicable diseases 25
2.5.2.2. Mental health 25
2.5.2.3. Mortality and life expectancy 26
2.5.3. Use of life satisfaction as an international comparator 26
2.5.4. Self-reported life satisfaction 27
2.5.4.1. Worldwide patterns 27
2.5.4.1.1. South African patterns 29
2.5.5. Indicators/Measures of life satisfaction 31
2.5.5.1. Overall life satisfaction 31
2.5.5.1.1. Satisfaction with specific factors 32
2.5.6. Factors influencing life satisfaction 33
2.5.6.1. Non-modifiable factors 33
2.5.6.2. Potentially modifiable factors 33
2.5.6.2.1. Personal health status 33
2.5.6.2.2. Social support networks 34
2.5.6.2.3. Educational attainment 34
2.5.6.2.4. Employment status, income, and financial fulfillment 35
2.5.6.2.5. Housing and security 36
2.5.6.2.6. Built environment and infrastructure 36
2.5.6.2.7. Effective government and services 37
2.5.6.2.8. Civil society 37
2.5.7. Interventions addressing modifiable factors in life satisfaction 38

CHAPTER 3 40
PREDICTORS OF UTILIZATION OF PUBLIC HEALTHCARE SERVICES IN SOUTH AFRICA 40
3.1. Abstract 41
3.2. Background 42
3.3. Methods 43
3.3.1. Design, Setting, and Data Source 43
3.3.2. Variable Selection and Data Management 44
3.3.3. Descriptive Analysis 49
3.3.4. Investigation of Predictors of Utilization of Public Healthcare Services 49
3.3.5. Ethics approval 51
3.4. Results 51
3.4.1. Descriptive Analysis 51
3.4.2. Predictors of Utilization of Healthcare Services 55
3.5. Discussion 64
3.5.1. Strengths and limitations 70
3.6. Conclusion 71

CHAPTER 4 72
PREDICTORS OF SELF-REPORTED LIFE SATISFACTION IN GAUTENG PROVINCE, SOUTH AFRICA: A PARTIAL PROPORTIONAL ODDS MODELING APPROACH 72
4.1. Abstract 73
4.2. Background 75
4.3. Methods 76
4.3.1. Design, setting, and data source 76
4.3.2. Variable selection and data management 76
4.3.3. Descriptive analysis 77
4.3.4. Investigation of predictors of self-reported life satisfaction 81
4.3.5. Ethics approval 82
4.4. Results 83
4.4.1. Descriptive analysis 83
4.4.2. Predictors of self-reported life satisfaction 86

4.4.3. Predictors with proportional odds 94
4.4.4. Predictors with non-proportional odds 95
4.5. Discussion 100
4.5.1. Predictors with proportional odds 100
4.5.2. Predictors with non-proportional odds 103
4.5.3. Strengths and limitations 106
4.6. Conclusion 106

CHAPTER 5 108
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS 108

REFERENCES 114

VITA 160

LIST OF TABLES

Table 1. Original and Re-coded Sociodemographic Variables Assessed as Predictors of Utilization of Public Healthcare Services in South Africa, 2019. 46

Table 2. Characteristics of Respondents and Households from the General Household Survey Conducted in South Africa in 2019. 52

Table 3. Results of Univariable Multinomial Logistic Models Used to Assess Associations between Utilization of Healthcare Services and its Potential Predictors in South Africa, 2019. 56

Table 4. Results of the Multinomial Logistic Model Used to Investigate Predictors of Utilization of Healthcare Services in South Africa, 2019. 58

Table 5. Results of the Final Binary Logistic Model Used to Investigate Predictors of Utilization of Public Healthcare Services in South Africa, 2019. 60

Table 6. Original and Re-coded Sociodemographic Variables Assessed as Predictors of Life Satisfaction in Gauteng Province, South Africa (2017-2018). 79

Table 7. Self-Reported Life Satisfaction and Sociodemographic Characteristics of Survey Respondents in Gauteng Province, South Africa (2017-2018). 84

Table 8. Univariable Associations Between Life Satisfaction and Sociodemographic Factors among Respondents in Gauteng Province, South Africa (2017-2018). 87

Table 9. Results of the Proportional Odds Model Used to Investigate Predictors of Life Satisfaction among Survey Respondents in Gauteng Province, South Africa (2017-2018). 89

Table 10. Results of the Final Partial Proportional Odds Model Used to Investigate Predictors of Life Satisfaction among Survey Respondents in Gauteng Province, South Africa (2017-2018). 91

LIST OF FIGURES

Figure 1. Conceptual Model of Potential Predictors of Utilization of Public Healthcare Services in South Africa, 2019. 45

Figure 2. Revised Conceptual Model Showing Identified Predictors of Utilization of Public Healthcare Services in South Africa, 2019. 65

Figure 3. Conceptual Model of Potential Predictors of Life Satisfaction in Gauteng Province, South Africa, 2017-2018. 78

Figure 4. Odds Ratios for Positive Life Satisfaction Among Respondents (With vs. Without Children) by Income Category in Gauteng Province, South Africa (2017-2018). 96

Figure 5. Revised Conceptual Model of Predictors of Life Satisfaction in Gauteng Province, South Africa (2017-2018). 99

LIST OF ABBREVIATIONS

DOH: Department of Health

GHS: General Household Survey

GIS: Geographic Information Systems

HIV/AIDS: Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome

HRQOL: Health-Related Quality-of-Life

LMICs: Low- and Middle-Income Countries

NDP: National Development Plan (2030)

PO: Proportional Odds

PPO: Partial Proportional Odds

QOL: Quality-of-Life

SRLS: Self-Reported Life Satisfaction

SWB: Subjective Well-Being

SWLS: Satisfaction With Life Scale

TB: Tuberculosis

UHC: Universal Healthcare Coverage

UN: United Nations

WHO: World Health Organization

CHAPTER 1

INTRODUCTION

The availability, accessibility, and utilization of healthcare services all play important roles in the health of populations. Healthcare service utilization, in particular, varies widely across populations[1] and has been associated with disparities in life expectancy[1–7] as well as many other health outcomes[1,4,8], such as chronic disease rates and mortality[8,9], and mental health disorders[10]. South Africa has experienced significant improvements in many health indicators since the dismantling of the apartheid system[11,12], yet nearly 30 years on, high rates of poverty[13–15] and health disparities[16,17] remain. Although the South African constitution provides for the right of all citizens to access healthcare[18], considerable disparities in the utilization of the public healthcare system persist[19–24].

Social determinants and geographic disparities, particularly rural-urban differences in healthcare, have been cited as key drivers of disparities in health outcomes in South Africa[25–27]. Selection and utilization of healthcare services may be influenced by demographic[28,29] or systematic differences[22,30–34] across the population, leading to differential outcomes between population groups[35–37]. Thus, expanding healthcare accessibility and utilization are important means to achieving universal healthcare and improving health outcomes[38–41]. Unfortunately, predictors of public healthcare utilization in South Africa have not been investigated[21,42] and yet this information is critical to guide health programs aimed at improving the uptake of public healthcare services and health outcomes.

Self-reported life satisfaction (SRLS) has been associated with a broad range of health outcomes, including non-communicable diseases[43–50], mental health[51–56], mortality[44,54,57,58], and life expectancy[43,59–61]. Large-scale population surveys conducted around the world have led to the identification of associations between SRLS and various sociodemographic factors including higher relative income, marital status, age, and rural-urban residence[62–64]. Rural-urban differences in SRLS hold important implications for South Africa. Despite rapid urbanization[65] and decreases in education and employment disparities across racial groups[13] since the end of apartheid in 1994, disparities in rural-urban poverty and health remain deeply entrenched in South Africa[16]. Unfortunately, there has been little published research investigating life satisfaction and its predictors in South Africa[66].

Considering the above issues, the objectives of this study were to investigate: (i) rural/urban disparities and sociodemographic determinants of utilization of public healthcare services in South Africa (Chapter 3); and (ii) individual quality of life and demographic predictors of SRLS among residents of Gauteng province, South Africa (Chapter 4). The identification of disparities in public healthcare service utilization and life satisfaction as well as their predictors may guide planning of evidence-based health programs aimed at improving utilization of health services and population health outcomes for all South Africans.

This dissertation is divided into five chapters. Chapters 1 and 2 comprise the introduction and literature review, respectively. Chapters 3 and 4 describe the methods and results of studies addressing the objectives outlined above. The findings of Chapters 3 and 4 have been submitted for publication and are currently under peer review. Finally, Chapter 5 summarizes the conclusions and provides recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.1. Association of healthcare utilization and health outcomes

2.1.1. Worldwide

Utilization of healthcare services plays an important role in population health outcomes[7–9,67]. While healthcare services provide the means of identifying and addressing health challenges faced by individuals, the impact of the services depends, at least in part, on the uptake of the services[1]. Worldwide, disparities in healthcare services utilization abound[1,68,69]. These disparities are associated with differences in life expectancy[1–7] as well as a wide range of health outcomes, including cardiovascular disease and mortality[8,9], diabetes mellitus and associated mortality[8,9], Caesarian births[9], cancer screening and interventions[9], mental health disorders[10] and suicides[9].

Differences in health outcomes are also associated with rural-urban differences in healthcare utilization[26,70–72] and lack of consideration of the broader social context driving health and illness[7]. This has led to the assumption that improving accessibility of healthcare or providing individualized screening and referral for unmet social needs at healthcare visits will impact downstream health outcomes[73]. Yet healthcare utilization depends upon an array of factors such as availability, affordability, perceived necessity, and quality of care[74–77], all of which impact health outcomes through complex but poorly understood mechanisms[78].

2.1.1.1. South Africa

Although South Africa is the wealthiest nation in sub-Saharan Africa, it also demonstrates the greatest income inequality in the region[13,16,79]. Despite minor decreases in poverty since 1993, the economic differences both between and within racial groups, termed "population groups" by the South African administrative system, have increased during the post-apartheid period[13,16]. This income inequality directly contributes to the health disparities recorded by national and international bodies[12,36,80,81]. However, the country also benefits from a widespread network of public healthcare facilities[82,83]. As in other countries, utilization of healthcare services in South Africa is influenced by a variety of accessibility and quality factors[84].

In South Africa, the factors influencing healthcare utilization are further complicated by the history of systematic discrimination throughout the colonial period and particularly under the nation's strict apartheid laws enacted and enforced between 1948 and 1994[27,85]. Population group classifications defined 4 principal racial groups which are still used today: Black African (people of indigenous heritage who speak an African language), Colored (people of admixed genetic lineage), Asian/Indian, and White[86,87]. Although a generation has passed since the apartheid policy was ended, the effects of differential access to housing, education, healthcare, and civil society participation are still clearly visible in the health of the population[11,88].

In South Africa, utilization of healthcare services has been associated with numerous self-reported physical and mental health conditions including stroke, diabetes, hypertension, multimorbidity, disability, health-related quality-of-life, and depression[22,41,89,90]. However, whereas many studies have identified more healthcare use among persons with the aforementioned conditions[22,41,89,90], others have reported less frequent healthcare utilization among individuals with potentially more care needs, including immigrants[84], rural residents[29], and the disabled[91]. Additionally, in South Africa, frequency of healthcare utilization has been associated with various sociodemographic factors, including age, sex, racial group, employment, income, and educational attainment[84,89,92,93].

2.2. Healthcare provision

2.2.1. World Health Organization framework

The World Health Organization (WHO) has long promoted the importance of accessibility of primary healthcare in improving health outcomes[94–96]. In 2019, the WHO reaffirmed this in a position paper, the *Framework for Provision of Essential Health Services through Strengthened District/Local Health Systems*. The document highlights the role of health districts in providing primary care, with a goal of reaching universal healthcare in United Nations (UN) member states by 2030[97]. The framework describes the goal of provision of health services that operate not only in support of acute individual needs, but that also respond to "community needs across the entire lifecourse"[97]. The WHO has specifically identified the expansion of primary care services

across sub-Saharan Africa as a priority, setting proposed interventions and achievement milestones[97].

2.2.2. South African approach to healthcare provision

2.2.2.1. Constitutional guarantee of healthcare services access

South Africa's current constitution, adopted in 1996, enshrines within its Bill of Rights the right of all people in the nation to have access to healthcare services[18]. However, what constitutes "access" to healthcare was not specifically defined at the time of drafting, but has evolved concurrently with the design of a broader national development plan[83]. Currently, the healthcare landscape in South Africa consists of a mixture of public and private providers and facilities with highly variable expense coverage[98].

2.2.2.2. Governmental healthcare provision and subsidies

Pursuant to the constitutional guarantee and as a signatory to the *Agenda for Sustainable Development*, South Africa's National Development Plan (NDP) lays out the government's aim to provide basic healthcare to all citizens through an expanded network of public providers[83]. The healthcare system comprises national-, provincial-, and district-level health authorities, each fulfilling distinct roles[99]. Whereas the national Department of Health develops health policy nationwide and is concerned with the issuance of "norms and standards on health matters"[99], the provincial health departments are principally responsible for implementation of national health policy, provision of specialized services, and management of health information systems[99]. The district health

system maintains primary responsibility for direct patient care, covering approximately 85% of the population[100,101] through government-run local clinics, district hospitals, and a limited number of tertiary facilities[25,102]. However, the public healthcare system as it currently exists is beset by inequalities in terms of staffing, capacity relative to need, funding, and supplies[34,101,102].

The government of South Africa has proposed to fully implement a national health insurance (NHI) program by 2030[103]. However, to-date the NHI Bill has not been approved and the program remains in a developmental policy stage[104]. Once implemented nationwide, the NHI program will be administered through a fund legally constituted as a non-profit public entity[105]. Funding for the NHI program is expected to come from a combination of general taxes, mandatory employee contributions, and employer matching[105]. While the NHI program is intended to improve health outcomes through increased healthcare access, there are researchers and organizations which assert that the addition of funding without significant increases in technical efficiency will not achieve the desired health improvements[101,106].

The NHI program is designed to largely replace the current two-tiered system of public healthcare and not-for-profit private insurance organizations known as medical aid schemes. Current medical aid schemes provide funding principally for the care of chronic illnesses and emergencies, with varying levels of coverage beyond a set of prescribed minimum benefits[34,107]. Participants may select from a limited number of “open”

schemes, paying elective monthly contributions to receive benefits, or may be enrolled in "restricted" schemes, with contributions withheld by their employers[108]. Beyond their funding through contributions, medical aid schemes also receive significant subsidies from the government[109]. While total health expenditures account for approximately 14% of the national budget[110], more than half of the funding goes to the subsidization of medical aid schemes[111]. However, such schemes provide variable coverage for just 16% of the population[34,110,112], while the remaining 84% of the population depends solely upon the public healthcare system. Moreover, medical aid schemes are disproportionately distributed across population groups[113]. In addition to medical aid schemes, voluntary health insurance may be purchased which provides coverage for conditions beyond the prescribed minimum benefits[34].

Although both medical aid schemes and voluntary health insurance will continue to be legal when the NHI program is fully implemented, such plans will no longer reimburse the cost of services covered by NHI. Rather, all healthcare consumers will be expected to access services through NHI-accredited facilities for a "defined package of… preventive, promotive, curative and rehabilitative healthcare services[105]," ranging from primary care to specialized levels of care. The implementation of NHI in South Africa will not centralize all healthcare delivery. In fact, the private sector is expected to expand its stake since it will no longer be dependent solely upon private pay or medical aid schemes with limited coverage. Accredited healthcare providers in the public and private sectors will be

reimbursed by the NHI program on the same cost basis and required to meet the same standards of care set by the Office of Health Standards Compliance[105].

2.2.2.3. Public healthcare services in South Africa

The public healthcare system in South Africa includes primary care clinics, district hospitals, and a limited set of tertiary level facilities including regional and academic hospitals[25,99,102]. Direct public healthcare services in each province are under the management of the department of health, with funding allocated by the provincial administration[34] and services provided through district and sub-district facilities[99]. While this autonomy in theory permits each province to adapt to its particular needs, the system has resulted in differential healthcare service utilization across jurisdictions[34]. However, the incipient NHI program is expected to reduce the disparity in service availability and, hence, improve public healthcare utilization across the country[103].

2.2.2.3.1. Primary Care

The current national health plan focuses the services of the public health system on primary healthcare[25,34,83]. Local primary care clinics provide women's health/reproductive health, pediatric care, and basic healthcare services[83], including management of some chronic conditions[34]. Acute care and hospital or specialty care referrals may be initiated from district or sub-district health clinics. Additionally, public primary care clinics provide pharmacy services[34], which are of particular importance to individuals with chronic conditions requiring ongoing therapeutics. However, there is

evidence that many users of pharmacy services do not consider this utilization of public healthcare[114], skewing the reported public healthcare utilization rate.

2.2.2.3.2. Disease diagnosis

Through the existing system of public facilities, South Africans have access to primary care clinics and referral facilities[34,83]. However these provide limited diagnostic services[34]. Screening for communicable and non-communicable conditions, including tuberculosis (TB), human immunodeficiency virus (HIV), diabetes mellitus, and hypercholesterolemia, may be conducted at district health clinics[115,116]. Specialized diagnostic procedures may be available at district or referral hospitals, although the availability varies by province, given local allocation of funding[34]. Despite availability of basic diagnostic services through the public healthcare system, diagnosis of serious conditions is severely deficient[117,118]. For example, across South Africa, estimates of adults with diabetes who are undiagnosed range from 45% to 85%[119,120], while estimated undiagnosed HIV has been reported to be as high as 19% in a hyperendemic community with an annual testing regimen[121].

2.2.2.3.3. Disease management

In addition to medical diagnostics, the public healthcare system provides medical management through public health clinics[122]. Although dedicated HIV/AIDS and TB care services are provided[11,122], there are no public clinics specifically for these diseases. Both anti-retroviral therapy and TB treatment are free, but require regular follow-up and

lengthy or lifelong treatment[123,124], necessitating potentially costly visits in terms of travel expenses, time, or other opportunity costs[125]. Management of other chronic conditions is also provided through the primary care clinic network[11,34,125] or district hospitals[29]. In addition to primary care clinics, population-based care is provided through community health worker teams designed to improve service integration, reduce disease-associated stigma, and provide health education[126].

2.2.2.3.4. Education programs

In South Africa, given the prevalence of communicable and non-communicable conditions requiring ongoing management[80,127], appropriate patient education supporting disease management, treatment compliance, and avoidance of disease transmission is critical to the health of the population. Unfortunately, South Africa's public healthcare facilities suffer from a shortage of patient educators[103,128] and educational materials[103] to meet the needs of the population's linguistic variety[129] and disparities in literacy[130]. Furthermore, patient-provider interactions, which offer a timely opportunity for patient education and provider assessment of patient knowledge, may be severely hindered by communication challenges[118,122,131].

2.2.2.4. Barriers to healthcare provision in South Africa

2.2.2.4.1. Barriers in the public healthcare system

Despite the guarantee of access to healthcare for all citizens of South Africa and the percentage of the population which relies on the public system for healthcare, barriers to

equitable utilization of healthcare remain[92,112]. In a nationally representative survey, more than half (54.9%) of users of public healthcare facilities reported a problem during their last visit, including long wait time, lack of medication availability, or rude or uncaring staff[132]. However, little is known about barriers unique to utilization of the public healthcare system[112].

Barriers to healthcare reported in the literature include ability to pay for services beyond those provided through primary care[92], costs of transportation to and from healthcare facilities[21,22,92,133,134], as well as the opportunity cost or real costs resulting from time off of work[112,134] or wait times[22,92,133]. Patient satisfaction with the quality of care has also been cited as a barrier to public healthcare utilization[34,92,112,134]. Similarly, previous research has signaled the attitudes of staff and patient treatment as important factors influencing the acceptance and utilization of public healthcare facilities[112,132,134–136]. The perception of "not being sick enough" has also been identified as a barrier to healthcare utilization in numerous studies[42,92,112,134]. Notably, there is some evidence that the perception of health concerns not rising to the level of care-worthiness is particularly prevalent among those patients requiring ongoing care for a chronic condition[42], thereby further reducing the likelihood of continuity of care which would improve patient outcomes.

Lack of accessibility to public healthcare facilities in South Africa have also been described in the literature[23,29,31,112,132,136]. Although the expanding public healthcare

system appears to have reduced travel times, as evidenced by a decrease over a decade in the percentage of households traveling 30 minutes or more to their preferred healthcare facility[34], improvements in access to healthcare have not significantly improved health inequities[29]. Such limitations to healthcare facility access are especially acute for disabled individuals[22,91,134], who may be further hindered by a lack of adequate transportation[33], difficulties associated with mobility or communication[22,33], and greater perception of their health issues not being severe enough to warrant care[22], in addition to facing greater inaccessibility due to costs[22,91].

2.2.2.4.2. Barriers in the private healthcare system

Considering the wide variety of facilities making up the private healthcare sector, reported barriers to their utilization also demonstrate variability. Although national surveys have identified far fewer problems with accessing care or the quality of care among users of private healthcare in South Africa compared to those using public healthcare, nearly 1 in 5 adults (18%) still reported a problem during their last visit[132]. The principal barrier to private healthcare utilization remains the cost of services[92,132]. Other barriers are similar to those identified for the public sector, including perceived lack of need[92], long wait times[132], and transportation costs[92]. Although both medical aid schemes and private insurance provide coverage for many services related to covered conditions[107], the amount of coverage provided may run out early in the calendar year[137], leaving individuals to pay any additional medical expenses out-of-pocket. Most critically, such plans cover only a small proportion of the population[109,111].

2.2.2.4.3. Challenge of non-allopathic healthcare providers

In South Africa, as in many nations, the healthcare landscape also includes non-allopathic healthcare providers[138,139]. Such healthcare, termed "traditional," "complementary," or "alternative," may be practiced as either a supplement or substitute for allopathic medicine. Traditional health practitioners in South Africa utilize herbal or traditional remedies and spiritual practices to elicit cures for medical or psychosocial ills[140,141]. The Traditional Health Practitioners Act of 2007[142] established a framework for regulating and beginning to integrate such practices, which retain strong cultural and religious relevance for many South Africans[143].

Across South Africa the use of non-allopathic practitioners is widespread[143,144], but there is geographic and demographic variability in their use[28], with greater reliance on traditional health practitioners in rural areas[28,42] where distance to allopathic medical facilities may be greater[31]. Prior research has also identified beliefs regarding the effectiveness of traditional medicine for specific ills in comparison to allopathic medicine[24,114], suggesting that selection of traditional medicine practitioners is dependent upon the type of heath concern in addition to accessibility, rurality, cost, or religious belief.

2.3. Measuring public healthcare services

Three closely intertwined concepts govern the use of public healthcare services: availability, accessibility, and utilization. Use of these terms in the literature is

variable[23,145,146], however, the generally accepted uses and the methods of assessment for each are briefly described below.

2.3.1. Availability

Healthcare availability may be defined as the existence of facilities which are open to consumers and provide care as part of the network of providers which individuals have a right to access. The WHO notes that availability of healthcare services assesses "the extent to which specific services are offered and available in the relevant health care settings"[147]. Therefore, availability depends not only on the distribution of health facilities with respect to that of a population, but also to the operating conditions of the facilities, including their funding, staffing, and hours of operation[148].

Availability of healthcare services is frequently measured by both the number of facilities which exist within a jurisdiction and the ease of procuring an appointment within a reasonable timeframe. However, these measures do not assess either the quality of the care provided or the ability of consumers to take advantage of the services available. Furthermore, such standards are often restricted to particular healthcare specialties, such as emergency care or obstetric services. For example, the WHO has issued guidelines on the measurement of emergency obstetric services, recommending use of the number of hospitals per 500,000 population as an comparator for both international and sub-national assessments[149]. Yet, given population and data quality limitations, calculation of healthcare service availability using such measures most often occurs at a national level.

Assessment of healthcare service availability for sub-national populations may therefore be challenging[150]. Recommended availability measures include items such as the percentage of facilities offering services according to national defined service package, provider absence rate, and percentage of facilities compliant with infection control measures[147]. Where such assessments have been completed in sub-Saharan Africa, sub-national rates of healthcare availability have been shown to diverge significantly from the national rate [151]. Yet the guidelines also note that such measures are country-specific[147], and therefore of minimal utility as comparators.

2.3.2. Accessibility

Healthcare accessibility describes the degree to which individuals are able to take advantage of the healthcare facilities available to them. Thus, accessibility may be limited by the cost of care, distance to facility, transportation capacity and cost, facility operating hours, staffing levels, appointment availability, physical access to structures, or other functional limitations such as language or knowledge and understanding of healthcare practices[148].

Accessibility of healthcare services may be measured in multiple ways, including a mixture of measured and reported data[152,153]. The ability of consumers to reach a facility is a critical component in its use[21,31]. Therefore, time or distance to healthcare facilities are commonly used metrics[23,153], since these reflect the geographic distribution and

transportation capacity of a society[31]. Other means of assessment have also been utilized, either directly measuring or gathering reported structural, financial, or personal or cultural barriers to accessibility[154]. Such measured or reported data may include appointment wait times or obstacles to physical access (structural barriers), lack of service provision based on resources (financial barrier), and lack of language services or knowledge of where or how to seek services (personal or cultural barriers).

2.3.3. Utilization

Healthcare utilization is defined as the use of healthcare services by individuals "for the purpose of preventing and curing health problems, promoting maintenance of health and well-being, or obtaining information about one's health status and prognosis[155]." Thus, the concept of healthcare utilization contains the implicit assumption that services are both available and accessible to a population[40], even if barriers to their availability or accessibility exist, and that the choice of utilization is driven by a selection process[133].

Healthcare utilization has most often been measured as counts of events, such as number of visits per capita, visits within a specified time period, or hospital days[153]. While some utilization data may be obtained from administrative or insurance claim data[73], such data are frequently obtained through interview, adding an additional concern for their reliability due to the likelihood of recall bias[156]. Despite measurement difficulties, assessing utilization of healthcare may serve as a gauge reflecting preference for type of services (i.e., public, private, or alternative practitioners)[84,92,133,157], necessary levels of

care for programmatic expansion (i.e., primary, secondary, or tertiary)[72], or the usefulness of modalities accommodating accessibility challenges (e.g., telehealth, community screening programs, community health workers)[158].

The primary source of nationally representative data on healthcare utilization in South Africa is the Department of Health's General Household Survey (GHS)[159]. Conducted annually, the GHS includes survey questions which focus on healthcare utilization specifically and may serve for longitudinal comparison[160], with some important caveats. Variation in a few of the questions across years of survey repetition has rendered the results not directly comparable across all years[161]. Furthermore, the household-level collection of data regarding healthcare utilization limits the level of assessment and findings should not be inferred to individuals.

2.4. Data gaps regarding public healthcare service utilization in South Africa

2.4.1. Disparities in utilization

There is limited literature on utilization of public healthcare services across South Africa[112]. This is because local priority tends to be on service provision rather than assessment. Where healthcare service use assessments are conducted, they are rarely coordinated with other health districts, leading to a patchwork of findings[162].

The few studies that have been published identified significant differences in public healthcare utilization by sex[112], socioeconomic status[112], educational attainment[112], racial

group[21,112,132], distance to nearest health facility[21], and having a disabled household member[22]. Smaller studies within South Africa, principally conducted in Gauteng province, have also identified disparities in the use of public healthcare by chronic non-communicable disease status[114] as well as the type of illness experienced[24]. Furthermore, disparities between users of public and private healthcare facilities has been reported with regard to transportation[114], waiting time[114,132], consultation time[114], staff treatment[132], availability of medicine at facilities[132], cleanliness of facilities[132], out-of-pocket expenses[114,132], and overall satisfaction with services[114,136].

2.4.1.1. Predictors

There is a paucity of published literature on predictors of public healthcare utilization. A study in Eastern Cape and Western Cape provinces reported transportation costs, staff attitude, quality of clinical care/advice, availability of medicine, and waiting time as significant predictors of utilization of public health facilities [133]. In a large-scale geographical information system (GIS) study conducted in KwaZulu-Natal province, travel time to a public clinic was reported as a significant predictor of usage, with households within 30 minutes of the clinic having odds of clinic utilization 10 times those of households 90-120 minutes away[31].

A study of Gauteng province residents identified age, sex, racial group, employment status, medical aid participation, and immigration status as significant predictors of healthcare utilization[84]. Although the study did not differentiate between public and

private healthcare utilization, approximately two-thirds (65.4%) of respondents used a public healthcare facility as their primary service site[84]. The study reported that reasons for not using public healthcare were quality of care (77% of respondents), inaccessibility (6.4%) and unavailability (4.6%)[84].

In the face of demonstrated health disparities across South Africa[12,16,17,36,80,81] and the need for timely and accessible public health services[38,39,41], the limited research into predictors of healthcare utilization represents a serious gap in the literature. Such investigation may provide important insight into the factors driving disparities in healthcare utilization and guide efforts to improve utilization as the nation implements NHI.

2.5. Health outcomes and life satisfaction

The term "life satisfaction" is frequently used interchangeably with "happiness" in the literature[64,163,164]. Although some seminal authors in the field explicitly distinguish between the two[165–167], the broad body of happiness and life satisfaction research indicates very high correlation[168]. For the purposes of this review, the focus has been overall life satisfaction specifically and therefore the terms have been considered separately, except where researchers have not specified whether their definition included or excluded happiness.

Overall self-reported life satisfaction (SRLS) comprises the sense of general contentedness with life circumstances which individuals describe [169]. Although the causal relationship of SRLS and life events is poorly understood[170], it is clear that individuals' educational attainment, employment, income, career fulfillment, personal relationships, health status, living conditions, etc. play a role in the overall satisfaction which they report[167].

There is evidence of associations between life satisfaction and educational attainment[171–173], employment status[174–176], housing and neighborhood environment[66,177,178], and healthcare access[53]. Life satisfaction has been shown to be both relatively stable over time and yet also responsive to life events[169,179]. Thus, assessment of SRLS may provide insight into the physical conditions of individuals' lives and suggest areas of intervention which could provide important benefits for population well-being[62,63,180].

2.5.1. Measurement of life satisfaction

Life satisfaction is highly individualized[169] and reflects a wide variety of personal experiences, beliefs, and situational influences[181]. Therefore, assessment of SRLS is subjective in nature[169] and relies on questionnaire surveys[182]. Measurement of SRLS may comprise either a series of questions regarding respondents' satisfaction with different aspects of life, termed "life domains," or may be captured with a global measure of SRLS in which respondents weight the relative importance of the domains themselves[167,169]. Both approaches may also be combined, allowing survey respondents to consider their

satisfaction with multiple life domains independently as well as the overall composite measure[161].

2.5.2. Association of health outcomes with life satisfaction

2.5.2.1. Communicable and non-communicable diseases

Few studies have investigated the association of communicable conditions and SRLS. In contrast, there is a considerable body of literature reporting associations between chronic conditions and SRLS[43]. Numerous studies have reported associations between SRLS and a range of chronic health outcomes, including all-cause chronic disease[44], multimorbidity[45], non-malignant breast disease[46], pain[52,183], cardiovascular disease risk[47,184,185], cancer[47], Parkinson's Disease[48,49], Type 2 diabetes mellitus[47], and congenital heart disease[50]. Likewise, prior research has reported independent association of SRLS with various environmental factors impacting chronic disease prevalence and severity[186], including air quality, noise, and green space[64,187,188]. An association between life satisfaction and general good health among aging populations has also been consistently described[172,178,189,190].

2.5.2.2. Mental health

There is evidence of association between life satisfaction ratings and many mental health measures[55], including alcohol misuse[56], depression[51–54], sleep habits[52], and a range of psychosocial problems[52]. Life satisfaction ratings have been used extensively in health psychology[55]. However, assessment in this arena has often been restricted to individuals

with diagnosed mental health concerns, comparing potential demographic or social risk factors with various aspects of their subjective well-being, and thus providing limited utility with regard to the broader relationship between SRLS and mental health.

2.5.2.3. Mortality and life expectancy

Evidence shows that lower levels of SRLS are associated with severe incident health outcomes including greater all-cause mortality[44,54,57,58] and reduced life expectancy[43,59–61]. In addition, lower SRLS scores are associated with higher risk of suicide[191], traffic deaths[192], and unintentional fatal injury[193]. Researchers have hypothesized that the relationship between SRLS and accident deaths may reflect a propensity for greater risk-taking behavior among individuals experiencing lower life satisfaction[194].

2.5.3. Use of life satisfaction as an international comparator

International comparisons of SRLS conducted over many years have reported internal consistency in SRLS by country[64], as well as patterns in the association of SRLS and national economic status[195–197]. Furthermore, investigation of the association between health and SRLS across nations has revealed broad patterns of poor health being significantly associated with lower self-reported life satisfaction[172,198–200]. Additionally, studies conducted in various regions of the world have demonstrated association between SRLS and age[198,201–203], marital status[203,204], educational attainment[53,172,202–204], income or employment status[203,204], rural/urban residence[53,205], and religious/spiritual beliefs[203,206].

Since measures of life satisfaction demonstrate broad agreement and have been shown to be culturally valid, SRLS ratings have been increasingly used to make evaluations of the relative happiness of populations of nations[64]. While such comparisons may be of interest to the public, given the influence of cultural differences on the associations[207], international comparisons of SRLS provide limited utility for the purposes of planning national and sub-national health, education, and economic policy[205]. Rather, geographically restricted investigation of well-being, including self-reported SRLS, is critical to the development of interventions to address health and health-adjacent disparities[52,62,175,208].

2.5.4. Self-reported life satisfaction

2.5.4.1. Worldwide patterns

Cities generally tend to have higher levels of SRLS than rural areas within nations[64]. The nations which score most highly in SRLS are principally in Western Europe and other developed nations[64], with general consistency in the happiness and life satisfaction scores over time[64,209–217]. Likewise, the human development index score of a nation positively correlates with its mean SRLS score[79]. However, the level of development status alone is insufficient in explaining life satisfaction, especially at the international level[205,207].

Higher levels of reported social support, freedom to make life choices, and generosity have been found to be among the most influential predictors of mean national life satisfaction[64]. Similarly, national levels of interpersonal and institutional trust are

significantly associated with SRLS[218], although these both moderate the association between income inequality and SRLS[219]. Indeed, each of the relationships with SRLS identified in the literature is moderated by other variables wherever these are assessed. For example, greater urban life satisfaction, particularly in developed regions[220], may be moderated by the "age-friendliness" of cities – that is, the adaptation of infrastructure and services to preserve health, security, and quality-of-life as people age[221]. Additionally, the strong correlation between SRLS and gross national income per capita[207] is found to be weaker when adjusted for urban/rural residence[64]. So too, the significant association of interpersonal and institutional trust with SRLS is adjusted by a range of factors, including health, family support, discrimination, unemployment, income, and safety[64].

It is evident that life satisfaction is intertwined with numerous sociocultural and biological factors[207] and exhibits high variability around the world[64]. What has emerged among investigators conducting the broad variety of well-being research around the world is the central idea of comparison with others in regard to the overall sense of contentment with life[205,207]. That is, perceived (subjective) well-being depends upon both individual awareness of objective differences in measures of well-being and the ability of individuals to respond to or control such differences[207]. Whether this is understood in largely material terms (of particular importance in more economically developed nations) or with regard to community respect or familial happiness (as in less economically developed nations) is a question of cultural and personal variation[207]. Although the value

of direct international comparison is limited, it provides insight into the complex sets of factors which should be considered in investigating SRLS[207,219].

2.5.4.1.1. South African patterns

Drawing from representative national and provincial sources, as well as more geographically- or population-limited surveys, an overall picture of SRLS across South Africa has begun to emerge. Current life satisfaction in South Africa is relatively low[64]. According to the most recently available international data, South Africa falls into the lowest third of nations surveyed, with a mean SRLS score of 4.8 on a scale of 0-10[64]. Furthermore, there was a small but significant decline in mean SRLS values between the 2008–2012 and 2017–2019 time periods[64], with a corresponding re-categorization from "struggling" (SRLS score <7 but ≥5) to "suffering" (SRLS score <5)[222]. In comparison to most other nations of similar mean SRLS, South Africa's life satisfaction score is made up of greater levels of reported social support, while healthy life expectancy plays a smaller role[64]. Research from South Africa's most populous province, Gauteng shows that satisfaction with public services demonstrates geographic variability, with declines in many sectors[223]. In fact, the Gauteng study specifically highlights a significant decline in satisfaction with public healthcare services over the 10-year period of the study[223].

Although the population age structure of South Africa is heavily skewed toward youth, older adults make up an increasing percentage of the population[87]. Given predicted growth and increasing public healthcare need, understanding the factors influencing

SRLS and healthcare-specific satisfaction of these older adults is critical, yet little research has been conducted in this area. One small study on the domains predicting happiness of older adults in South Africa identified significant differences in overall happiness by racial group, chronic disease, and family caregiving responsibilities[224]. However, the study reported a relatively small proportion of score variability explained by satisfaction with health[224] compared to that identified in a longitudinal study of residents in an informal settlement[66]. Researchers hypothesized that this is a function of the difference in healthcare availability, not a decrease in the importance of health with age[66,224].

Currently, South Africa has very high levels of both long- and short-term internal migration – a consequence of both the continued levels of poverty and the nation's history of controlled migration under apartheid. Between 2006 and 2011, an estimated 5% of the national population migrated, primarily from rural to urban areas, while short-term regional relocations reached as high as 25% during the period[225]. In contrast to the international generalization of improved SRLS among urban residents, in South Africa, migrants who relocate from rural to urban areas have lower levels of life satisfaction[226]. This reduction has been theorized to be due to the change in life experiences compared to pre-migration expectations, in addition to the emotional impact of being distant from family or other social support structures[226]. Indeed, South Africa has been identified among the top ten countries with prominent urban-rural differences in life evaluation scores[64].

2.5.5. Indicators/Measures of life satisfaction

2.5.5.1. Overall life satisfaction

As described previously, SRLS is a measure of general contentedness with life circumstances that is widely utilized as a stand-in for overall subjective well-being[55,169] and has important associations with healthy life expectancy[43] and other health outcomes[55,190]. Overall life satisfaction comprises self-weighted satisfaction across numerous specific life domains[167], each of which varies over time in response to experiential and situational factors, yet demonstrates association with SRLS[55]. Although there is some evidence that SRLS is differentially weighted by more and less satisfied persons[227], long-term panel data indicates that, for individuals, more than half (estimated at 60-80%) of SRLS variability over time is associated with long-term factors, including both stable personality traits and more slowly changing situational factors[167].

Life satisfaction is commonly assessed in international surveys using the question: "All things considered, how satisfied are you with your life as a whole these days?"[222]. Responses are collected using the Cantril Self-Anchoring Striving Scale, or Cantril's Ladder, which allows respondents to rate their life satisfaction on a scale from 0 (completely dissatisfied) to 10 (completely satisfied)[228].

In contrast, national surveys frequently assess SRLS using the Satisfaction With Life Scale (SWLS), which rates SRLS on a multi-item, 7-point Likert scale[229]. Although there

is some evidence that greater numerical response scales perform better in measuring SRLS[161], the SWLS has been integrated into many studies since its introduction in 1985[229] and the instrument is well validated across cultures[55]. Single-item measures are also used extensively to assess SRLS, with results which have been shown to be comparable to more complex assessment scales[230].

2.5.5.1.1. Satisfaction with specific factors

As with SRLS, satisfaction with specific life domains is highly variable across and within countries[64,168,227]. Surveys such as the Gallup World Poll assess respondent satisfaction with life domains using the same 11-point scale utilized for SRLS[231]. The 7-point SWLS has also been used as a basis for the development of domain-specific satisfaction scales[55] which may provide additional insight into factors influencing the SRLS rating[182,208]. Descriptions of life domains vary broadly[161,170,208,232], but most definitions include the following: personal health status, social support networks, educational attainment, employment and financial fulfilment, housing and security, built environment and infrastructure, and effective government and services.

While satisfaction with each specific life domain has a strong association with SRLS at an individual level[227], the overlap of interrelated domain conditions in a nation, whether negative or positive, has been shown to predict as much as 80% of SRLS[167]. However, many investigations of influences in SRLS have historically been based on limited cross-sectional data[233], with broad international studies based on high quality datasets only

recently becoming possible[168]. This reinforces the important role which ongoing representative studies may play in furthering understanding of the complex components of SRLS and their role in health outcomes.

2.5.6. Factors influencing life satisfaction

2.5.6.1. Non-modifiable factors

Among the broad range of factors influencing SRLS, those which are non-modifiable have been shown to exert a strong influence[62–64]. These include age[163,174,234], race[171,235–237], gender[238,239], and family structure[240–244]. However, the associations identified between these demographic factors are not universal, but rather vary across cultures and may shift in light of important moderating variables such as marital status[241,245], parenthood[240,246–248], employment[176,249,250], education[171,172,202,250,251], income[202,252], and rural or urban residence[53,220,251,253].

2.5.6.2. Potentially modifiable factors

2.5.6.2.1. Personal health status

Personal health status has been frequently identified as one of the most influential factors in overall SRLS of individuals[161,163,167,189,199,254,255]. Both greater self-reported health and measured health status are associated with greater SRLS in surveys conducted across the globe[167], particularly among older individuals[189,254,256]. Additionally, satisfaction with health status at a national level is closely associated with the availability of equitable healthcare systems, which is in turn associated with SRLS[257].

2.5.6.2.2. Social support networks

Social support networks represent another important life domain[168,258] and the existence of such relationships has been strongly associated with SRLS[64,167]. Personal relationships are often assessed in survey data, with the most frequently collected relationships being marital status[167], number of children[161], and family or household structure[161,259], all of which are associated with SRLS[240–242,244,245,247]. Although there is variation across cultures, most studies have identified greater life satisfaction among married individuals[241,245,260] and multi-generational structured households[241,242]. Conversely, the findings on parenthood are highly variable[240,244,247] and are likely strongly influenced by the availability of governmental policies and social support[261]. Additionally, global measures of social support and perceived levels of social support are also commonly collected[161,167,258] and demonstrate positive association with SRLS[254].

2.5.6.2.3. Educational attainment

There is evidence that satisfaction with the educational life domain is associated with individual SRLS[262]. Educational attainment is strongly associated with both employment and income levels, and is therefore frequently used as a proxy measure of socioeconomic status[263,264], particularly for settings in which capturing income information is problematic for cultural or practical reasons[161]. Yet there is also strong evidence of variability in the relationship between education and income[264]. Educational attainment is reported to be positively associated with SRLS in most societies[64,250,265]. The direct

association has been theorized to be due to increased ability to achieve life aspirations[171], in addition to the influence of education on socioeconomic status through the indirect mechanisms of income or occupational prestige[173].

2.5.6.2.4. Employment status, income, and financial fulfillment

Domain-specific employment and financial satisfaction levels are also closely aligned to the measures of SRLS[173] and employment status has emerged as another extremely influential predictor of life satisfaction[168,174,219]. However, while the domain-specific measure of income satisfaction has been identified as a component of SRLS, such detail is rarely collected in surveys. Rather, most assessments utilize absolute or relative income, which are also associated with SRLS[173,196,266].

Gender differences exist in the association between employment and SRLS, specifically with regard to full- or part-time work schedules. Expectations of income and family responsibility appear to play defining roles in reported satisfaction levels[250], with men having a sizeable reduction in SRLS associated with part-time work compared to full-time work, whereas the work schedule plays little role for women with children[249,250]. The income-SRLS relationship is moderated by a variety of additional factors, including respondent age[267] and education[249], as well as cultural practices[173], overall wealth[173], or income inequality[219] of the country in which the research was conducted. Inclusion of employment and economic measurements in model development is therefore critically important, but the selection of appropriate measures is constrained by the data available.

2.5.6.2.5. Housing and security

Personal satisfaction with housing may reflect the stability or quality of the same, or the availability of services and household infrastructure[161]. In addition to association between overall housing domain satisfaction and SRLS[179,236], various aspects of housing satisfaction are positively associated with SRLS. These include: neighborhood communication[202], neighborhood physical order[178], and availability of public services within the neighborhood[236]. Furthermore, both neighborhood security and personal living situation, are important factors in SRLS[236,268]. Studies in low- and middle-income countries (LMICs) have reported poorer SRLS among women who report feeling unsafe in either their living environment or neighborhood[269]. While the association is reported to be less critical to the life satisfaction of men, community trust has been identified as an important factor in SRLS for both sexes[202].

2.5.6.2.6. Built environment and infrastructure

Domain-specific measures of satisfaction with environmental and infrastructure factors may be broad or specific. Frequently, satisfaction with transportation services or recreational facilities available within a neighborhood are the focus[161]. Prior research has identified association between SRLS and environmental factors including outdoor leisure time, air quality, noise, and green space[64,187,188,270]. Additionally, infrastructure which facilitates transportation, provides opportunities for socialization, exercise, or sport, and

permits greater independence, particularly as individuals age, is reported to be associated with higher levels of SRLS[66,220,271,272].

2.5.6.2.7. Effective government and services

Higher reported national life satisfaction scores are strongly associated with higher levels of human development, including more effective[79] and less corrupt government[215]. Higher levels of SRLS and lower levels of happiness inequality within a nation show interactive association with government quality and size[273]. Higher SRLS is also associated with both more freedom of personal choice and lower levels of societal inequality[79]. Furthermore, government-implemented policies and programs have been shown to have a clear impact on the SRLS of their population[79,215,261]. Satisfaction with public services, which directly impact individual well-being, is also correlated with SRLS[178]. Therefore, policy development in this area is recommended[175].

2.5.6.2.8. Civil society

Civil society includes non-governmental entities vital to the health of a society. Such organizations specifically noted by the World Bank include "community groups, non-governmental organizations, labor unions, indigenous groups, charitable organizations, faith-based organizations, professional associations, and foundations[274]." Civil society is critical in addressing both local and broad societal concerns[275], yet the role of different types of social organizations in the SRLS of individuals is not well understood[276]. There is good evidence of an association between religious participation and SRLS and the

relationship's underlying mechanisms of social support and meaningful activity have been previously described[166]. However, there is limited research that investigates association between higher SRLS scores and more broadly defined civil society participation[276–278].

2.5.7. Interventions addressing modifiable factors in life satisfaction

Interventions directed at any of the modifiable factors associated with SRLS may have an impact on life satisfaction. Meta-analysis of randomized controlled trials of psychological interventions to improve SRLS has demonstrated that improvement within a study cohort is achievable[279]. Whereas direct psychological intervention may be effective in improving the SRLS of individuals, such methods are impractical at the societal level. Rather, since the well-being of nations is the sum of individual SRLS[280], governments may implement policies and programs to more effectively target factors associated with individual levels of satisfaction, with anticipated long-term consequences for national life satisfaction levels[175,176].

Many interventions targeting areas such as infrastructure, education, healthcare accessibility, and public healthcare utilization have been undertaken throughout the world. Yet these have been implemented for the purpose of improving real or perceived deficiencies, rather than with the specific goal of improving life satisfaction across a population. Furthermore, follow-up time for such interventions must be sufficiently long to identify an indirect impact on SRLS, not to mention broader population health[281]. It is unsurprising, then, that SRLS has remained constant in most places where it is measured

over time[64]. This combination of association with modifiable factors and incremental rate of change has led various international organizations to advocate long-term use of life satisfaction and well-being indicators in policy development[1,282,283]. In addition, the use of satisfaction/well-being indicators to direct policy initiatives encourages coordination across government agencies, maximizing the likelihood of achievement[282]. Such integration of specific life satisfaction targets is anticipated to have a sizeable downstream impact on health outcomes[52], improving population health in South Africa and around the world.

CHAPTER 3

PREDICTORS OF UTILIZATION OF PUBLIC HEALTHCARE SERVICES IN SOUTH AFRICA

3.1. Abstract

Background. Healthcare utilization strongly influences population health outcomes. As nations expand universal healthcare systems, identification of predictors of public healthcare utilization may benefit programs aimed at reducing health inequities and improving population health. Therefore, the objective of this study was to investigate sociodemographic predictors of public healthcare utilization in South Africa.

Methods. A retrospective cross-sectional study was conducted using 2019 South African General Household Survey data. Distribution of household sociodemographic variables and their 95% confidence intervals were computed. A weighted multinomial logistic model was used to investigate predictors of public healthcare utilization. Odds ratios with 95% confidence intervals were computed for all predictors in the final model.

Results. A total of 19,039 households were included in the study, of which 72.4% reported a public facility as their usual healthcare facility. Chronic health conditions were reported by 18.4% of the households. Significantly ($p<0.001$) higher odds of public healthcare utilization were observed with decreasing age and educational attainment of household heads. Households with ≥6 members had significantly ($p<0.001$) higher odds of public healthcare utilization than smaller households. Although rural households had significantly ($p<0.001$) higher odds of public healthcare utilization than urban households, the association ($p=0.048$) between healthcare use and travel time was non-linear. Compared to households <15 minutes from their usual facility, those 15-29 and 30-89 minutes away had higher odds of public healthcare utilization, while those ≥90 minutes away showed no difference. Odds of public healthcare utilization were

significantly ($p<0.001$) higher among households with chronic conditions than those without.

Conclusions. The findings highlight the roles of poverty, healthcare accessibility, and chronic conditions in utilization of public healthcare in South Africa. Rural/urban differences suggest that targeted public healthcare accessibility initiatives may improve utilization. The importance of continued improvements in accessibility and utilization of public healthcare to reduce health inequities cannot be overemphasized.

3.2. Background

Availability, accessibility, and utilization of healthcare services are important factors that influence population health outcomes[8,67]. For instance, there is evidence that disparities in the utilization of healthcare services is associated with differences in life expectancy[1–6]. Urban-rural differences in healthcare utilization have also been shown to influence health outcomes[26,70,71]. Although South Africa has experienced national improvements in many health measures over the past quarter century[11,12], poverty[13] and health disparities[25] continue to plague the country. Studies conducted in South Africa have identified geographic and socioeconomic differences as key drivers of disparities in health outcomes[20,25]. However, to date, the role of public and private healthcare services utilization has remained largely unexamined[21].

In South Africa, the right of access to healthcare services is affirmed by the Constitution, yet disparities in utilization of the public healthcare system continue to exist[21,22]. In

addition to the direct impact which social determinants may have on health outcomes, the socioeconomic, demographic, and systematic differences in health status across the population may influence the selection and utilization of healthcare services[34,38]. Identification of disparities in the utilization of public health services and predictors of the identified disparities would provide guidance for health planning programs which aim to improve population health outcomes[24,38]. Therefore, the objective of this study was to investigate rural/urban disparities and sociodemographic determinants of utilization of public healthcare services in South Africa.

3.3. Methods

3.3.1. Design, Setting, and Data Source

This retrospective cross-sectional study used survey data consisting of responses from 19,649 households in South Africa. The data were collected as part of the 2019 General Household Survey[284] and obtained from DataFirst[285], the University of Cape Town's open data portal. The annual General Household Survey (GHS) is conducted by Statistics South Africa using computer-assisted in-person interviews to collect data on the living conditions of South Africans, including utilization of health services, educational attainment, employment, and housing. The survey instrument included both individual-level (focusing on the household head) and household-level questions, with a national response rate of 87.2%[160].

3.3.2. Variable Selection and Data Management

Potential predictors of utilization of public healthcare services were selected from the GHS instrument. Based on a conceptual model (Figure 1), 12 potential predictors of utilization of public healthcare services were investigated. Individual-level potential predictors of utilization of public healthcare services investigated were: sex, age group, race group, employment status, and educational attainment. Household-level variables investigated included: home ownership, income relative to household needs, household size, single or multi-generation household, rurality (rural vs. metro district), travel time to healthcare facility, and whether any household member had a chronic health condition.

Data management was performed in STATA Version 16.1 [286]. The survey data comprised two datasets linked by unique household identifier: a household dataset and an individual-level dataset. A number of variables from the household dataset, including head-of-household sex and race group, income relative to household needs, rurality, and travel time to healthcare facility, were retained as originally coded. The rest of the household-level variables were re-coded as shown in Table 1. Additional variables were extracted from the individual-level dataset and these were also re-coded as shown in Table 1.

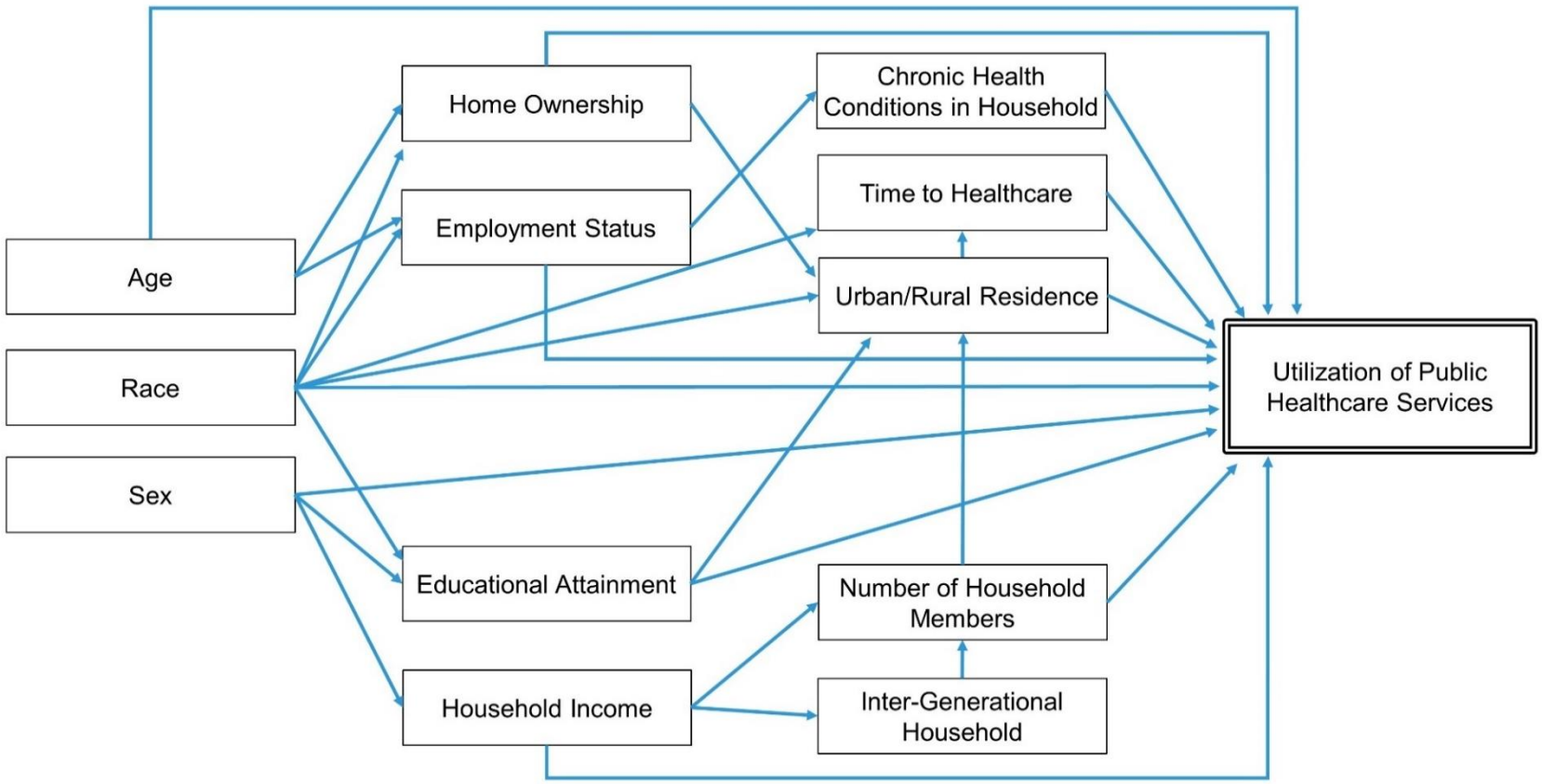

Figure 1. Conceptual Model of Potential Predictors of Utilization of Public Healthcare Services in South Africa, 2019.

Table 1. Original and Re-coded Sociodemographic Variables Assessed as Predictors of Utilization of Public Healthcare Services in South Africa, 2019.

Source	Original Variable		Re-coded Variable	
Household-level dataset	**Healthcare facility utilization**		**Healthcare facility utilization**	
	1	Public Hospital	0	Private Facility
	2	Public Clinic	1	Public Facility
	3	Other in the public sector	2	Traditional/Alternative Practitioner
	4	Private Hospital	3	Unknown
	5	Private Clinic		
	6	Private doctor/specialist		
	7	Traditional healer/sangoma		
	8	Spiritual healer's workplace/church		
	9	Pharmacy/chemist		
	10	Health facility provided by employer		
	11	Alternative medicine, e.g., homoeopathist		
	12	Other in private sector		
	13	Do not know		
	99	Unspecified		
	Head-of-household age		**Head-of-household age group**	
	Age in years (continuous)		1	<18
			2	18-29
			3	30-44
			4	45-59
			5	60+
	Tenure of dwelling		**Home ownership**	
	1	Rented	0	Do not own
	2	Owned, not yet paid off to bank	1	Own
	3	Rented from other (including institutions)		
	4	Owned, not yet paid off to private lender		
	5	Owned and fully paid off		
	6	Occupied rent-free		
	7	Other		
	8	Don't know		
Individual-level dataset	**Employment status (assigned individually)**		**Head-of-household employed**	
	1	Yes (Wage earner, business earnings, or unremunerated work such as agriculture)	0	Unemployed
	2	No	1	Employed/Laboring
	8	Not applicable		
	9	Unspecified		
	Education (assigned individually)		**Head-of-household educational attainment**	
	0	Grade R/0	0	No schooling
	1	Grade 1/Sub A/Class 1	1	Less than primary

Table 1 continued

Source	Original Variable		Re-coded Variable	
Individual-level dataset	2	Grade 2/Sub B/Class 2	2	More than primary, less than secondary
	3	Grade 3/Standard 1/ABET/AET 1	3	Secondary or equivalent
	4	Grade 4/Standard 2	4	Bachelor's degree or higher or equivalent
	5	Grade 5/Standard 3/ABET/AET 2	5	Unknown
	6	Grade 6/Standard 4		
	7	Grade 7/Standard 5/ABET/AET 3		
	8	Grade 8/Standard 6/Form 1		
	9	Grade 9/Standard 7/Form 2/ABET/AET 4/NCV Level 1/ NQF Level 1		
	10	Grade 10/Standard 8/Form 3/NCV Level 2/ NQF Level 2		
	11	Grade 11/Standard 9/Form 4/NCV Level 3/ NQF Level 3		
	12	Grade 12/Standard 10/Form 5/National Senior Certificate/Matric/ NCV Level 4/ NQF Level 4		
	13	NTC l/N1/NQF 1		
	14	NTC ll/N2/NQF 2		
	15	NTC lll/N3/NQF 3		
	16	N4/NTC 4/NQF Level 5		
	17	N5/NTC 5/ NQF Level 5		
	18	N6/NTC 6/ NQF Level 5		
	19	Certificate with less than Grade 12/Standard 10		
	20	Diploma with less than Grade 12/Standard 10		
	21	Higher/National/Advance certificate with Grade 12/Std 10/NQF Level 5		
	22	Diploma with Grade 12/Standard 10/ NQF Level 6		
	23	Higher Diploma/(B-Tech Diploma) NQF Level 7		
	24	Bachelor's Degree/ NQF Level 7		
	25	Honors Degree/Postgraduate Diploma/NQF Level 8		
	26	Post Higher Diploma (Master's Degree) NQF Level 9		
	27	Doctoral Degrees (PhD) NQF Level 10		
	28	Other		
	29	Do not know		
	98	No schooling		
	99	Unspecified		

Table 1 continued

Source	Original Variable		Re-coded Variable	
Individual-level dataset	**Household members (assigned individually)**		**Inter-generational household**	
	1	Head/acting head	0	Single generation
	2	Husband/wife/partner of household head	1	Multigeneration
	3	Son/daughter/stepchild/adopted child of household head		
	4	Brother/sister/stepbrother/stepsister of household head		
	5	Father/mother/stepfather/stepmother of household head		
	6	Grandparent/great grandparent of household head		
	7	Grandchild/great grandchild of household head		
	8	Other relative (e.g., in-laws or aunt/uncle) of household head		
	9	Non-related persons		
	Number of people living in household			
	Number of people in household (continuous)		0	1 to 5
			1	6 or more
	Chronic conditions (assigned individually)		**Any chronic condition in household**	
	1	Yes (Tuberculosis, Diabetes mellitus, Stroke/Cerebrovascular disease, Cardiovascular disease, or Human Immunodeficiency Virus)	0	No
	2	No	1	Yes

3.3.3. Descriptive Analysis

All statistical analyses were performed using STATA Version 16.1 [286]. To adjust for the complex survey design of the GHS, all statistical analyses were performed in the **svyset** environment of STATA, specifying the survey weight variable (*house_wgt*). Head-of-household age and number of household members were assessed for normality of distribution using the modified Jarque-Bera skewness-kurtosis test. The modified version of the Jarque-Bera test was used in this case for two reasons: (i) it has a higher power than the better-known Shapiro-Wilk test when evaluating large datasets[287], (ii) the standard Jarque-Bera test is not supported in the complex survey weighting environment[288]. Both variables were non-normally distributed and were subsequently categorized (Table 1). Percentages and 95% confidence intervals were computed for all the categorical sociodemographic variables. Observations with unknown values were excluded from the subsequent model building process and hence the final dataset had a total of 19,039 households.

3.3.4. Investigation of Predictors of Utilization of Public Healthcare Services

A survey-weighted multinomial logistic model was used to investigate the predictors of utilization of public healthcare services. The model was constructed in two steps: First, the STATA **svy: xi: mlogit** command was used to investigate univariable associations between each potential predictor and the polytomous outcome (Public healthcare facility, Traditional/Alternative Practitioner, or Private healthcare facility), using univariable multinomial logistic models and a relaxed alpha level of 0.10. Statistical significance was

assessed using the adjusted Wald test. Potential predictor variables with $p \leq 0.10$ were considered for inclusion in the multivariable multinomial logistic model in step 2.

The second step involved building a multivariable multinomial logistic model using a manual backwards elimination process. Variables which were not significant at an alpha level of 0.05 based on the Wald test were sequentially removed until all remaining variables were significant at the specified alpha level. Confounding was assessed at each variable elimination step based on the change in coefficients of variables still in the model. When removal of a variable resulted in a change of 20% or more in the coefficients of any of the remaining variables, the removed variable was considered a confounder and retained in the model, regardless of its statistical significance. No biologically plausible interaction terms were identified and hence none was assessed for significance in the final model. Multicollinearity was assessed using variance inflation factor (VIF), with values of VIF>10 judged to be indicative of multicollinearity.

The polytomous outcome (Public healthcare facility, Traditional/Alternative Practitioner, and Private healthcare facility utilization) demonstrated a clear schism in significance. Consequently, the outcome variable was dichotomized (Public healthcare facility utilization versus Private healthcare facility utilization) and re-fit as binary logistic model using the STATA **svy: xi: logit** command. For this model, the Traditional/Alternative Practitioners were categorized as private healthcare services. Odds ratios (OR) and their 95% confidence intervals (CI) were computed for all variables retained in the final

model. The multinomial generalization of the Hosmer-Lemeshow test (STATA **mlogitgof** post-test command) and the standard Hosmer-Lemeshow goodness-of-fit test (STATA **estat gof** post-test command), were used to compare the fit of the multinomial and binomial logistic models, respectively.

3.3.5. Ethics approval

This study was approved by the University of Tennessee Institutional Review Board (IRB Number 22-06828-XP).

3.4. Results

3.4.1. Descriptive Analysis

This retrospective cross-sectional study used survey data containing information on the living conditions of 19,039 households in South Africa. As many as 84.8% of the respondents reported that the travel time to the healthcare facility they usually used was <30 minutes (Table 2). For the majority (72.4%) of the households these were public facilities, while 27.1% usually used private healthcare providers and 0.4% reported mainly using traditional or alternative care practitioners.

Table 2. Characteristics of Respondents and Households from the General Household Survey Conducted in South Africa in 2019.

	Characteristic	Weighted Frequency	Weighted Percent	Weighted 95% CI[1]
Head of Household Characteristics	**Healthcare accessibility**			
	Less than 15 minutes	8,174	41.6	40.3, 42.9
	15-29 minutes	8,488	43.2	42.1, 44.3
	30-89 minutes	2,676	13.6	12.8, 14.5
	90 minutes and more	260	1.3	1.1, 1.6
	Unknown	51	0.3	0.2, 0.4
	Healthcare facility type			
	Public Facility	14,228	72.4	71.1, 73.7
	Private Facility	5,329	27.1	25.9, 28.4
	Traditional/Alternative Practitioner	71	0.4	0.3, 0.5
	Unknown	21	0.1	0.1, 0.2
	Sex			
	Female	8,222	41.8	41.0, 42.7
	Male	11,427	58.2	57.3, 59.0
	Age group			
	<18	41	0.2	0.1, 0.3
	18-29	2,591	13.2	12.6, 13.8
	30-44	7,460	38.0	37.1, 38.9
	45-59	5,601	28.5	27.8, 29.2
	60+	3,957	20.1	19.5, 20.9
	Race group			
	Black African	15,987	81.4	80.0, 82.6
	Colored	1,385	7.0	6.3, 7.9
	Indian/Asian	474	2.4	2.0, 2.9
	White	1,803	9.2	8.3, 10.1
	Employment status			
	Unemployed	8,180	43.0	42.0, 44.0
	Employed/Laboring	10,859	57.0	56.0, 58.0
	Educational attainment			
	No schooling	1,075	5.5	5.1, 5.8
	Less than primary	1,596	8.1	7.7, 8.6
	More than primary, less than secondary	8,481	43.2	42.2, 44.1
	Secondary or equivalent	6,608	33.6	32.7, 34.6
	Bachelor's degree or higher or equivalent	1,473	7.5	6.9, 8.2
	Unknown	415	2.1	1.9, 2.4
Household	**Home ownership**			
	Do not own	7,666	40.3	39.0, 41.6
	Own	11,373	59.7	58.4, 61.0
	Household income relative to need			
	Much higher	939	4.8	4.3, 5.3
	Higher	3,308	16.8	15.9, 17.8
	More or less the same	6,229	31.7	30.6, 32.8

Table 2 continued

Characteristic	Weighted Frequency	Weighted Percent	Weighted 95% CI[1]
Lower	6,405	32.6	31.5, 33.8
Much lower	2,762	14.1	13.3, 14.9
Unknown	6	0.0	0.0, 0.1
Multigenerational household			
No	7,221	36.8	35.8, 37.7
Yes	12,428	63.3	62.3, 64.2
Number of people living in household			
1 to 5	16,860	85.8	85.2, 86.4
6 or more	2,789	14.2	13.6, 14.8
Urban/rural district of residence			
Urban	8,845	45.0	43.1, 46.9
Rural	10,804	55.0	53.1, 56.9
Chronic health conditions in household			
No	16,038	81.6	81.0, 82.3
Yes	3,611	18.4	17.7, 19.0
Tuberculosis	327	1.7	1.5, 1.9
Diabetes	1,670	8.5	8.1, 9.0
Stroke/Cerebrovascular disease	226	1.2	1.0, 1.3
Myocardial infarction/Heart disease	369	1.9	1.7, 2.1
HIV/AIDS	1,534	7.8	7.4, 8.3

[1]95% Confidence interval

Respondent (household head) age was non-normally distributed ($p<0.001$) and ranged from 12 to 105 years, with a median of 44 (Interquartile range: 34, 56). More than half (58.2%) of the households were headed by males (Table 2). Most (81.4%) household heads were Black African and more than half (57.0%) were employed or laboring (worked for themselves or someone else without remuneration). Educational attainment was unevenly distributed between those with less than secondary school education (56.8%) and those with secondary school education or higher (43.2%). Respondents with more than primary school education but less than secondary school education comprised 43.2% of the study subjects.

Almost 60% of the households owned their home (Table 2). Just over half (53.3%) of the respondents reported that their household income was “much higher,” “higher,” or “about the same” as the household needs. Nearly two-thirds (63.3%) of the households were multi-generational. The number of household members was also non-normally distributed ($p<0.001$), ranging from 1 to 24 people, with a median of 3 (Interquartile range: 2, 4). Chronic health conditions, affecting one or more household members, were reported in 18.4% of the households. These conditions included tuberculosis (1.7% of households), diabetes (8.5% of households), cerebrovascular disease (1.2% of households), heart disease (1.9% of households), and HIV/AIDS (7.8% of households).

3.4.2. Predictors of Utilization of Healthcare Services

The results of the univariable multinomial logistic models used to assess the associations between the polytomous utilization of healthcare services (public, traditional vs private facilities) and potential predictors are shown in Table 3. All but two (home ownership and multi-generational households) of the variables assessed in the multivariable multinomial logistic model had significant ($p<0.05$) associations with the outcome (Table 4). It is worth noting that although most of the predictors were significantly associated with the outcome based on the Wald test, the majority were associated with public healthcare utilization but not Traditional/Alternative Practitioner. Given this clear difference in associations, the potential predictors were further investigated for association with the binary outcome (public vs all other facilities) using a binary logistic model. The results of the final multivariable binary logistic model are shown in Table 5. Based on this model, significant predictors of utilization of public healthcare services were: sex, age group, race, employment status, educational attainment, household income, number of household members, urban/rural district of residence, travel time to healthcare facility, and presence of chronic conditions among household members (Table 5).

Table 3. Results of Univariable Multinomial Logistic Models Used to Assess Associations between Utilization of Healthcare Services and its Potential Predictors in South Africa, 2019.

	Public Facility[1]				Traditional/Alternative Practitioner[1]			
		95% CI[2]				95% CI[2]		
Variable	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**
Sex (p<0.001)								
Female	1.77	1.63	1.92	<0.001	1.16	0.68	1.99	0.581
Male	Referent				Referent			
Age Group (p<0.001)								
<18	11.13	1.51	82.19	0.018	<0.01	<0.01	<0.01	<0.001
18-29	1.54	1.31	1.82	<0.001	1.00	0.28	3.59	0.999
30-44	0.90	0.81	1.01	0.073	1.28	0.68	2.42	0.450
45-59	0.79	0.71	0.88	<0.001	0.90	0.46	1.77	0.766
60+	Referent							
Race Group (p<0.001)								
Black African	38.30	31.31	46.85	<0.001	18.40	4.47	75.71	<0.001
Colored	13.93	10.83	17.92	<0.001	3.16	0.44	22.91	0.254
Indian/Asian	3.35	2.34	4.81	<0.001	2.69	0.24	29.89	0.420
White	Referent							
Employment status (p<0.001)								
Unemployed	3.50	3.20	3.83	<0.001	3.13	1.81	5.41	<0.001
Employed/Laboring	Referent							
Educational attainment (p<0.001)								
No schooling	206.06	139.26	304.88	<0.001	51.78	13.38	200.42	<0.001
Less than primary	117.58	88.56	156.11	<0.001	6.11	1.00	37.46	0.050
Primary	45.92	37.55	56.15	<0.001	8.53	2.57	28.39	<0.001
Secondary or equivalent	7.74	6.39	9.36	<0.001	1.75	0.50	6.09	0.377
Bachelor's or higher	Referent							
Home ownership (p<0.001)								
Own	1.86	1.69	2.04	<0.001	1.16	0.66	2.01	0.610
Do not own	Referent							

Table 3 continued

	Public Facility[1]				Traditional/Alternative Practitioner[1]			
		95% CI[2]				95% CI[2]		
Variable	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**
Household income relative to need (p<0.001)								
Much higher	0.64	0.52	0.80	<0.001	1.28	0.48	3.44	0.621
Higher	0.61	0.54	0.69	<0.001	0.32	0.10	1.04	0.058
Lower	1.79	1.59	2.02	<0.001	1.17	0.58	2.38	0.658
Much lower	3.96	3.33	4.71	<0.001	4.88	2.34	10.21	<0.001
More or less the same	Referent							
Multigenerational household (p<0.001)								
Yes	1.42	1.30	1.54	<0.001	0.78	0.46	1.32	0.352
No	Referent							
Number of people living in household (p<0.001)								
6 or more	2.98	2.61	3.41	<0.001	0.60	0.22	1.69	0.337
1 to 5	Referent							
Urban/rural district of residence (p<0.001)								
Rural	2.55	2.24	2.90	<0.001	2.12	1.18	3.79	0.012
Urban	Referent							
Healthcare accessibility (p<0.001)								
15-29 minutes	1.84	1.65	2.04	<0.001	0.89	0.48	1.65	0.716
30-89 minutes	3.11	2.64	3.65	<0.001	1.85	0.89	3.86	0.101
90 minutes and more	3.19	2.01	5.08	<0.001	9.90	3.25	30.17	<0.001
Less than 15 minutes	Referent							
Chronic health conditions in household (p<0.001)								
Yes	1.70	1.53	1.89	<0.001	1.63	0.82	3.24	0.164
No	Referent				Referent			

[1]Baseline category was Private Facility
[2]95% Confidence Interval

Table 4. Results of the Multinomial Logistic Model Used to Investigate Predictors of Utilization of Healthcare Services in South Africa, 2019.

	Public Facility[1]				Traditional/Alternative Practitioner[1]			
		95% CI[2]				95% CI[2]		
Variable	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**
Sex (p<0.001)								
Female	1.23	1.11	1.36	<0.001	0.85	0.50	1.45	0.556
Male	Referent				Referent			
Age Group (p<0.001)								
<18	3.40	0.42	27.37	0.251	0.00	0.00	0.00	<0.001
18-29	3.57	2.87	4.42	<0.001	1.55	0.44	5.42	0.494
30-44	2.62	2.22	3.08	<0.001	2.68	1.19	6.03	0.017
45-59	1.82	1.56	2.14	<0.001	1.90	0.95	3.80	0.070
60+	Referent							
Race Group (p<0.001)								
Black African	16.75	13.50	20.78	<0.001	12.49	3.20	48.80	<0.001
Colored	5.92	4.58	7.65	<0.001	2.03	0.29	14.44	0.478
Indian/Asian	2.80	1.90	4.13	<0.001	2.66	0.25	28.58	0.419
White	Referent							
Employment status (p<0.001)								
Unemployed	2.67	2.37	3.01	<0.001	3.07	1.60	5.90	<0.001
Employed/Laboring	Referent							
Educational attainment (p<0.001)								
No schooling	75.38	49.88	113.92	<0.001	20.22	4.35	94.12	<0.001
Less than primary	50.16	37.18	67.68	<0.001	2.79	0.40	19.36	0.299
Primary	24.50	19.76	30.39	<0.001	4.86	1.35	17.45	0.015
Secondary or equivalent	5.39	4.38	6.63	<0.001	1.31	0.36	4.75	0.685
Bachelor's or higher	Referent							

Table 4 continued

	Public Facility[1]				Traditional/Alternative Practitioner[1]			
		95% CI[2]				95% CI[2]		
Variable	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**	**Relative Risk Ratio**	**Lower limit**	**Upper limit**	**p-value**
Household income relative to need (p<0.001)								
Much higher	0.66	0.53	0.83	<0.001	1.23	0.45	3.36	0.690
Higher	0.68	0.59	0.79	<0.001	0.35	0.11	1.15	0.083
Lower	1.18	1.04	1.34	0.012	0.79	0.38	1.61	0.512
Much lower	1.76	1.46	2.14	<0.001	2.18	1.02	4.68	0.044
More or less the same	Referent							
Number of people living in household (p<0.001)								
6 or more	1.81	1.55	2.12	<0.001	0.38	0.14	1.08	0.069
1 to 5	Referent							
Urban/rural district of residence (p<0.001)								
Rural	1.31	1.15	1.48	<0.001	1.28	0.68	2.41	0.443
Urban	Referent							
Healthcare accessibility (p=0.004)								
15-29 minutes	1.14	1.02	1.28	0.027	0.60	0.31	1.16	0.128
30-89 minutes	1.20	1.00	1.43	0.046	0.82	0.38	1.74	0.599
90 minutes and more	1.04	0.62	1.75	0.875	3.42	0.99	11.75	0.051
Less than 15 minutes	Referent							
Chronic health conditions in household (p<0.001)								
Yes	1.35	1.18	1.54	<0.001	1.45	0.66	3.16	0.355
No	Referent				Referent			

[1]Baseline category was Private Facility
[2]95% Confidence Interval

Table 5. Results of the Final Binary Logistic Model Used to Investigate Predictors of Utilization of Public Healthcare Services in South Africa, 2019.

Variable	Odds Ratio	95% CI[1] Lower limit	95% CI[1] Upper limit	p-value
Sex				<0.001
Female	1.23	1.12	1.36	<0.001
Male	Referent			
Age Group				<0.001
<18	3.55	0.44	28.42	0.233
18-29	3.50	2.83	4.33	<0.001
30-44	2.54	2.16	2.98	<0.001
45-59	1.78	1.52	2.08	<0.001
60+	Referent			
Race Group				<0.001
Black African	16.31	13.17	20.20	<0.001
Colored	5.92	4.59	7.63	<0.001
Indian/Asian	2.79	1.89	4.10	<0.001
White	Referent			
Employment status				<0.001
Unemployed	2.59	2.30	2.92	<0.001
Employed/Laboring	Referent			
Educational attainment				<0.001
No schooling	63.68	43.35	93.55	<0.001
Less than primary	49.50	36.77	66.65	<0.001
Primary	23.77	19.19	29.44	<0.001
Secondary or equivalent	5.38	4.38	6.62	<0.001
Bachelor's or higher	Referent			
Household income relative to need				<0.001
Much higher	0.66	0.53	0.83	<0.001
Higher	0.69	0.60	0.79	<0.001
Lower	1.19	1.04	1.35	0.008
Much lower	1.69	1.40	2.04	<0.001
More or less the same	Referent			
Number of people living in household				<0.001
6 or more	1.84	1.58	2.15	<0.001
1 to 5	Referent			
Urban/rural district of residence				<0.001
Rural	1.30	1.15	1.47	<0.001
Urban	Referent			

Table 5 continued

Variable	Odds Ratio	95% CI[1] Lower limit	95% CI[1] Upper limit	p-value
Healthcare accessibility				0.048
15-29 minutes	1.15	1.03	1.29	0.016
30-89 minutes	1.20	1.01	1.43	0.039
90 minutes and more	0.92	0.56	1.50	0.739
Less than 15 minutes	Referent			
Chronic health conditions in household				<0.001
Yes	1.33	1.17	1.52	<0.001
No	Referent			

[1]95% Confidence Interval

Households headed by females had significantly higher odds (OR=1.23; 95% CI: 1.12, 1.36) of reporting the use of public healthcare facilities than those headed by males (Table 5). The odds of using public healthcare services varied with the age of the household head. Households headed by individuals 18-29 years of age had more than 3 times higher odds (OR=3.50; 95% CI: 2.83, 4.33) of using public healthcare services than those headed by 60+ year olds. The strength of this association was much lower (OR=1.78, 95% CI: 1.52, 2.08) for households headed by individuals 45-59 years. Compared to households headed by White individuals, those headed by individuals of all other race categories had significantly ($p<0.001$) higher odds of using public healthcare. The odds of using public healthcare services was highest among Black African-headed households (OR=16.31, 95% CI: 13.17, 20.20), followed by those headed by Colored individuals (OR=5.92; 95% CI: 4.59, 7.63) and then the Indian/Asian-headed households (OR=2.79; 95% CI: 1.89, 4.10).

A number of socioeconomic factors were also significant predictors of utilization of public healthcare services. Households headed by unemployed individuals had much higher odds (OR=2.59; 95% CI: 2.30, 2.92) of reporting use of public healthcare services than those in which the household head was employed (Table 5). There was evidence of decreasing odds of utilization of public healthcare services with higher educational attainment. Households headed by persons with no formal schooling had extremely high odds (OR=63.68; 95% CI: 43.35, 93.55) of utilization of public healthcare services compared to those headed by individuals with bachelor's degrees or higher. Although the

odds decreased steadily across other levels of educational attainment, they remained high even for households headed by individuals who had completed secondary school education (OR=5.38; 95% CI: 4.38, 6.62). Households for which total income was lower/much lower than the needs of the household had higher odds of utilizing public healthcare services, with the odds being higher among those in the "much lower" category (OR=1.69; 95% CI: 1.40, 2.04) than the "lower" category (OR=1.19; 95% CI: 1.04, 1.35), compared to households in which the income relative to need was the same. Households with ≥6 members had higher odds of utilizing public healthcare facilities (OR=1.84; 95% CI 1.58, 2.15) compared to those composed of <6 members.

Use of public healthcare services was significantly higher among rural households (OR=1.30; 95% CI: 1.15, 1.47) than those in urban districts (Table 5). Although there was a significant (p=0.048) association between utilization of public healthcare services and travel time to the healthcare facility, this relationship was not linear. Households that were 15-29 minutes away and those 30-89 minutes away both had significantly higher odds of utilization of public healthcare services (OR=1.15; 95% CI: 1.03, 1.29 and OR=1.20; 95% CI: 1.01, 1.43, respectively) than those that were <15 minutes away from their usual healthcare facility. However, the odds of using public healthcare services were not significantly (p=0.739) different among households that were ≥90 minutes from their usual facility (OR=0.92; 95% CI: 0.56, 1.50) compared to those that were <15 minutes away. Finally, households having ≥1 family member with a chronic condition had higher odds (OR=1.33; 95% CI: 1.17, 1.52) of utilizing public healthcare facilities than those

that did not have a member with a chronic condition requiring regular medical care. A revised conceptual model including only predictors that were significant in the final model is shown in Figure 2.

3.5. Discussion

This study investigated predictors of public healthcare service utilization in South Africa, with a focus on rural/urban and sociodemographic disparities. Individuals of lower age, educational attainment, and household income relative to need tended to have higher odds of utilization of public healthcare. Higher odds of utilization of public healthcare were also associated with unemployment, larger households, and rural residence.

The travel time of <30 minutes to the preferred healthcare facility observed in the current study is consistent with reports from recent years[113,159,289] but reflects an increase in the percentage of the population living within <30 minutes of a healthcare facility compared to preceding years[290,291]. Despite a broad range of attempts to improve the public healthcare sector[83,292,293], disparities in accessibility continue to exist in South Africa[11,162]. However, the current expansion of primary care sites as part of South Africa's National Development Plan is expected to improve accessibility[83] and address these disparities[22,294].

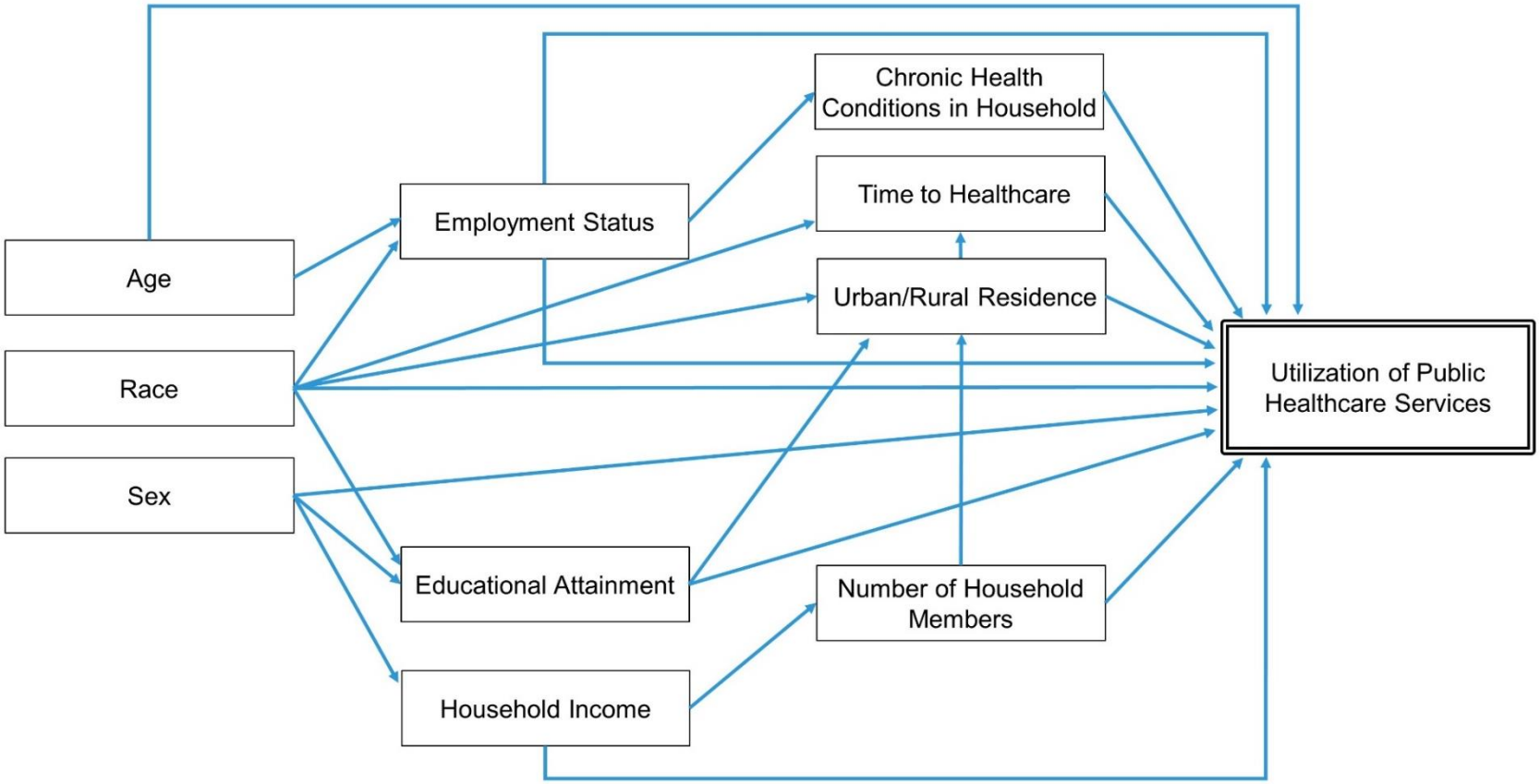

Figure 2. Revised Conceptual Model Showing Identified Predictors of Utilization of Public Healthcare Services in South Africa, 2019.

Consistent with the reports from previous South African studies[11,22,28,42,92,144], the majority (72.4%) of households in the current study reported mainly using public healthcare. A very small percentage of households (0.4%) preferred to use traditional or alternative practitioners. This is similar to the reported findings of a study in Gauteng Province[84] but in contrast to those of a cohort study conducted in Mpumalanga Province which reported that 25% of young adult migrants and 5% of non-migrants preferred to use traditional health practitioners[28]. The striking differences in the percentage of the population using traditional health practitioners across studies may have been influenced by the perceived social desirability of such healthcare. Whereas traditional healthcare was frequently reported to non-governmental researchers in the Mpumalanga study, in government sponsored surveys such as those used in the present study and the Gauteng study, much lower percentages of traditional practitioner utilization were reported. Thus, it is possible that respondents felt more comfortable reporting their use of traditional practitioners to non-governmental researchers than in government-conducted surveys.

The finding that households headed by females had significantly higher odds of utilization of public healthcare is consistent with reports from other studies, both in South Africa[144] and elsewhere[157]. Moreover, previous South African studies have reported higher overall utilization of public facilities by females[42,84,133]. Although the present study did not assess the specific types of services used, previous research has pointed to the potential for integration of HIV and non-communicable disease care with women's health services[125], as well as the greater percentage of women with disabilities[22], as factors

influencing the higher usage odds among women. Such findings indicate the need to package services together, thus reducing travel and cost barriers as well as improving care coordination and treatment compliance.

In the present study, households headed by Black Africans and other non-White individuals had higher odds of public healthcare utilization than those headed by White individuals. This is similar to reports of a national study of public healthcare use which reported that White individuals had the lowest demand for public healthcare compared to all other races[144]. Moreover, a study in Gauteng province reported that, in comparison to Black Africans, White, Colored, and Indian/Asian individuals had significantly higher odds of seeking healthcare of any type[84].

The finding of higher odds of public healthcare use among households headed by individuals with less than a Bachelor's degree is consistent with a study in Gauteng which reported that rates of public healthcare use was lowest among individuals with postgraduate degrees and increased as the level of educational attainment decreased[84]. Similarly, in a study of older rural adults in South Africa, individuals with ≥6 years of education had significantly higher odds of using any healthcare compared to those with lower educational levels[42]. The identification of unemployment and low household income as predictors of public healthcare utilization is consistent with numerous international studies which have reported association with public healthcare use for both unemployed and socioeconomically disadvantaged individuals[28,42,92,295,296]. Indeed, a

growing body of literature assessing the factors influencing healthcare selection indicates that the negative relationship between socioeconomic status and public healthcare use persists, even in many locations which provide universal healthcare[39,69,295,296].

Contrary to the findings of the current study that household size of ≥6 members was a significant predictor of public healthcare utilization, a study conducted in Eastern Cape Province found that household size was not significantly associated with healthcare access[33]. However, the Eastern Cape study was limited in scope and focused solely on residents of rural areas. Other studies have reported that larger households are generally less likely to seek medical care, particularly in rural areas[70], which points to the complex relationship that exists between rural residence, socioeconomic pressure, and household size.

Households in rural districts had higher odds of public healthcare utilization than those in urban districts, which is consistent with the findings of a wide-ranging report on the national healthcare sector in South Africa[34]. Although the authors reported wide variability by province, the overall utilization of public healthcare facilities was greatest in rural areas. Prior research has highlighted the association between disparities in health outcomes and healthcare service utilization across the globe[1,2,4–6], particularly with regard to the difference between urban and rural settings[3,26,33]. As distance to healthcare increases, so do transportation costs, which previous research has shown represent a significant barrier to accessibility for many South Africans[21,23,33,114,133,134]. The present

study's finding that travel times to a healthcare site of 15-89 minutes were significant predictors of public healthcare use corresponds with a study of transportation time to healthcare facilities in KwaZulu-Natal province, which also reported much higher proportion of public healthcare use in rural areas despite the significantly longer travel times[31]. The higher odds of seeking care at public facilities identified among rural households might indicate improved accessibility in terms of travel time to healthcare site under the newly decentralized health system. However, a recent study conducted in Mpumalanga Province reported that the larger number of public healthcare facilities has not resolved the inequality of healthcare accessibility due to a variety of economic and preference issues[29]. Thus, improvements which are to result in increased public healthcare utilization must go beyond merely reducing travel time to health facility[82].

The observed association between presence of chronic conditions among household members and utilization of public healthcare services in the present study aligns with the finding reported by a study of older rural adults in South Africa, in which individuals with chronic conditions were reported to have significantly higher odds of using healthcare[42]. Although the higher utilization of healthcare among individuals with chronic conditions is well documented across a range of countries[41], the relationship between public healthcare utilization and chronic conditions has been identified in very few studies. In a study of older adults in Ghana, having ≥2 chronic conditions was a significant predictor of both public and private healthcare utilization[157], while a study conducted in Johannesburg, South Africa[114] also identified higher likelihood of public

healthcare use among individuals with self-reported chronic conditions. However, these findings contrast with those of an earlier national study in South Africa which reported that, despite greater prevalence of diseases responsible for significant premature mortality among socioeconomically disadvantaged households, such households had lower levels of utilization of healthcare[117]. While the current expansion of primary care sites is expected to improve accessibility and appears to have increased use of public healthcare services by households with chronic conditions, the need for further measures to decrease health disparities remains.

3.5.1. Strengths and limitations

Important strengths of this study are the use of household survey data and rigorous statistical analyses to investigate sociodemographic predictors of public healthcare utilization. The representativeness at a metro/non-metro level within each province may provide useful information for local planning of healthcare services. However, as with any survey, responses may be subject to reporting or recall biases. Additionally, lack of district-specific information precluded the incorporation of additional census variables or spatial analyses to assess geographic differences in healthcare service utilization. Nonetheless, the results of this study identify important predictors of public healthcare utilization, which may be useful in supporting the development of plans to improve healthcare accessibility for all South Africans.

3.6. Conclusion

This study identified a number of predictors of utilization of public healthcare services in a representative sample of South African households. The findings highlight the roles of poverty, healthcare accessibility, and chronic conditions in the utilization of public healthcare services. Considering the sociodemographic characteristics of the South African population, continued improvements in accessibility and utilization of public healthcare cannot be overemphasized in the quest to reduce health inequities and improve health outcomes. The differences in utilization patterns identified between rural and urban districts suggests that targeted health policy initiatives addressing accessibility of public health services may also improve public healthcare utilization.

CHAPTER 4

PREDICTORS OF SELF-REPORTED LIFE SATISFACTION IN GAUTENG PROVINCE, SOUTH AFRICA: A PARTIAL PROPORTIONAL ODDS MODELING APPROACH

4.1. Abstract

Background: Life satisfaction is an important measure of well-being and has been associated with numerous health outcomes. Identification of predictors of life satisfaction is important for guiding programs aimed at improving population health. Therefore, the objective of this study was to investigate socioeconomic and demographic predictors of overall life satisfaction in Gauteng province, South Africa.

Methods: A retrospective cross-sectional study was conducted using 2017-2018 Gauteng Quality of Life Survey data. Distribution of sociodemographic variables and their 95% confidence intervals were computed. Weighted partial proportional odds models were used to investigate predictors of life satisfaction. Odds ratios and their 99% confidence intervals were computed for all predictors in the final model.

Results: A total of 24,889 respondents participated in the study, of whom 49.5% reported satisfaction with public health services, while 92.8% reported being in good/excellent health. Older respondents had significantly ($p<0.001$) higher odds of life satisfaction than their younger counterparts. There were increasing odds of life satisfaction with greater educational attainment. Household size and makeup were both significant ($p\leq0.002$) predictors of higher life satisfaction. Among respondents who were satisfied with public health services, the odds of life satisfaction were twice those of respondents without public health services ($p<0.001$). Similarly, respondents in good/excellent health had odds of life satisfaction twice as high as those reporting poor/very poor health ($p<0.001$). Compared to respondents from Johannesburg, those from Lesedi had significantly ($p<0.001$) higher odds of life satisfaction. Significant ($p\leq0.012$) non-proportional odds

were observed across other municipalities, with higher odds in Emfuleni and Midvaal, and lower odds in Ekurhuleni.

Conclusion: The study findings highlight the potential influence of socioeconomic, demographic and healthcare factors on life satisfaction in Gauteng province. The inequalities observed across municipalities suggest that jurisdiction-specific programs might be necessary to improve life satisfaction. Ongoing assessments following implementation of such programs are recommended.

4.2. Background

Life satisfaction is an important measure of individual well-being and has been proposed as an indicator of broader quality of life (QOL)[55,62]. There is a growing body of literature which identifies urban-rural differences as a key aspect of self-reported life satisfaction[216]. In the past quarter-century, South Africa has undergone a period of both rapid urbanization[65] and decreases in education and employment inequities across racial groups[13], yet high rates of poverty and health disparity persist[16]. This is particularly true in Gauteng[15], South Africa's most populous province[87], which is characterized by a network of urban areas, comprising 14.7 million inhabitants in 2018 [297]. To understand how QOL has changed with these environmental, socioeconomic, and demographic changes[65], ongoing assessments have been conducted through biennial surveys for the past decade. Unfortunately, there has been little published research that investigated levels of life satisfaction within Gauteng or how the improvements in education and employment equity have influenced overall life satisfaction within the province[66].

Although dependent upon self-reporting, there is evidence that life satisfaction is associated with more objectively measured QOL indicators[203], such as employment status[174–176], educational attainment[171–173], religious beliefs[206], housing and neighborhood environment[66,177,178], and healthcare access[53]. Moreover, studies have reported associations between self-reported overall life satisfaction and a wide range of health outcomes including all-cause mortality[54,57,58], multimorbidity[45], all-cause chronic disease[44], cardiovascular disease risk[184,185], breast disease risk factors[46], Parkinson's

Disease[48,49], and congenital heart disease[50]. Identification of disparities and predictors of life satisfaction would be helpful in guiding social service and health planning programs aimed at addressing these disparities to improve population health outcomes[175,203,208]. Therefore, the objective of this study was to investigate individual quality of life and demographic predictors of self-reported overall life satisfaction among residents of Gauteng province, South Africa.

4.3. Methods

4.3.1. Design, setting, and data source

This retrospective cross-sectional study used survey data consisting of responses from 24,889 participants from Gauteng province, South Africa, collected as part of the 2017-2018 Quality of Life Survey (QOLS-V)[298]. The data were obtained from DataFirst[285], the University of Cape Town's open data portal, and used under a Creative Commons CC-BY (Attribution-only) License.

4.3.2. Variable selection and data management

Potential predictors of overall life satisfaction were extracted from the QOLS-V instrument. Based on a conceptual model (Figure 3), 13 potential predictors of overall life satisfaction were considered for investigation: age, sex, birthplace, educational attainment, racial group, religious affiliation, household size, spouse living with respondent, have minor children living with respondent, self-reported health status, satisfaction with healthcare services, total monthly household income, and municipality.

Data management was performed in STATA Version 16.1 [286]. The outcome variable, overall life satisfaction, was re-coded from a 5-point scale (1=Very satisfied, 2=Satisfied, 3=Neither satisfied nor dissatisfied, 4=Dissatisfied, 5=Very dissatisfied) to a 3-point scale (1=Dissatisfied/Very dissatisfied, 2=Neither satisfied nor dissatisfied, 3=Satisfied/Very satisfied). Age was categorized into 4 groups (18-29, 30-44, 45-60, and 60+ years), while existing categorical variables for self-reported health status, satisfaction with healthcare services, religious affiliation, household size, and monthly household income were re-coded as shown in Table 6. Total monthly household income, in South African Rand, was re-coded with breakpoints which approximated the food poverty line for a median-size household (R531 [$40 USD] per person per month) [37], 60% of mean monthly income (R20,860 [$1,582 USD]), and 180% of mean monthly income[299].

4.3.3. Descriptive analysis

All statistical analyses were performed using STATA Version 16.1 [286]. To adjust for the complex survey design of the QOLS-V survey, all statistical analyses were performed in the **svyset** environment of STATA, specifying the survey weights variable (*weight*) to ensure representativeness of the study area population at the administrative ward level. Normality of participant age was assessed using the Jarque-Bera test, implemented in the STATA **jb** command. Given the large sample size, the more frequently used Shapiro-Wilk test of normality was not appropriate, whereas the Jarque-Bera test has been shown to have better power for large datasets[287]. However, Jarque-Bera is not supported in the complex survey weighting environment and therefore a modified Jarque-Bera skewness-

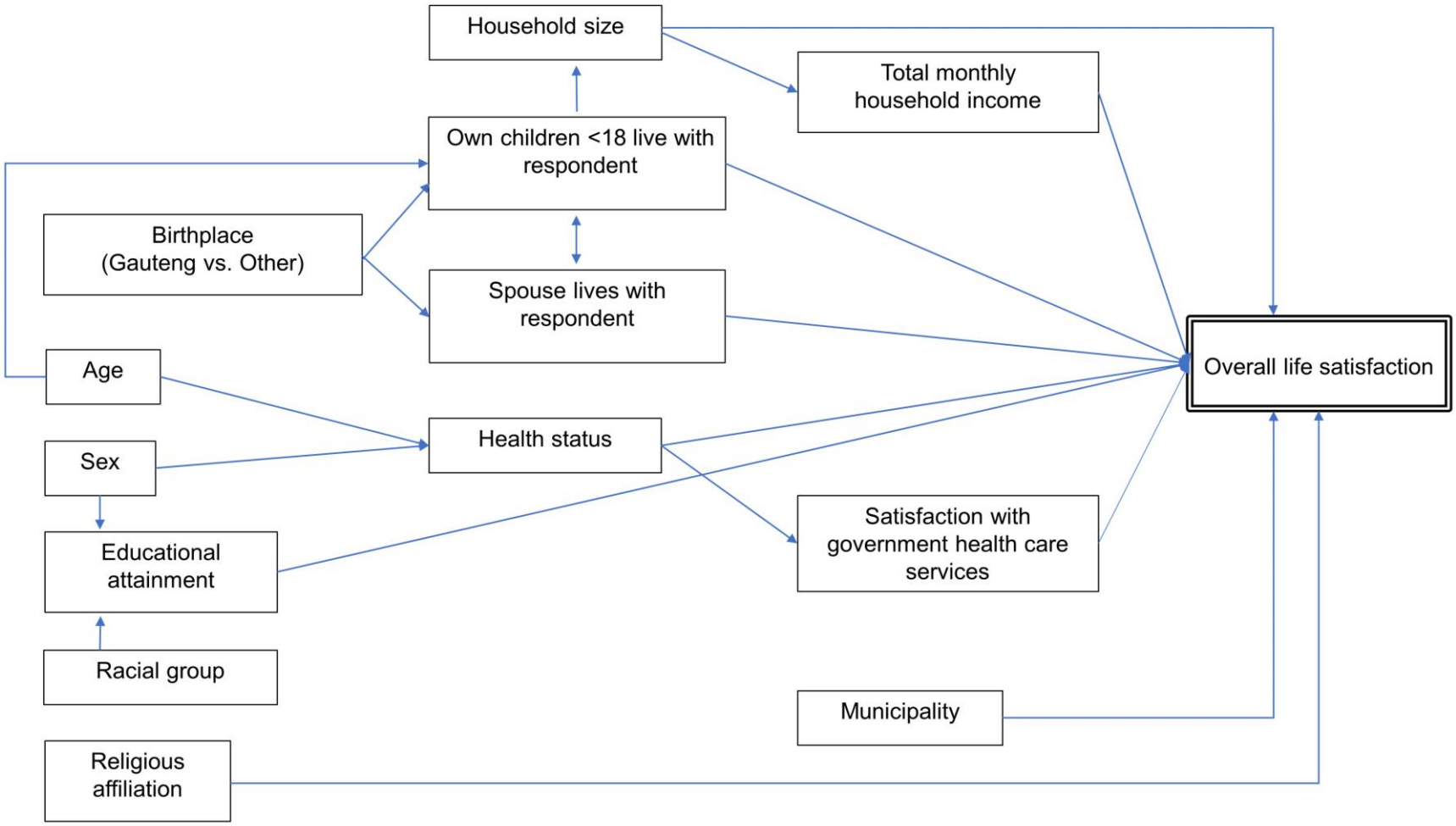

Figure 3. Conceptual Model of Potential Predictors of Life Satisfaction in Gauteng Province, South Africa, 2017-2018.

Table 6. Original and Re-coded Sociodemographic Variables Assessed as Predictors of Life Satisfaction in Gauteng Province, South Africa (2017-2018).

Original Variable		Re-coded Variable	
Age		**Age group**	
Age in years (continuous)		1	18-29
		2	30-44
		3	45-59
		4	60+
Religious affiliation		**Religious affiliation**	
1	None	1	None
2	African Traditional Religion	2	African Traditional Religion
3	Christian	3	Christian
4	Buddhist	4	Other
5	Hindu		
6	Jewish		
7	Muslim		
8	Sikh		
9	Other		
Satisfaction with public health services		**Satisfaction with public health services**	
6	There are none	0	There are none
5	Very dissatisfied	1	Dissatisfied/Very dissatisfied
4	Dissatisfied	2	Neither
3	Neither dissatisfied nor satisfied	3	Satisfied/Very satisfied
2	Satisfied		
1	Very satisfied		
Self-reported health status		**Self-reported health status**	
4	Very Poor	0	Poor/Very Poor
3	Poor	1	Good/Excellent
2	Good		
1	Excellent		
Monthly household income		**Monthly household income**	
1	R1 - R400	0	R0-R1,600 ($0-$121 USD)
2	R401 - R800	1	R1,601-R12,800 ($121-$971 USD)
3	R801 - R1,600	2	R12,801-R38,400 ($971-$2,913 USD)
4	R1,601 - R3,200	3	R38,401+ (≥$2,913 USD)
5	R3,201 - R6,400	4	Refused
6	R6,401 - R12,800		
7	R12,801 - R19,200		
8	R19,201 - R25,600		
9	R25,601 - R38,400		
10	R38,401 - R51,200		
11	R51,201 - R76,800		
12	R76,801 - R102,400		
13	R102,401 - R153,000		
14	R153,601 - R204,800		

Table 6 continued

Original Variable		Re-coded Variable	
15	R204,801 - R500,000		
16	More		
17	No Income		
18	Respondent refused		
Number of people living in household			
1	1	0	1 to 5
2	2	1	6 or more
3	3		
4	4		
5	5		
6	6		
7	7+		

kurtosis test, using the STATA **sktest** command, was also used[288]. Since the variable was non-normally distributed, median and interquartile range were used as the measures of central tendency and dispersion, respectively.

Distribution of the categorical sociodemographic variables and their 95% confidence intervals were computed. The variables assessed included: age group, sex, birthplace, educational attainment, racial group, religious affiliation, household size, spouse living with respondent, minor children living with respondent, self-reported health status, satisfaction with healthcare services, and total monthly household income.

4.3.4. Investigation of predictors of self-reported life satisfaction

A survey-weighted multivariable proportional odds (PO) model, built in two-steps, was used to investigate the predictors of overall life satisfaction. First, the STATA **svy: xi: ologit** command was used to investigate univariable associations between each potential predictor and the outcome, applying a relaxed alpha level of 0.10. Statistical significance was assessed using the adjusted Wald test. Potential predictor variables with $p \leq 0.10$ were considered for inclusion in the subsequent multivariable proportional odds model.

The second step involved building a multivariable proportional odds model using a manual backwards elimination process, sequentially removing variables which were not significant at an alpha level of 0.05 based on the Wald test. The coefficients of all variables were reviewed at each step for evidence of confounding. In situations where the

removal of a variable resulted in a change of 20% or more in the coefficients of any of the variables in the model, the removed variable was considered a confounder and retained in the model, regardless of its statistical significance. Biologically plausible two-way interaction terms were assessed for retention in the model, if significant.

The proportional odds assumption was assessed using the unweighted Brant test, implemented in the STATA **brant** command. Since the proportional odds assumption was not met, the PO model was determined to be inappropriate for the data. Consequently, the model was re-fit as a generalized ordinal model using the STATA **gsvy: xi: gologit2** command, employing the autofit option to fit a partial proportional odds (PPO) model[300]. Variables in the model were assessed with a more stringent cutoff of $p<0.01$ given the sample size and large number of predictors included in the model. Odds ratios (OR) and their 99% confidence intervals (CI) were computed for all variables retained in the final model.

4.3.5. Ethics approval

Approval for study conduct was granted by the University of Tennessee Institutional Review Board (IRB Number 21-06577-XM).

4.4. Results

4.4.1. Descriptive analysis

The study included a total of 24,889 survey respondents, of whom a small majority (50.6%) were male (Table 7). Age was non-normally distributed ($p<0.0001$) and respondents ranged from 18 to 105 years, with a median age of 38 (Interquartile range: 29, 50). Most respondents were Black African (78.7%) and more than half (56.1%) were born in the province. For educational attainment, the largest percentage (31.9%) matriculated from secondary school and more than a quarter (28.5%) reported higher than secondary school education. Approximately half (49.5%) of the respondents reported being satisfied or very satisfied with the public health services available to them. A relatively large percentage (12.1%) of respondents reported having no public health services available, yet nearly all participants (92.8%) reported their own health status as good or excellent.

The largest percentage of respondents (36.1%) reported income levels between R1,601 and R12,800 ($121-$971 USD) per month, which corresponds to a range from just above the poverty line for a household of 3 (the national median) to approximately 60% of the national mean monthly wage at the time the survey was conducted[299]. Household sizes ranged from 1 to 7 or more residents, with the largest percentage (22.7%) of respondents belonging to single-individual households and smaller percentages of respondents in each larger household category. More than a third (37.9%) of respondents had a spouse living with them, while 42.1% reported having minor children living in the household.

Table 7. Self-Reported Life Satisfaction and Sociodemographic Characteristics of Survey Respondents in Gauteng Province, South Africa (2017-2018).

	Characteristic	Weighted Frequency	Weighted Percent	Weighted 95% CI*
Individual Factors	**Life Satisfaction**			
	Dissatisfied/Very Dissatisfied	4,942	19.9	18.8, 21.0
	Neither Satisfied nor Dissatisfied	3,151	12.7	12.1, 13.3
	Satisfied/Very Satisfied	16,797	67.5	66.2, 68.8
	Sex			
	Male	12,585	50.6	49.7, 51.4
	Female	12,304	49.4	48.6, 50.3
	Age group			
	18-29	6,390	25.7	24.7, 26.7
	30-44	9,645	38.8	37.9, 39.6
	45-59	5,504	22.1	21.5, 22.8
	60+	3,350	13.5	12.7, 14.3
	Race group			
	Black African	19,574	78.7	75.9, 81.1
	Colored	830	3.3	2.5, 4.5
	Indian/Asian	658	2.6	2.0, 3.5
	White	3,652	14.7	12.7, 16.9
	Other	175	0.7	0.5, 0.9
	Birthplace			
	Gauteng	13,965	56.1	54.2, 58.1
	Another province within South Africa	8,799	35.4	33.7, 37.0
	Another country	2,125	8.5	7.8, 9.3
	Religious affiliation			
	None	3,418	13.7	13.2, 14.3
	African Traditional Religion	2,089	8.4	7.8, 9.1
	Christian	17,686	71.1	70.0, 72.1
	Other	1,696	6.8	6.0, 7.8
	Educational attainment			
	None	661	2.7	2.4, 3.0
	Primary only	2,109	8.5	7.9, 9.0
	Secondary incomplete	6,587	26.5	25.2, 27.7
	Matriculated Secondary	7,939	31.9	31.0, 32.8
	More than Secondary	7,102	28.5	26.5, 30.6
	Unspecified	492	2.0	1.8, 2.2
	Satisfaction with public health services			
	There are none	3,013	12.1	10.9, 13.5
	Dissatisfied/Very Dissatisfied	5,909	23.7	22.6, 25.0
	Neither Satisfied nor Dissatisfied	3,650	14.7	13.9, 15.5
	Satisfied/Very Satisfied	12,318	49.5	48.1, 50.9

Table 7 continued

	Characteristic	Weighted Frequency	Weighted Percent	Weighted 95% CI*
	Self-reported health status			
	Poor/Very Poor	1,796	7.2	6.8, 7.7
	Good/Excellent	23,093	92.8	92.3, 93.2
Household Factors	**Monthly household income**			
	R0-R1,600 ($0-$121 USD)	4,452	17.9	16.8, 19.0
	R1,601-R12,800 ($121-$971 USD)	8,991	36.1	34.8, 37.5
	R12,801-R38,400 ($971-$2,913 USD)	2,035	8.2	7.4, 9.0
	R38,401+ (≥$2,913 USD)	658	2.6	2.2, 3.1
	Refused	8,753	35.2	33.9, 36.5
	Family members in household			
	Spouse lives with respondent	9,443	37.9	36.9, 39.0
	Children live with respondent	10,472	42.1	41.1, 43.1
	Number of people living in household			
	1-5	21,853	87.8	87.0, 88.6
	≥6	3,036	12.2	11.5, 13.0
	Municipality of Residence			
	City of Johannesburg	9,119	36.6	31.9, 41.6
	City of Tshwane	5,995	24.1	20.2, 28.5
	Ekurhuleni	6,456	25.9	21.9, 30.4
	Emfuleni	1,326	5.3	3.9, 7.2
	Lesedi	203	0.8	0.5, 1.4
	Merafong City	355	1.4	1.0, 2.1
	Midvaal	211	0.8	0.5, 1.4
	Mogale City	728	2.9	2.1, 4.1
	Rand West	497	2.0	1.4, 2.8

* CI = confidence interval

Residents of 3 municipalities accounted for 86.6% of the study respondents. These included the City of Johannesburg (36.6%), Ekurhuleni (25.9%), and the City of Tshwane (24.1%), while the remaining municipalities represented 13.4% of the respondents (Table 7).

4.4.2. Predictors of self-reported life satisfaction

Based on the proportional odds (PO) models, all variables assessed had significant ($p<0.10$) univariable associations with the outcome (Table 8). All but one of these predictors (religious affiliation) also had significant ($p<0.05$) adjusted associations with overall life satisfaction in the final multivariable PO model (Table 9). However, the PO model did not meet the proportional odds assumption ($p<0.0001$) indicating that it was not appropriate for the data and hence partial proportional odds (PPO) models were used.

The final PPO model included a total of twelve main effects and one interaction term (Table 10). Many (7/13) of the predictors met the proportional odds assumption. However, evidence of non-proportional odds was observed for the following six predictors: race group, birthplace, satisfaction with public health services, self-reported health status, monthly household income, and municipality.

Table 8. Univariable Associations Between Life Satisfaction and Sociodemographic Factors among Respondents in Gauteng Province, South Africa (2017-2018).

Variable	Odds Ratio	95% Confidence Interval Lower limit	Upper limit	p-value
Sex				0.281
Female	1.03	0.97	1.10	0.281
Male	Referent			
Age group				<0.001
60+	1.76	1.57	1.97	<0.001
45-59	1.24	1.13	1.36	<0.001
30-44	1.06	0.98	1.14	0.129
18-29	Referent			
Race Group				<0.001
Colored	1.67	1.39	2.01	<0.001
Indian/Asian	3.28	2.38	4.52	<0.001
White	4.46	3.87	5.14	<0.001
Other	1.14	0.68	1.90	0.617
Black African	Referent			
Birthplace				<0.001
Another country	1.21	1.05	1.38	0.006
Gauteng province	1.34	1.24	1.44	<0.001
Another S. African province	Referent			
Religious affiliation				<0.001
Christian	1.29	1.14	1.47	<0.001
None	1.13	0.96	1.32	0.138
Other	1.92	1.58	2.32	<0.001
African Traditional Religion	Referent			
Educational attainment				<0.001
No Education	0.78	0.64	0.95	0.014
Primary only	0.91	0.81	1.02	0.095
Secondary incomplete	0.83	0.77	0.90	<0.001
More than secondary	1.99	1.82	2.18	<0.001
Unspecified	1.42	1.14	1.79	0.002
Secondary matriculation	Referent			
Satisfaction with public health services				<0.001
Dissatisfied/Very dissatisfied	1.01	0.88	1.16	0.907
Neither satisfied nor dissatisfied	1.76	1.52	2.03	<0.001
Satisfied/Very satisfied	2.10	1.84	2.39	<0.001
There are none where I live	Referent			
Self-reported health status				<0.001
Good/Excellent	1.96	1.77	2.18	<0.001
Poor/Very poor	Referent			

Table 8 continued

Variable	Odds Ratio	95% Confidence Interval Lower limit	Upper limit	p-value
Monthly household income				<0.001
Refused	2.31	2.09	2.54	<0.001
R38,401+ (≥$2,913 USD)	7.56	5.51	10.36	<0.001
R12,801-R38,400 ($971-$2,913 USD)	4.06	3.50	4.71	<0.001
R1,601-R12,800 ($121-$971 USD)	1.49	1.36	1.62	<0.001
R0-R1,600 ($0-$121 USD)	Referent			
Number of people in household				<0.001
1-5	1.48	1.35	1.63	<0.001
≥6	Referent			
Spouse lives with respondent				<0.001
Yes	1.48	1.39	1.58	<0.001
No	Referent			
Children live with respondent				0.002
Yes	0.91	0.86	0.97	0.002
No	Referent			
Municipality				0.003
City of Tshwane	0.89	0.76	1.05	0.168
Ekurhuleni	0.89	0.76	1.04	0.151
Emfuleni	1.00	0.82	1.22	0.991
Lesedi	1.59	1.13	2.22	0.008
Merafong City	0.84	0.68	1.05	0.129
Midvaal	1.56	1.12	2.19	0.009
Mogale City	1.07	0.86	1.34	0.533
Rand West	0.97	0.79	1.19	0.735
City of Johannesburg	Referent			

Table 9. Results of the Proportional Odds Model Used to Investigate Predictors of Life Satisfaction among Survey Respondents in Gauteng Province, South Africa (2017-2018).

Variable	Odds Ratio	95% Confidence Interval Lower limit	Upper limit	p-value
Sex				0.195
Female	1.07	0.97	1.18	0.195
Male	Referent			
Age group				<0.001
60+	1.81	1.58	2.07	<0.001
45-59	1.13	1.02	1.25	0.022
30-44	0.93	0.86	1.01	0.074
18-29	Referent			
Race Group				<0.001
Colored	1.32	1.11	1.56	0.002
Indian/Asian	2.01	1.46	2.78	<0.001
White	2.44	2.12	2.82	<0.001
Other	1.02	0.60	1.74	0.941
Black African	Referent			
Birthplace				0.004
Another country	1.14	0.99	1.31	0.068
Gauteng province	1.12	1.05	1.20	0.001
Another S. African province	Referent			
Educational attainment				<0.001
No Education	0.79	0.60	1.04	0.098
Primary only	0.77	0.65	0.92	0.004
Secondary incomplete	0.90	0.81	1.01	0.088
More than secondary	1.27	1.12	1.44	<0.001
Unspecified	0.89	0.66	1.20	0.444
Secondary matriculation	Referent			
Satisfaction with public health services				<0.001
Dissatisfied/Very dissatisfied	1.08	0.96	1.23	0.207
Neither satisfied nor dissatisfied	1.36	1.18	1.56	<0.001
Satisfied/Very satisfied	1.91	1.69	2.15	<0.001
There are none where I live	Referent			
Self-reported health status				<0.001
Good/Excellent	2.09	1.86	2.36	<0.001
Poor/Very poor	Referent			
Monthly household income				<0.001
Refused	1.64	1.49	1.81	<0.001
R38,401+ (≥$2,913 USD)	3.50	2.55	4.81	<0.001

Table 9 continued

Variable	Odds Ratio	95% Confidence Interval Lower limit	Upper limit	p-value
R12,801-R38,400 ($971-$2,913 USD)	2.40	2.05	2.80	<0.001
R1,601-R12,800 ($121-$971 USD)	1.34	1.23	1.47	<0.001
R0-R1,600 ($0-$121 USD)	Referent			
Number of people in household				<0.001
1-5	1.26	1.14	1.38	<0.001
≥6	Referent			
Spouse lives with respondent				<0.001
Yes	1.26	1.18	1.35	<0.001
No	Referent			
Children live with respondent				0.001
Yes	0.89	0.83	0.96	0.001
No	Referent			
Municipality				<0.001
City of Tshwane	0.96	0.86	1.08	0.517
Ekurhuleni	0.95	0.85	1.06	0.363
Emfuleni	1.12	0.98	1.29	0.102
Lesedi	1.65	1.29	2.11	<0.001
Merafong City	0.95	0.80	1.12	0.525
Midvaal	1.33	1.03	1.71	0.026
Mogale City	1.12	0.96	1.30	0.164
Rand West	1.01	0.86	1.18	0.924
City of Johannesburg	Referent			
Sex*Educational Attainment				<0.001
Female * No Education	1.08	0.78	1.51	0.630
Female * Primary Education Only	1.47	1.18	1.83	0.001
Female * Secondary Incomplete	1.03	0.89	1.21	0.665
Female * More Than Secondary	1.01	0.85	1.20	0.915
Female * Unspecified	1.55	1.01	2.39	0.046
Male * Secondary matriculation	Referent			

Table 10. Results of the Final Partial Proportional Odds Model Used to Investigate Predictors of Life Satisfaction among Survey Respondents in Gauteng Province, South Africa (2017-2018).

	Dissatisfied or Very Dissatisfied				Neither Satisfied nor Dissatisfied			
		99% Confidence Interval				99% Confidence Interval		
Variable	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**
Sex				0.199				0.199
Female	1.07	0.94	1.22	0.199	1.07	0.94	1.22	0.199
Male	Referent				Referent			
Age group				<0.001				<0.001
60+	1.79	1.50	2.13	<0.001	1.79	1.50	2.13	<0.001
45-59	1.13	0.99	1.29	0.020	1.13	0.99	1.29	0.020
30-44	0.93	0.84	1.03	0.078	0.93	0.84	1.03	0.078
18-29	Referent				Referent			
Race Group				<0.001				<0.001
Colored	1.32	1.05	1.65	0.002	1.32	1.05	1.65	0.002
Indian/Asian	2.04	1.33	3.13	<0.001	2.04	1.33	3.13	<0.001
White	**3.35**	2.52	4.45	<0.001	**2.42**	1.99	2.94	<0.001
Other	1.02	0.51	2.06	0.944	1.02	0.51	2.06	0.944
Black African	Referent				Referent			
Birthplace				<0.001				<0.001
Another country	1.13	0.95	1.36	0.073	1.13	0.95	1.36	0.073
Gauteng province	**1.18**	1.07	1.31	<0.001	**1.10**	1.00	1.20	0.012
Another province	Referent				Referent			
Educational attainment				<0.001				<0.001
No Education	0.79	0.56	1.13	0.094	0.79	0.56	1.13	0.094
Primary only	0.77	0.61	0.97	0.003	0.77	0.61	0.97	0.003
Secondary incomplete	0.90	0.78	1.05	0.076	0.90	0.78	1.05	0.076
More than secondary	1.28	1.09	1.51	<0.001	1.28	1.09	1.51	<0.001

Table 10 continued

	Dissatisfied or Very Dissatisfied				Neither Satisfied nor Dissatisfied			
		99% Confidence Interval				99% Confidence Interval		
Variable	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**
Unspecified	0.90	0.61	1.33	0.478	0.90	0.61	1.33	0.478
Secondary matriculation	Referent				Referent			
Satisfaction with public health services				<0.001				<0.001
Dissatisfied/Very dissatisfied	1.07	0.92	1.26	0.249	1.07	0.92	1.26	0.249
Neither satisfied nor dissatisfied	**1.95**	1.59	2.38	<0.001	**1.19**	0.99	1.44	0.017
Satisfied/Very satisfied	**2.01**	1.71	2.35	<0.001	**1.82**	1.55	2.14	<0.001
There are none where I live	Referent				Referent			
Self-reported health status				<0.001				<0.001
Good/Excellent	**2.25**	1.90	2.66	<0.001	**1.97**	1.68	2.32	<0.001
Poor/Very poor	Referent				Referent			
Monthly household income				<0.001				<0.001
Refused	**1.89**	1.643	2.18	<0.001	**1.55**	1.37	1.76	<0.001
R38,401+ (≥$2,913 USD)	3.44	2.27	5.22	<0.001	3.44	2.27	5.22	<0.001
R12,801-R38,400 ($971-$2,913 USD)	2.35	1.91	2.87	<0.001	2.35	1.91	2.87	<0.001
R1,601-R12,800 ($121-$971 USD)	1.33	1.18	1.49	<0.001	1.33	1.18	1.49	<0.001
R0-R1,600 ($0-$121 USD)	Referent				Referent			
Number of people in household				<0.001				<0.001
1-5	1.26	1.011	1.43	<0.001	1.256	1.11	1.43	<0.001
≥6	Referent				Referent			

Table 10 continued

	Dissatisfied or Very Dissatisfied				Neither Satisfied nor Dissatisfied			
		99% Confidence Interval				99% Confidence Interval		
Variable	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**	**Odds Ratio***	**Lower limit**	**Upper limit**	**p-value**
Spouse lives with respondent				<0.001				<0.001
Yes	1.26	1.15	1.38	<0.001	1.26	1.15	1.38	<0.001
No	Referent				Referent			
Children live with respondent				0.002				0.002
Yes	0.90	0.82	0.98	0.002	0.90	0.82	0.98	0.002
No	Referent				Referent			
Municipality				<0.001				<0.001
City of Tshwane	0.96	0.83	1.12	0.508	0.96	0.83	1.12	0.508
Ekurhuleni	**0.86**	0.74	1.00	0.012	**0.99**	0.86	1.14	0.796
Emfuleni	**1.29**	1.05	1.59	0.001	**1.07**	0.88	1.32	0.367
Lesedi	1.65	1.20	2.28	<0.001	1.65	1.20	2.28	<0.001
Merafong City	0.94	0.76	1.17	0.493	0.94	0.76	1.17	0.493
Midvaal	**1.10**	0.80	1.51	0.429	**1.38**	0.99	1.93	0.012
Mogale City	1.11	0.91	1.36	0.177	1.11	0.91	1.36	0.177
Rand West	1.01	0.82	1.24	0.929	1.01	0.82	1.24	0.929
City of Johannesburg	Referent				Referent			
Sex*Educational Attainment				<0.001				<0.001
Female * No Education	1.08	0.71	1.66	0.631	1.08	0.71	1.66	0.631
Female * Primary only	1.46	1.10	1.94	0.001	1.46	1.10	1.94	0.001
Female * Secondary incomplete	1.03	0.85	1.27	0.662	1.03	0.85	1.27	0.662
Female * More	1.01	0.80	1.26	0.954	1.01	0.80	1.26	0.954
Female * Unspecified	1.54	0.87	2.71	0.051	1.54	0.87	2.71	0.051
Male * Secondary Matriculation	Referent				Referent			

* Non-proportional odds marked in bold.

4.4.3. Predictors with proportional odds

Age group was a significant ($p<0.001$) predictor of life satisfaction, with increasing odds of life satisfaction above Dissatisfied/Very dissatisfied being observed as age increased. Whereas adults aged 30-44 years had lower odds (OR=0.93, $p=0.078$) of reporting greater life satisfaction compared to young adults aged 18-29, adults aged 45-59 had higher odds (OR=1.13, $p=0.020$). The oldest group, adults ≥60 years, had odds of reporting higher levels of life satisfaction nearly twice that of the young adults (OR=1.79, $p<0.001$).

Overall life satisfaction was significantly ($p<0.001$) associated with educational attainment and showed a pattern of increasing odds of life satisfaction with increasing levels of education. Compared to respondents who had completed secondary education, those with lower levels of educational attainment had lower odds of life satisfaction above Dissatisfied, ranging from an OR of 0.77 for those with only primary education ($p=0.003$), to an OR of 0.90 for those with incomplete secondary education ($p=0.076$). Only respondents with educational attainment beyond secondary school had higher odds of greater life satisfaction (OR=1.28, $p<0.001$).

Household size and makeup were both significant predictors of higher levels of life satisfaction. Households with 1-5 household members had higher odds (OR=1.26, $p<0.001$) of greater life satisfaction compared to those with ≥6 members. Interestingly, the specific nature of the relationships within the household also made a difference. While respondents whose spouse lived with them had greater odds (OR=1.26, $p<0.001$) of being in a higher category of life satisfaction than those without a spouse living with them, respondents whose minor children lived with them had significantly lower odds (OR 0.90, $p=0.002$) of life satisfaction than those

without children in the household. However, the association was moderated by income with greater life satisfaction reported only by respondents in the highest income category and who had children in the household (Figure 4).

One interaction term, Sex*Educational attainment, was significant ($p<0.001$) in the final PPO model. Compared to males of equivalent educational attainment, females at every educational level had greater odds of reporting a higher category of life satisfaction. The difference was most pronounced among those with only a primary education (OR=1.46, p=0.001) (Table 10).

4.4.4. Predictors with non-proportional odds

A total of six significant predictors in the final PPO model did not meet the proportional odds assumption: race group, birthplace, satisfaction with public health services, self-reported health status, monthly household income, and municipality. The non-proportional odds ratios are herein reported as OR_1, representing the odds ratio for Grouping Level 1 (Dissatisfied/Very dissatisfied vs. Neither satisfied nor dissatisfied or Satisfied/Very satisfied), and OR_2, which is the odds ratio for Grouping Level 2 (Dissatisfied/Very dissatisfied or Neither satisfied nor dissatisfied vs. Satisfied/Very satisfied).

Racial group and birthplace were significant ($p<0.001$) predictors of life satisfaction. In comparison to Black Africans, respondents of other racial categories had higher odds of life satisfaction above Dissatisfied. These ranged from 32% higher odds for Colored respondents (proportional OR=1.32, p=0.002) to odds more than 3 times higher for White respondents (OR_1=3.35, $p<0.001$; OR_2=2.42, $p<0.001$). Compared to respondents born in other South African

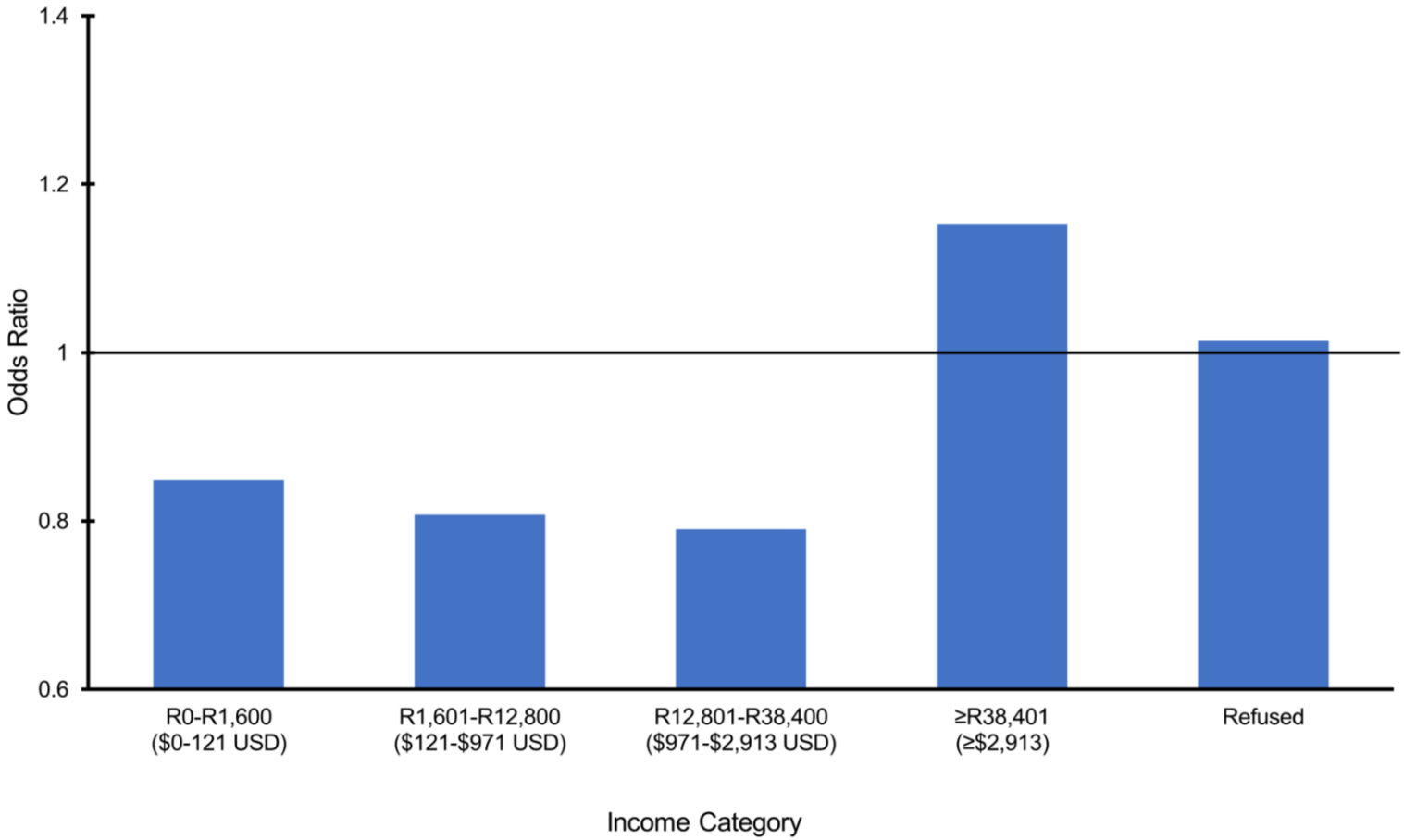

Figure 4. Odds Ratios for Positive Life Satisfaction Among Respondents (With vs. Without Children) by Income Category in Gauteng Province, South Africa (2017-2018).

provinces, those born in Gauteng province had higher odds of reporting higher levels of life satisfaction (OR_1=1.18, p<0.001; OR_2=1.10, p=0.012).

Satisfaction with public health services and personal health status were also significant (p<0.001) predictors of overall life satisfaction, but showed variation by grouping level. The odds for respondents who were dissatisfied with the public health services were not significantly different from those of respondents for whom no services were available (proportional OR=1.07, p=0.249). However, in comparison to those respondents without any public health services available, respondents who were neither satisfied nor dissatisfied with the public health services had significantly higher odds of reporting higher levels of overall life satisfaction (OR_1=1.95, p<0.001; OR_2=1.19, p=0.017). Respondents who reported being satisfied with the public health services had odds of greater life satisfaction approximately twice as high as those without public health services available (OR_1=2.01, p<0.001; OR_2=1.82, p<0.001). Similarly, respondents with good or excellent self-reported health status had odds of life satisfaction twice as high as those reporting poor or very poor health (OR_1=2.25, p<0.001; OR_2=1.97, p<0.001).

Monthly household income was a highly significant (p<0.001) predictor of life satisfaction, with progressively higher odds of reporting life satisfaction above Dissatisfied at each higher income category. Relative to the baseline category of being below the poverty line (R0-R1,600 [$0-$121 USD]), respondents reporting monthly household income of R1,601-R12,800 ($121-$971 USD) had 33% higher odds of greater life satisfaction (OR=1.33, p<0.001), while respondents with income of R12,801-R38,400 ($971-$2,913 USD) had more than 2 times higher odds than those of the base category (OR=2.35, p<0.001). Respondents in the highest income category

(R38,401+ [≥$2,913 USD]) had nearly 3.5 times higher odds than those in the base category (OR=3.44, $p<0.001$). While the specified income ranges demonstrated no variation in odds across grouping levels, the odds for respondents who refused to provide a household income level differed significantly by grouping level. At both grouping levels, the respondents who refused were much more likely to report higher levels of life satisfaction (OR_1=1.89, $p<0.001$; OR_2=1.55, $p<0.001$) than respondents in the base category.

Location of residence played a varying role in reported life satisfaction. Although there were no significant associations between life satisfaction and location of residence for many of the municipalities, overall, the variable was highly significant ($p<0.001$). In comparison to respondents from the City of Johannesburg, only those from Lesedi had significantly higher odds (OR=1.65, $p<0.001$) of life satisfaction above Dissatisfied (Table 10). Non-proportional but statistically significant odds were observed for residents of Ekurhuleni (OR_1=0.86, p=0.012; OR_2=0.99, p=0.796), Emfuleni (OR_1=1.29, p=0.001; OR_2=1.07, p=0.367) and Midvaal (OR_1=1.10, p=0.429; OR_2=1.38, p=0.012) municipalities. Among variables that did not meet the proportional odds assumption, all except municipality had OR_1 that were greater than OR_2. A revised conceptual model showing only predictors that were significant in the final PPO model is shown in Figure 5.

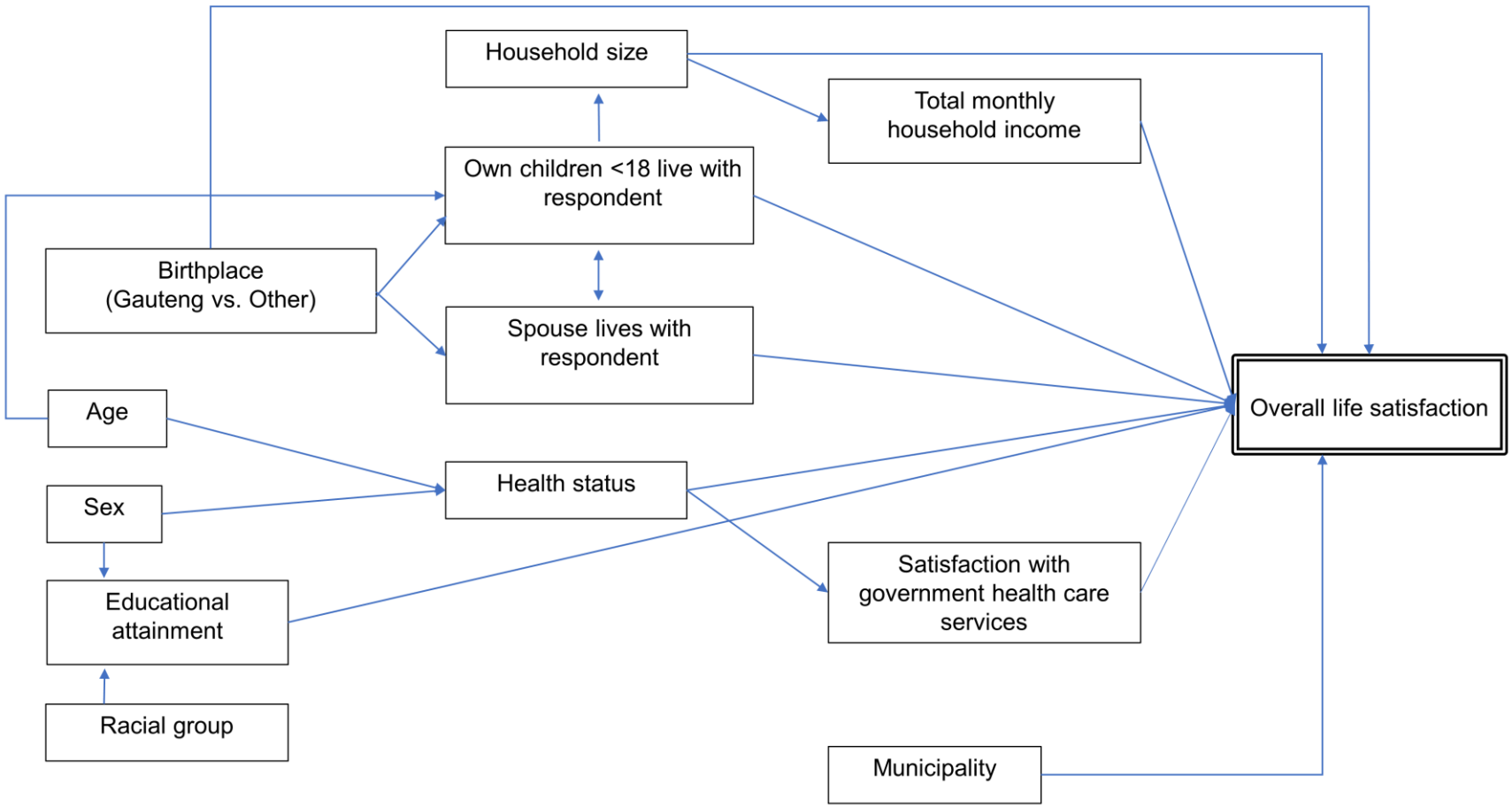

Figure 5. Revised Conceptual Model of Predictors of Life Satisfaction in Gauteng Province, South Africa (2017-2018).

4.5. Discussion

The objective of this study was to describe overall life satisfaction and identify its socioeconomic and demographic predictors among residents of Gauteng province, South Africa. Multiple factors have been shown to play a role in individuals' sense of overall life satisfaction[55,63,216,23755,63,64,237], including a wide variety of sociodemographic factors, personal beliefs, and cultural values[175]. Most of the significant predictors of life satisfaction identified in this study demonstrated consistent patterns of increasing odds of higher levels of life satisfaction with higher income, education, and health, but smaller household sizes. These findings are consistent with those from other studies conducted in South Africa[66,93,224,301,302] as well as other countries[64,175,196,260], and hold implications for policy adaptation[303].

4.5.1. Predictors with proportional odds

The highest odds of life satisfaction observed among individuals ≥60 years old is partially consistent with the widely reported U-shaped relationship between age and life satisfaction for adults between 20-60 years[163,201,304]. The higher levels of self-reported life satisfaction in the youngest and oldest age categories are moderated by income[163,304], social support[254], health status[163], leisure time[237,270], and cultural differences[62,175,201]. Contrary to the findings of this study, a study in Johannesburg, South Africa, reported that age was not significantly associated with life satisfaction[236], however, the study was limited in scale and enrolled only middle-class urban residents.

Contrary to the findings from previous studies in South Africa which reported no association between educational attainment and life satisfaction[93,224,236,302], this study found that higher odds of life satisfaction were associated with higher levels of education. In South Africa, inequities in educational attainment increased in the decade immediately following the end of apartheid, during which most of the South African studies mentioned above were conducted, before decreasing over the subsequent decade[15]. Thus, the disparity between our findings and those from previous studies in South Africa with regard to both percentage of respondents with a post-secondary education and the significant association with life satisfaction suggests that more recent gains in educational attainment have improved the satisfaction of Gauteng residents. Evidence suggests that the relationship between education and life satisfaction is mixed and may vary by geographic location. For instance, while the findings of some studies conducted in both Europe and the United States are consistent with those of the current study and reported highly significant associations between education and life satisfaction[171,203,204,247,261], others have reported no association[237].

Close family support, in terms of living arrangement with spouse and children as well as the number of people living in the household, presents a complicated picture. In this study, respondents who lived with their spouses reported higher odds of greater life satisfaction than those who did not live with a spouse, which is consistent with the findings of a study in South Africa's Eastern Cape province which reported marital status to be a significant positive predictor of well-being[302]. Likewise, a study of the quality of

life among adults aged 50 and older across South Africa reported a significant positive association with marital status, with unmarried individuals reporting lower levels of well-being than their married counterparts[271]. Studies conducted in other countries have also consistently identified marital status as a positive contributor to life satisfaction[165,171,200,204,246,256].

Conversely, respondents whose minor children lived with them had significantly lower odds of life satisfaction than those without children in the household, consistent with reports from a multi-country study by Cetre et al[247]. Cetre and co-authors also reported that the association between life satisfaction and living with minor children in the household was strongly moderated by national income level and average number of children[247]. This may be due to the relative decrease in per-capita income which occurs as the number of household residents increase or the additional responsibilities and costs which occur when the household includes minor children[261]. Quality of life survey data from Gauteng province reported that in 2018 more than 20% of respondents did not have sufficient income to feed their children during the previous year[305]. This suggests that economic concerns might explain the lower levels of life satisfaction reported among parents living with minor children. While much of the existing literature has reported negative associations between life satisfaction and having children in the household[240,306–308], studies also report that the association of having children with self-reported well-being is moderated by other socioeconomic and demographic factors including sex[309], marital status[309], age at parenthood[247], income level[247], working hours[246], and age and

number of children[246]. Likewise, decreases in leisure time associated with parenting have been reported to significantly influence life satisfaction[237]. However, a longitudinal study in South Africa identified leisure as having only a small but significant association with overall life satisfaction[66]. Large-scale social surveys conducted in Europe have reported positive associations between life satisfaction of parents and both the level of socio-economic development[310] and national policies regarding child care provision or other family benefits[261]. Thus, the availability of family-friendly policies may facilitate employment opportunities and decrease the financial pressures associated with parenting, with consequent improvement in life satisfaction among parents.

4.5.2. Predictors with non-proportional odds

Race was an important predictor in the final PPO model, which is consistent with the reports of a study of pre-apartheid life satisfaction in Durban[311]. A follow-up study conducted nationwide in the years immediately following the democratic transition reported a narrowing of the gap in satisfaction between racial groups[312], while another post-apartheid assessment among middle-class residents of Johannesburg reported that race was not a significant predictor of life satisfaction[236]. It would be expected that the democratic transition in South Africa would result in reduction in inequalities experienced by different race groups[65]. Yet a study of poverty and inequality within Gauteng province reported that the drivers of economic inequality have been increasingly influenced by within-race group differences rather than across-group differences[15]. Taken together, these reports suggest that factors reflecting structural inequality such as access

to education, increases in income, or improvements in living conditions may play important moderating roles in the reported association between race and life satisfaction.

The observed association between life satisfaction and birthplace is consistent with findings of a study of internal migrants in South Africa which reported that migration from a rural to urban area was associated with a decrease in life satisfaction of more than 8% [226]. The 2018 Edition of the World Happiness Report indicated that migrants are less satisfied than the native-born in most geographic areas[214]. This is despite the emigration of most migrants to generally more prosperous nations with higher rankings for individual happiness. The lower life satisfaction reported by migrants appears to be at least partially explained by the loss of social support[214,226,313].

In the present study, good or excellent self-reported health status was an important predictor of greater life satisfaction. This is consistent with findings from other studies conducted in South Africa, which have reported that health status was significantly associated with life satisfaction[66,302] and health-related quality of life[93]. Having good health in old age may be an important component of the significant association observed between older age and life satisfaction. Indeed, in a study conducted solely among older South Africans, health status was a significant predictor of happiness[224]. Similar findings have been reported across the world, with association between health and life satisfaction identified across a diverse range of countries and healthcare systems including Chile[238], China[202], Finland[199], Italy[190], Poland[199], Australia[314], Spain[199,254], and the United States[200].

Self-reported health status has been previously associated with healthcare access, particularly among older adults[315]. The significant association between public health services and life satisfaction identified in the present study is consistent with findings of a study in Canada which reported that community supports and availability of healthcare services were significantly associated with life satisfaction[220]. Furthermore, a multi-city quality of life survey across Europe and North America reported that the public services including healthcare access were strongly predictive of the life satisfaction of residents, especially for older adults[316]. Considering the large percentage of survey respondents in the present study who reported not having access to any public health services, increasing access to public health services provides a potential path for improvement of health outcomes and life satisfaction across Gauteng province.

Total monthly household income had the strongest association with overall life satisfaction, in agreement with findings of a study which reported income as the primary determinant of self-reported quality of life in a peri-urban South African community[93]. Similarly, a study in a community of Eastern Cape province reported that income level was significantly associated with well-being[302]. Meta-analyses conducted across diverse settings have shown income level to be a highly significant predictor of life satisfaction[64,173,260,317]. However, the relationship has been reported by many researchers to be moderated by several factors including the availability of leisure time[237,270], parenting status[246], and personality and personal aspirations[196], among others.

4.5.3. Strengths and limitations

This study represents a novel use of prospectively collected quality of life data to identify socioeconomic and demographic predictors of overall life satisfaction. An important strength of the study is its representativeness at a sub-provincial level, which provides information useful in local planning. The principal limitation of this study was the inability to conduct thorough model assessment due to the lack of diagnostic procedures available for assessment of weighted proportional odds models. Generalized ordinal model diagnostics are not well developed at present and their performance within a complex survey environment presented further challenges to goodness-of-fit assessment. Despite this limitation, appropriate model development was ensured through use of a conceptual diagram and the identification of non-proportional odds to provide improved model fit. The PPO model used in the study provides great specificity across predictor levels, improving confidence in model estimates. The results of the present study provide important insight into modifiable predictors that may be targeted to improve the life satisfaction of residents of Gauteng province.

4.6. Conclusion

This study identified a number of significant predictors of life satisfaction among residents of Gauteng province, South Africa. The findings highlight the importance of income, social support, and health in determining life satisfaction. The potential influence of public policy changes to decrease financial challenges and health access barriers faced by residents of the province should be considered to help improve life satisfaction. The

variability noted across municipalities indicates that specifically targeted public policy initiatives or private sector projects addressing availability of public health services, educational improvement, childcare, or income parity may also improve life satisfaction. Ongoing assessments of life satisfaction in response to such changes is recommended.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Good health across the life course is a key element of individual well-being. One important measure of well-being, overall self-reported life satisfaction (SRLS), is associated with a wide range of specific health outcomes[43–45,47–50,52,172,183–185,190,303]. The health and SRLS relationship is known to be moderated by many demographic and socioeconomic factors[53,172,198,201–204,206] and has also been shown to vary geographically[53,205]. Evidence of the association between disparities in health outcomes and healthcare service utilization[1,4,8 28,34,84,92,157], especially across rural and urban areas[31,42,311], highlights the need to investigate these further. Unfortunately, very few studies have been conducted to assess the associations between structural healthcare limitations and socioeconomic barriers in South Africa[21,42,112].

Although South Africa guarantees its citizens the right to access healthcare[18], disparities in the accessibility and utilization of such services remain[11,29,33]. Increases in healthcare availability and utilization may have a significant impact on health outcomes[7–9,67] as well as overall life satisfaction[318,319]. Therefore, the present work sought to identify predictors of public healthcare service utilization and higher life satisfaction in South Africa. Identification of factors associated with healthcare utilization may guide intervention strategies designed to improve public healthcare uptake, life expectancy, and overall SRLS.

This study found that nearly three-quarters of households reported using a public facility as their primary healthcare site, which is consistent with the reports from previous South

African studies[11,22,28,42,92,144]. The percentage of households reporting travel times <30 minutes to the primary healthcare site was also consistent with recent reports[113,159,289]. This reflects an increase in urbanization[65] and hence in the population living within 30 minutes of a healthcare facility compared to preceding years[290,291]. The ongoing expansion of primary care sites as part of South Africa's National Development Plan[83] is expected to continue to improve accessibility[82,83] by further reducing travel time to public facilities. Furthermore, the planned rollout of National Health Insurance (NHI)[19,292] is intended to increase public healthcare utilization rates across socioeconomic strata and result in improved health outcomes[92,104,109,110,133].

This study confirmed several predictors of household utilization of public healthcare that had been identified by previous studies. These included: female household head[144,157], households headed by non-White individuals[144], lower educational attainment of household head[84], lower household income[28,42,92], household head unemployment[28,42,92], rural residence[34], and travel time to healthcare facility[31]. Other sociodemographic factors identified in this study as predictors of public healthcare utilization but not previously reported in the literature on South Africa included lower age of household head and larger household size.

The presence of chronic conditions among household members was also an important predictor of public healthcare utilization. Although more frequent utilization of healthcare among individuals with chronic conditions is well documented in several

countries[56], the relationship between chronic conditions and public healthcare utilization specifically has been identified in very few previous studies[114,157]. However, the identification of such an association presents a somewhat complicated picture, as the directionality of the relationship is unclear. For instance, users of the public healthcare system may represent a population at greater risk of developing chronic conditions due to lower quality of care, socioeconomic status, educational attainment, or other influences. On the other hand, the presence of chronic diseases in a household may affect the choice of healthcare because of economic, transport, or other accessibility considerations. Either causal relationship may be envisioned. Nevertheless, the identified relationship provides an important area of focus regarding service provision. The findings highlight the value of integrating healthcare services in order to reduce time and cost barriers, particularly with regard to women's health services, HIV/AIDS care, TB treatment, and regular follow-up care for other chronic conditions such as diabetes and cardiovascular disease. Such health service integration has been shown to improve care coordination and treatment compliance[320], potentially reducing expenditures within South Africa's incipient universal healthcare system.

This study also demonstrated the important role of healthcare access as a predictor of higher life satisfaction among residents of Gauteng province, South Africa. Significant predictors of life satisfaction identified in this study were similar to those previously shown to be associated with individual SRLS[55,63,64,190,199,200,202,237,238,254,314]. The study identified increasing odds of higher SRLS with higher income, education, and self-

reported health status, as well as with smaller household sizes. These findings are consistent with those of studies conducted in both South Africa[66,93,224,301,302] and other countries[64,175,196,260] and hold important policy implications, particularly with regard to education and income parity initiatives. Furthermore, the finding of a significant association between public health services and life satisfaction is in line with those of studies conducted elsewhere which have reported that availability of healthcare and other public services are strongly predictive of the life satisfaction of residents, especially for older adults[220,316]. Thus, while the large percentage of survey respondents who reported lack of access to public health services in this study is a serious concern, it also provides a clear path for improvement of health outcomes and, subsequently, life satisfaction.

The findings from this study emphasize the importance of poverty, healthcare accessibility, rural/urban differences, and chronic conditions in the utilization of public healthcare services. These findings point to the potential for public policy to meaningfully address the health barriers faced across South Africa, principally through increasing accessibility and uptake of public healthcare services. Ongoing assessments of public healthcare utilization and barriers to its utilization are recommended as the nation continues to develop its health infrastructure and implement equitable healthcare access programs. Future studies, conducted at lower geographical scales, will be useful in guiding health planners to develop targeted public policy initiatives addressing disparities in utilization of public healthcare services, educational improvement, and income parity.

Such programs would help reduce health inequities, improve health outcomes, and ultimately increase life satisfaction for all South Africans.

REFERENCES

1. World Health Organization. *World Health Statistics 2019: Monitoring Health for the SDGs, Sustainable Development Goals*.; 2019.
2. Hao L, Xu X, Dupre ME, et al. Adequate access to healthcare and added life expectancy among older adults in China. *BMC Geriatr*. 2020;20(1):1-15. doi:10.1186/s12877-020-01524-9
3. Szwarcwald CL, Souza Júnior PRB De, Marques AP, Almeida WDS De, Montilla DER. Inequalities in healthy life expectancy by Brazilian geographic regions: Findings from the National Health Survey, 2013. *Int J Equity Health*. 2016;15(1):1-9. doi:10.1186/s12939-016-0432-7
4. Organization for Economic Cooperation and Development, World Health Organization. *Health at a Glance Asia/Pacific 2012*.; 2012. doi:10.1787/9789264105133-ko
5. Mazeikaite G, O'Donoghue C, Sologon DM. *What Drives Cross-Country Health Inequality in the EU? Unpacking the Role of Socio-Economic Factors*. Vol 155. Springer Netherlands; 2021. doi:10.1007/s11205-020-02587-2
6. Balkhi B, Alshayban D, Alotaibi NM. Impact of Healthcare Expenditures on Healthcare Outcomes in the Middle East and North Africa (MENA) Region: A Cross-Country Comparison, 1995–2015. *Front Public Heal*. 2021;8(February):1-9. doi:10.3389/fpubh.2020.624962
7. Macinko J, Starfield B, Shi L. The contribution of primary care systems to health outcomes within Organization for Economic Cooperation and Development (OECD) countries, 1970-1998. *Health Serv Res*. 2003;38(3):831-865.

doi:10.1111/1475-6773.00149

8. Wang SY, Chen LK, Hsu SH, Wang SC. Health care utilization and health outcomes: A population study of Taiwan. *Health Policy Plan*. 2012;27(7):590-599. doi:10.1093/heapol/czr080

9. Hadley J, Ayanian JZ, Butler S, Davis K, Kronick R. Sicker and poorer - The consequences of being uninsured: A review of the research on the relationship between health insurance, medical care use, health, work, and income. *Med Care Res Rev*. 2003;60(2 SUPPL.). doi:10.1177/1077558703254101

10. Sporinova B, Manns B, Tonelli M, et al. Association of Mental Health Disorders with Health Care Utilization and Costs among Adults with Chronic Disease. *JAMA Netw Open*. 2019;2(8):1-14. doi:10.1001/jamanetworkopen.2019.9910

11. Mayosi BM, Ch B, Phil D, Benatar SR, Ch B, Med DS. Health and Health Care in South Africa — 20 Years after Mandela. *N Engl J Med*. 2014;371(14):1344-1353.

12. Abbafati C, Abbas KM, Abbasi-Kangevari M, et al. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204-1222. doi:10.1016/S0140-6736(20)30925-9

13. Leibbrandt M, Woolard I, Finn A, Argent J. Trends in South African Income Distribution and Poverty since the Fall of Apartheid. *OECD Soc Employ Migr Work Pap*. 2010;(101):1-91. doi:10.1787/5kmms0t7p1ms-en

14. Statistics South Africa. *Poverty in Perspective*.; 2021.

15. Mushongera D, Tseng D, Kwenda P, Benhura M, Zikhali P, Ngwenya P. *Poverty and Inequality in the Gauteng City-Region*. Vol 9.; 2018. doi:10.1177/0974910113505796

16. Leibbrandt M, Woolard I, McEwen H, Koep C. *Employment and Inequality Outcomes in South Africa*.; 2010. https://www.researchgate.net/publication/266214017_Employment_and_inequality_outcomes_in_South_Africa/link/54b670370cf2bd04be320e0a/download

17. Peltzer K, Phaswana-Mafuya N, Pengpid S. Rural–urban health disparities among older adults in South Africa. *African J Prim Heal Care Fam Med*. 2019;11(1).

18. Republic of South Africa. *Constitution of the Republic of South Africa -- Chapter 2: Bill of Rights*.; 1996. https://www.justice.gov.za/legislation/constitution/SAConstitution-web-eng-02.pdf

19. Pauw TL. Catching up with the constitution: An analysis of National Health Insurance in South Africa post-apartheid. *Dev South Afr*. 2021;0(0):1-14. doi:10.1080/0376835X.2021.1945911

20. Myer L, Ehrlich RI, Susser ES. Social epidemiology in South Africa. *Epidemiol Rev*. 2004;26:112-123. doi:10.1093/epirev/mxh004

21. McLaren ZM, Ardington C, Leibbrandt M. Distance decay and persistent health care disparities in South Africa. *BMC Health Serv Res*. 2014;14(1):1-9. doi:10.1186/s12913-014-0541-1

22. Mutwali R, Ross E. Disparities in physical access and healthcare utilization among adults with and without disabilities in South Africa. *Disabil Health J*. 2019;12(1):35-42. doi:10.1016/j.dhjo.2018.07.009

23. Burger R, Christian C. Access to health care in post-apartheid South Africa: availability, affordability, acceptability. *Heal Econ Policy Law*. 2020;15(1):43-55. doi:10.1017/S1744133118000300

24. Wong KK-L, von Mollendorf C, Martinson N, et al. Healthcare utilization for common infectious disease syndromes in Soweto and Klerksdorp, South Africa. *Pan Afr Med J*. 2018;30:1-12. doi:10.11604/pamj.2018.30.271.14477

25. Omotoso KO, Koch SF. Assessing changes in social determinants of health inequalities in South Africa: A decomposition analysis. *Int J Equity Health*. 2018;17(1):1-13. doi:10.1186/s12939-018-0885-y

26. Scheil-Adlung X. *Global Evidence on Inequities in Rural Health Protection New Data on Rural Deficits in Health Coverage for 174 Countries*.; 2015. http://www.social-protection.org/gimi/gess/RessourcePDF.action?id=51297

27. Coovadia H, Jewkes R, Barron P, Sanders D, McIntyre D. The health and health system of South Africa: historical roots of current public health challenges. *Lancet*. 2009;374(9692):817-834. doi:10.1016/S0140-6736(09)60951-X

28. Ginsburg C, Collinson MA, Gómez-Olivé FX, et al. Internal migration and health in South Africa: determinants of healthcare utilisation in a young adult cohort. *BMC Public Health*. 2021;21(1):1-15. doi:10.1186/s12889-021-10590-6

29. Winchester MS, King B. Decentralization, healthcare access, and inequality in Mpumalanga, South Africa. *Heal Place*. 2018;51(February):200-207. doi:10.1016/j.healthplace.2018.02.009

30. Sahadew N, Singaram VS, Brown S. Distribution, incidence, prevalence and default of patients with diabetes mellitus accessing public healthcare in the 11 districts of KwaZulu-Natal, South Africa. *South African Med J*. 2016;106(4):389-393. doi:10.7196/SAMJ.2016.v106i4.10143

31. Tanser F, Gijsbertsen B, Herbst K. Modelling and understanding primary health care accessibility and utilization in rural South Africa: An exploration using a geographical information system. *Soc Sci Med*. 2006;63(3):691-705. doi:10.1016/j.socscimed.2006.01.015

32. Neely AH, Ponshunmugam A. A qualitative approach to examining health care access in rural South Africa. *Soc Sci Med*. 2019;230(March):214-221. doi:10.1016/j.socscimed.2019.04.025

33. Vergunst R, Swartz L, Hem KG, et al. Access to health care for persons with disabilities in rural South Africa. *BMC Health Serv Res*. 2017;17(1):1-8. doi:10.1186/s12913-017-2674-5

34. McIntyre D, Ataguba J. *Access to Quality Health Care in South Africa: Is the Health Sector Contributing to Addressing the Inequality Challenge?*; 2015. https://www.parliament.gov.za/storage/app/media/Pages/2017/october/High_Level_Panel/Commissioned_reports_for_triple_challenges_of_poverty_unemployment_and_inequality/Diagnostic_Report_on_Access_to_Quality_Healthcare.pdf

35. Pillay-van Wyk V, Msemburi W, Laubscher R, et al. Mortality trends and differentials in South Africa from 1997 to 2012: second National Burden of Disease Study. *Lancet Glob Heal*. 2016;4(9):e642-e653. doi:10.1016/S2214-109X(16)30113-9

36. Nojilana B, Bradshaw D, Pillay-van Wyk V, et al. Emerging trends in non-communicable disease mortality in South Africa, 1997 – 2010. *South African Med J*. 2016;106(5):477-484. doi:10.7196/SAMJ.2016.v106i5.10674

37. Roomaney RA, Van Wyk B, Turawa EB, Pillay-Van Wyk V. Prevalence of multimorbidity in South Africa: A systematic review protocol. *BMJ Open*. 2020;10(12):1-6. doi:10.1136/bmjopen-2020-042889

38. Jaca A, Malinga T, Iwu-Jaja CJ, et al. Strengthening the Health System as a Strategy to Achieving a Universal Health Coverage in Underprivileged Communities in Africa: A Scoping Review. *Int J Environ Res Public Health*. 2022;19(1). doi:10.3390/ijerph19010587

39. Cotlear D, Nagpal S, Smith O, Tandon A, Cortez R. *Going Universal: How 24 Developing Countries Are Implementing Universal Health Coverage Reforms from the Bottom Up*. World Bank Group; 2015. http://documents.worldbank.org/curated/ en/936881467992465464/Going-universal-how-24-developing- countries-are-implementing-universal-health-coverage-reforms- from-the-bottom-up

40. Ng M, Fullman N, Dieleman JL, Flaxman AD, Murray CJL, Lim SS. Effective Coverage: A Metric for Monitoring Universal Health Coverage. *PLoS Med*. 2014;11(9). doi:10.1371/journal.pmed.1001730

41. Peltzer K, Williams JS, Kowal P, et al. Universal health coverage in emerging economies: Findings on health care utilization by older adults in China, Ghana, India, Mexico, the Russian Federation, and South Africa. *Glob Health Action*. 2014;7(1):1-9. doi:10.3402/gha.v7.25314

42. Ameh S, Gómez-Olivé FX, Kahn K, Tollman SM, Klipstein-Grobusch K. Predictors of health care use by adults 50 years and over in a rural South African setting. *Glob Health Action*. 2014;7(1):1-11. doi:10.3402/gha.v7.24771

43. Diener E, Chan MY. Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity. *Appl Psychol Heal Well-Being*. 2011;3(1):1-43. doi:10.1111/j.1758-0854.2010.01045.x

44. Rosella LC, Fu L, Buajitti E, Goel V. Death and Chronic Disease Risk Associated with Poor Life Satisfaction: A Population-Based Cohort Study. *Am J Epidemiol*. 2019;188(2):323-331. doi:10.1093/aje/kwy245

45. Liu G, Xue Y, Liu Y, Wang S, Geng Q. Multimorbidity in cardiovascular disease and association with life satisfaction: A Chinese national cross-sectional study. *BMJ Open*. 2020;10(12). doi:10.1136/bmjopen-2020-042950

46. Bai A, Li H, Huang Y, et al. A survey of overall life satisfaction and its association with breast diseases in Chinese women. *Cancer Med*. 2016;5(1):111-119. doi:10.1002/cam4.565

47. Feller S, Teucher B, Kaaks R, Boeing H, Vigl M. Life Satisfaction and Risk of Chronic Diseases in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Germany Study. *PLoS One*. 2013;8(8):1-9. doi:10.1371/journal.pone.0073462

48. Jonasson SB, Rantakokko M, Franzén E, Iwarsson S, Nilsson MH. Prediction of Life Satisfaction in People with Parkinson's Disease. *Parkinsons Dis*. 2020;2020:4-6. doi:10.1155/2020/1561037

49. Gustafsson H, Nordström P, Stråhle S, Nordström A. Parkinson's disease: a population-based investigation of life satisfaction and employment. *J Rehabil Med*. 2015;47(1):45-51. doi:10.2340/16501977-1884

50. Eslami B, Macassa G, Sundin Ö, Khankeh HR, Soares JJF. Quality of life and life satisfaction among adults with and without congenital heart disease in a developing country. *Eur J Prev Cardiol*. 2015;22(2):169-179. doi:10.1177/2047487313514017

51. Koivumaa-Honkanen H, Kaprio J, Honkanen R, Viinamäki H, Koskenvuo M. Life satisfaction and depression in a 15-year follow-up of healthy adults. *Soc Psychiatry Psychiatr Epidemiol*. 2004;39(12):994-999. doi:10.1007/s00127-004-0833-6

52. Kim ES, Delaney SW, Tay L, Chen Y, Diener E, Vanderweele TJ. Life Satisfaction and Subsequent Physical, Behavioral, and Psychosocial Health in Older Adults. *Milbank Q*. 2021;99(1):209-239. doi:10.1111/1468-0009.12497

53. Li C, Chi I, Zhang X, Cheng Z, Zhang L, Chen G. Urban and rural factors associated with life satisfaction among older Chinese adults. *Aging Ment Heal*. 2015;19(10):947-954. doi:10.1080/13607863.2014.977767

54. Collins AL, Glei DA, Goldman N. The Role of Life Satisfaction and Depressive Symptoms in All-Cause Mortality. *Psychol Aging*. 2009;24(3):696-702. doi:10.1037/a0016777

55. Pavot W, Diener E. The Satisfaction With Life Scale and the emerging construct of life satisfaction. *J Posit Psychol*. 2008;3(2):137-152. doi:10.1080/17439760701756946

56. Koivumaa-honkanen H, Kaprio J, Korhonen T, Honkanen RJ, Heikkilä K, Koskenvuo M. Self-reported life satisfaction and alcohol use: A 15-year follow-up of healthy adult twins. *Alcohol Alcohol*. 2012;47(2):160-168. doi:10.1093/alcalc/agr151

57. Boehm JK, Winning A, Segerstrom S, Kubzansky LD. Variability Modifies Life Satisfaction's Association With Mortality Risk in Older Adults. *Psychol Sci*. 2015;26(7):1063-1070. doi:10.1177/0956797615581491

58. St. John PD, MacKenzie C, Menec V. Does life satisfaction predict five-year mortality in community-living older adults? *Aging Ment Heal*. 2015;19(4):363-370. doi:10.1080/13607863.2014.938602

59. Guven C, Saloumidis R. Life Satisfaction and Longevity: Longitudinal Evidence from the German Socio-Economic Panel. *Ger Econ Rev*. 2014;15(4):453-472. doi:10.1111/geer.12024

60. Lawrence EM, Rogers RG, Wadsworth T. Happiness and Longevity in the United States. *Soc Sci Med*. 2015;145(November):115-119. doi:10.1016/j.socscimed.2015.09.020.Happiness

61. Arora A, Spatz E, Herrin J, et al. Population well-being measures help explain geographic disparities in life expectancy at the county level. *Health Aff*. 2016;35(11):2075-2082. doi:10.1377/hlthaff.2016.0715

62. Diener E. Subjective well-being: The science of happiness and a proposal for a national index. *Am Psychol*. 2000;55(1):34-43. doi:10.1037/0003-066X.55.1.34

63. Diener, E., Lucas, R. Explaining differences in societal levels of happiness: Relative standards, need fulfillment, culture, and evaluation theory. *J Happiness Stud*. 2000;1(November 1999):41-78.

64. Helliwell JF, Layard R, Sachs JD, De Neve J-E. *World Happiness Report 2020 | World Happiness Report*.; 2020. https://worldhappiness.report/ed/2021/

65. Everatt D. Quality of Life in the Gauteng City-Region, South Africa. *Soc Indic Res*. 2017;130(1):71-86. doi:10.1007/s11205-015-1127-y

66. Westaway MS. A longitudinal investigation of satisfaction with personal and environmental quality of life in an informal South African housing settlement, Doornkop, Soweto. *Habitat Int*. 2006;30(1):175-189. doi:10.1016/j.habitatint.2004.09.003

67. Shatilwe JT, Kuupiel D, Mashamba-Thompson TP. Evidence on access to healthcare information by women of reproductive age in low- And middle-income countries: Scoping review. *PLoS One*. 2021;16(6 June):1-21. doi:10.1371/journal.pone.0251633

68. Lozano R, Fullman N, Mumford JE, et al. Measuring universal health coverage based on an index of effective coverage of health services in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1250-1284. doi:10.1016/S0140-6736(20)30750-9

69. Barber RM, Fullman N, Sorensen RJD, et al. Healthcare access and quality index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990-2015: A novel analysis from the global burden of disease study 2015. *Lancet*. 2017;390(10091):231-266. doi:10.1016/S0140-6736(17)30818-8

70. Banerjee S. Determinants of rural-urban differential in healthcare utilization among the elderly population in India. *BMC Public Health*. 2021;21(1):1-18. doi:10.1186/s12889-021-10773-1

71. Naz L, Ghimire U, Zainab A. Behavioral factors associated with utilization of healthcare services among elderly in Pakistan: evidence from a nationally representative survey. *BMC Geriatr*. 2021;21(1):1-11. doi:10.1186/s12877-021-02005-3

72. Oladipo JA. Utilization of health care services in rural and urban areas: A determinant factor in planning and managing health care delivery systems. *Afr Health Sci*. 2014;14(2):322-333. doi:10.4314/ahs.v14i2.6

73. Gurewich D, Garg A, Kressin NR. Addressing Social Determinants of Health Within Healthcare Delivery Systems: a Framework to Ground and Inform Health Outcomes. *J Gen Intern Med*. 2020;35(5):1571-1575. doi:10.1007/s11606-020-05720-6

74. Habib OS, Patrick Vaughan J. The determinants of health services utilization in Southern Iraq: A household interview survey. *Int J Epidemiol*. 1986;15(3):395-403. doi:10.1093/ije/15.3.395

75. Jacobs B, Ir P, Bigdeli M, Annear PL, Van Damme W. Addressing access barriers to health services: An analytical framework for selectingappropriate interventions in low-income Asian countries. *Health Policy Plan*. 2012;27(4):288-300. doi:10.1093/heapol/czr038

76. Ngugi AK, Agoi F, Mahoney MR, et al. Utilization of health services in a resourcelimited rural area in Kenya: Prevalence and associated household-level factors. *PLoS One*. 2017;12(2):1-12. doi:10.1371/journal.pone.0172728

77. Tan JHI, Goh AXC, Yi H. Health inequity and social determinants of healthcare utilization in the disadvantaged community of Hong Kong. *Health Promot Int*. Published online 2021:1-14. doi:10.1093/heapro/daab195

78. Braveman P, Gottlieb L. The Social Determinants of Health: It’s Time to Consider the Causes of the Causes. *Public Health Rep*. 2014;129:19.

79. United Nations. *Human Development Report 2019 Beyond Income, beyond Averages, beyond Today: Inequalities in Human Development in the 21st Century*.; 2019.

80. Pheiffer C, Wyk VP Van, Turawa E, Levitt N, Kengne AP, Bradshaw D. Prevalence of type 2 diabetes in South Africa: A systematic review and meta-analysis. *Int J Environ Res Public Health*. 2021;18(11). doi:10.3390/ijerph18115868

81. World Health Organization. Country Cooperation Strategy: South Africa. 2018;7(January):35.

82. Fusheini A, Eyles J. Achieving universal health coverage in South Africa through a district health system approach: conflicting ideologies of health care provision. *BMC Health Serv Res*. 2016;16(1):1-11. doi:10.1186/s12913-016-1797-4

83. National Planning Commission. *National Development Plan (2030)*.; 2012.

84. Abaerei AA, Ncayiyana J, Levin J. Health-care utilization and associated factors in Gauteng province, South Africa. *Glob Health Action*. 2017;10(1). doi:10.1080/16549716.2017.1305765

85. Mhlauli MB, Salani E, Mokotedi R. Understanding Apartheid in South Africa through the Racial Contract. *Int J Asian Soc Sci*. 2015;5(4):203-209. doi:10.18488/journal.1/2015.5.4/1.4.203.209

86. Posel D. What's in a name? Racial categorisations under apartheid and their afterlife. *Transformation*. 2001;47:50-74. https://web.archive.org/web/20061108101109/http://www.transformation.und.ac.za/issue 47/47 posel1.pdf

87. Statistics South Africa. *Census 2011 Statistical Release*.; 2012. doi:10.1016/s0022-5223(14)01847-9

88. Henry J Kaiser Family Foundation. *A National Household Survey of Health Inequalities in South Africa . Prepared by the Community Agency for Social Enquiry A National Household Survey of Health Inequalities in South Africa*.; 1995.

89. Gómez-Olivé FX, Thorogood M, Clark B, Kahn K, Tollman S. Self-reported health and health care use in an ageing population in the Agincourt sub-district of rural South Africa. *Glob Health Action*. 2013;6:19305. doi:10.3402/gha.v6i0.19305

90. Alaba O, Chola L. The social determinants of multimorbidity in South Africa. *Int J Equity Health*. 2013;12(1):1. doi:10.1186/1475-9276-12-63

91. Vergunst R, Swartz L, Hem KG, et al. The perceived needs-access gap for health services among persons with disabilities in a rural area within South Africa. *Disabil Rehabil*. 2019;41(22):2676-2682. doi:10.1080/09638288.2018.1478001

92. Gordon T, Booysen F, Mbonigaba J. Socio-economic inequalities in the multiple dimensions of access to healthcare: The case of South Africa. *BMC Public Health*. 2020;20(1):1-13. doi:10.1186/s12889-020-8368-7

93. Jelsma J, Ferguson G. The determinants of self-reported health-related quality of life in a culturally and socially diverse South African community. *Bull World Health Organ*. 2004;82(3):206-212. doi:10.1590/S0042-96862004000300010

94. World Health Organization. Declaration of Alma-Ata. In: *The Interntional Conference on Primary Health Care*. ; 1978:3. doi:10.1016/s0140-6736(78)92291-2

95. World Health Organization. Tokyo declaration on universal health coverage: All together to accelerate progress towards UHC. *Univers Heal Cover Forum 2017*. Published online 2017:1-4. https://www.who.int/universal_health_coverage/tokyo-decleration-uhc.pdf?ua=1

96. World Health Organization. Declaration of Astana. In: *Global Conference on Primary Health Care*. ; 2018. https://www.who.int/docs/default-source/primary-health/declaration/gcphc-declaration.pdf

97. World Health Organization. *Framework for Provision of Essential Health Services through Strengthened District/Local Health Systems to Support UHC in the Context of the SDGs: Report of the Secretariat*.; 2019. https://apps.who.int/iris/handle/10665/332966

98. Ataguba JE, McIntyre D. Paying for and receiving benefits from health services in South Africa: Is the health system equitable? *Health Policy Plan*. 2012;27(SUPPL.1):35-45. doi:10.1093/heapol/czs005

99. Republic of South Africa. *National Health Act, 2004 (Act No. 61 of 2003)*. Vol 469.; 2004:1-94. http://www.chr.up.ac.za/undp/domestic/docs/legislation_55.pdf

100. Health Policy Project. Health financing profile - South Africa. *Heal Policy Proj*. 2016;(May):2.

101. Ngobeni V, Breitenbach MC, Aye GC. Technical efficiency of provincial public healthcare in South Africa. *Cost Eff Resour Alloc*. 2020;18(1):1-19. doi:10.1186/s12962-020-0199-y

102. Modisakeng C, Matlala M, Godman B, Meyer JC. Medicine shortages and challenges with the procurement process among public sector. *BMC Health Serv Res*. 2020;20(1):1-10.

103. South Africa Department of Health. *National Health Insurance for South Africa: Towards Universal Health Coverage*.; 2015. https://www.gov.za/sites/default/files/gcis_document/201512/39506gon1230.pdf

104. South Africa Department of Health. *Strategic Plan 2020/21 - 2024/25*.; 2020. https://www.health.gov.za/wp-content/uploads/2020/11/depthealthstrategicplanfinal2020-21to2024-25-1.pdf

105. South Africa Department of Health. *Understanding National Health Insurance*.; 2017.

106. National Commissioners on High Quality Health Systems. National Commissions on High Quality Health Systems: activities, challenges, and future directions. *Lancet Glob Heal*. 2019;7(2):e179-e180. doi:10.1016/S2214-109X(18)30528-X

107. Republic of South Africa. *Medical Schemes Act, 1998 (Act No. 131 of 1998)*.; 1999.

108. Harrison S. *South African Health Review 2003/04, Chapter 21*.; 2004. https://www.hst.org.za/publications/South African Health Reviews/SAHR2003_04_1.pdf

109. South Africa Department of Health. Some Key Messages on NHI. Published online 2020:1-10. https://www.health.gov.za/wp-content/uploads/2020/11/some-key-messages-on-nhi.pdf

110. Health Policy Project. *Health Financing Profile - South Africa*.; 2016. http://www.healthpolicyproject.com/pubs/7887/Botswana_HFP.pdf

111. Ranchod S, Adams C, Burger R, et al. South Africa's hospital sector: old divisions and new developments. *South African Heal Rev*. 2017;1:101-110. https://journals.co.za/doi/pdf/10.10520/EJC-c80f3c5a8

112. Harris B, Goudge J, Ataguba JE, et al. Inequities in access to health care in South Africa. *J Public Health Policy*. 2011;32(SUPPL. 1):S102-S123. doi:10.1057/jphp.2011.35

113. Statistics South Africa. *General Household Survey Statistical Release: 2018*.; 2019. www.statssa.gov.zainfo@statssa.gov.za

114. Lopes Ibanez-Gonzalez D, Norris SA. Chronic non-communicable disease and healthcare access in middle-aged and older women living in Soweto, South Africa. *PLoS One*. 2013;8(10):1-6. doi:10.1371/journal.pone.0078800

115. Gaga S, Mqoqi N, Chimatira R, Moko S, Igumbor JO. Continuous quality improvement in hiv and tb services at selected healthcare facilities in south africa. *South Afr J HIV Med*. 2021;22(1):1-11. doi:10.4102/SAJHIVMED.V22I1.1202

116. Mabuto T, Hansoti B, Kerrigan D, et al. HIV testing services in healthcare facilities in South Africa: a missed opportunity. *J Int AIDS Soc*. 2019;22(10):1-6. doi:10.1002/jia2.25367

117. Ataguba JE, Akazili J, McIntyre D. Socioeconomic-related health inequality in South Africa: Evidence from General Household Surveys. *Int J Equity Health*. 2011;10:1-10. doi:10.1186/1475-9276-10-48

118. Goudge J, Gilson L, Russell S, Gumede T, Mills A. Affordability, availability and acceptability barriers to health care for the chronically ill: Longitudinal case studies from South Africa. *BMC Health Serv Res*. 2009;9:1-18. doi:10.1186/1472-6963-9-75

119. International Diabetes Federation. *IDF Diabetes Atlas 10th Edition*.; 2021. https://diabetesatlas.org/

120. Beagley J, Guariguata L, Weil C, Motala AA. Global estimates of undiagnosed diabetes in adults. *Diabetes Res Clin Pract*. 2014;103(2):150-160. doi:10.1016/j.diabres.2013.11.001

121. Vandormael A, Oliveira T de, Tanser F, Bärnighausen T, Herbeck JT. High percentage of undiagnosed HIV cases within a hyperendemic South African community: a population-based study. *J Epidemiol Community Health*. 2018;72(2):168-172. doi:10.1136/jech-2017-209713.High

122. Dong K, Thabethe Z, Hurtado R, et al. Challenges to the success of HIV and tuberculosis care and treatment in the public health sector in South Africa. *J Infect Dis*. 2007;196(SUPPL. 3):491-496. doi:10.1086/521111

123. Maggiolo F, Bandera A, Bonora S, et al. Enhancing care for people living with HIV: current and future monitoring approaches. *Expert Rev Anti Infect Ther*. 2021;19(4):443-456. doi:10.1080/14787210.2021.1823217

124. ECDC. European Union Standards for Tuberculosis Care - 2017 update. *Eur Cent Dis Prev Control*. Published online 2017. doi:10.2900/307948

125. Clouse K, Motlhatlhedi M, Bonnet K, et al. "I just wish that everything is in one place": facilitators and barriers to continuity of care among HIV-positive, postpartum women with a non-communicable disease in South Africa. *AIDS Care - Psychol Socio-Medical Asp AIDS/HIV*. 2018;30:5-10. doi:10.1080/09540121.2018.1470308

126. Thomas LS, Buch E, Pillay Y. An analysis of the services provided by community health workers within an urban district in South Africa: a key contribution towards universal access to care. *Hum Resour Health*. 2021;19(1):1-11. doi:10.1186/s12960-021-00565-4

127. Levitt NS, Steyn K, Dave J, Bradshaw D. Chronic noncommunicable diseases and HIV-AIDS on a collision course: relevance for health care delivery, particularly in low-resource settings--insights from South Africa. *Am J Clin Nutr*. 2011;94(6):1690S-1696S. doi:10.3945/ajcn.111.019075.Sub-Saharan

128. Pinchevsky Y, Raal F, Butkow N, Chirwa T, Distiller L, Rothberg A. Quality of care delivered to type 2 diabetes mellitus patients in public and private sector facilities in Johannesburg, South Africa. *Int J Gen Med*. 2018;11:383-390. doi:10.2147/IJGM.S165545

129. Pascoe M, Mahura O, Dean J. Health resources for South Africa: A scoping review. *Heal SA Gesondheid*. 2020;25:1-7. doi:10.4102/hsag.v25i0.1378

130. van Rensburg ZJ. Levels of health literacy and English comprehension in patients presenting to South African primary healthcare facilities. *African J Prim Heal Care Fam Med*. 2020;12(1):1-6. doi:10.4102/phcfm.v12i1.2047

131. Deumert A. "It would be nice if they could give us more language" - Serving South Africa's multilingual patient base. *Soc Sci Med*. 2010;71(1):53-61. doi:10.1016/j.socscimed.2010.03.036

132. Hasumi T, Jacobsen KH. Healthcare service problems reported in a national survey of South Africans. *Int J Qual Heal Care*. 2014;26(4):482-489. doi:10.1093/intqhc/mzu056

133. Honda A, Ryan M, Van Niekerk R, McIntyre D. Improving the public health sector in South Africa: Eliciting public preferences using a discrete choice experiment. *Health Policy Plan*. 2015;30(5):600-611. doi:10.1093/heapol/czu038

134. Eide AH, Mannan H, Khogali M, et al. Perceived barriers for accessing health services among individuals with disability in four African countries. *PLoS One*. 2015;10(5):1-13. doi:10.1371/journal.pone.0125915

135. Peltzer K. Patient experiences and health system responsiveness in South Africa. *BMC Health Serv Res*. 2009;9:1-12. doi:10.1186/1472-6963-9-117

136. Jacobsen KH, Hasumi T. Satisfaction with healthcare services in South Africa: Results of the national 2010 general household survey. *Pan Afr Med J*. 2014;18:1-11. doi:10.11604/pamj.2014.18.172.4084

137. Michel J, Tediosi F, Egger M, et al. Universal health coverage financing in South Africa: wishes vs reality. *J Glob Heal Reports*. Published online 2020:1-11. doi:10.29392/001c.13509

138. Organization World Health. *WHO Global Report on Traditional and Complementary Medicine 2019*.; 2019.

139. Bodeker G, Kronenberg F. A public health agenda for traditional, complementary, and alternative medicine. *Am J Public Health*. 2002;92(10):1582-1591. doi:10.2105/AJPH.92.10.1582

140. Cumes D. South African indigenous healing: How it works. *Explor J Sci Heal*. 2013;9(1):58-65. doi:10.1016/j.explore.2012.11.007

141. Zuma T, Wight D, Rochat T, Moshabela M. The role of traditional health practitioners in Rural KwaZulu-Natal, South Africa: Generic or mode specific? *BMC Complement Altern Med*. 2016;16(1):1-13. doi:10.1186/s12906-016-1293-8

142. National Department of Health South Africa. *Traditional Health Practitioners Act No. 22*. Vol 511.; 2008:25.

143. Moshabela M, Zuma T, Gaede B. Bridging the gap between biomedical and traditional health practitioners in South Africa. In: *South African Health Review*. Health Systems Trust; 2016:83-92.

144. Mhlanga D, Garidzirai R. The influence of racial differences in the demand for healthcare in South Africa: A case of public healthcare. *Int J Environ Res Public Health*. 2020;17(14):1-10. doi:10.3390/ijerph17145043

145. Levesque JF, Harris MF, Russell G. Patient-centred access to health care: Conceptualising access at the interface of health systems and populations. *Int J Equity Health*. 2013;12(1):1. doi:10.1186/1475-9276-12-18

146. Gulliford M, Morgan M, Hughes D, Gibson B, Beech R, Hudson M. What does ' access to health care ' mean ? *J Heal Serv Res Policy*. 2002;7(3):186-188.

147. World Health Organization. *Primary Health Care Measurement Framework and Indicators: Monitoring Health Systems through a Primary Health Care Lens*.; 2022.

148. Allebeck P. Health Care Access. In: Gellman MD, Turner JR, eds. *Encyclopedia of Behavioral Medicine*. Springer New York; 2013:908. doi:10.1007/978-1-4419-1005-9_882

149. World Health Organization. *Monitoring Emergency Obstetric Care: A Handbook United Nations Fourth World Conference on Emergency Obstetric Care*.; 2009.

150. Collender G, Gabrysch S, Campbell OMR. Reducing maternal mortality: Better monitoring, indicators and benchmarks needed to improve emergency obstetric care. Research summary for policymakers. *Trop Med Int Heal*. 2012;17(6):694-696. doi:10.1111/j.1365-3156.2012.02983.x

151. Wigley AS, Tejedor-Garavito N, Alegana V, et al. Measuring the availability and geographical accessibility of maternal health services across sub-Saharan Africa. *BMC Med*. 2020;18(1):1-10. doi:10.1186/s12916-020-01707-6

152. Shah TI, Milosavljevic S, Bath B. Measuring geographical accessibility to rural and remote health care services: Challenges and considerations. *Spat Spatiotemporal Epidemiol*. 2017;21:87-96. doi:10.1016/j.sste.2017.04.002

153. O'Donnell O, van Doorslaer E, Wagstaff A, Lindelow M. *Analyzing Health Equity Using Household Survey Data*.; 2007. doi:10.1596/978-0-8213-6933-3

154. Johnson C. *Access to Health Care in America*. Vol 83.; 1991. doi:10.5860/choice.31-0970

155. Carrasquillo O. Health Care Utilization. In: Gellman MD, Turner JR, eds. *Encyclopedia of Behavioral Medicine*. Springer New York; 2013:909-910. doi:10.1007/978-1-4419-1005-9_885

156. Bhandari A, Wagner T. Self-reported utilization of health care services: improving measurement and accuracy. *Med Care Res Rev*. 2006;63(2):217-235.

157. Awoke MA, Negin J, Moller J, et al. Predictors of public and private healthcare utilization and associated health system responsiveness among older adults in Ghana. *Glob Health Action*. 2017;10(1). doi:10.1080/16549716.2017.1301723

158. Zurynski Y, Ansell J, Ellis LA, et al. Accessible and affordable healthcare? Views of Australians with and without chronic conditions. *Intern Med J*. 2021;51(7):1060-1067. doi:10.1111/imj.15172

159. Statistics South Africa. *General Household Survey Statistical Release: 2016*.; 2017. statssa.gov.za

160. Statistics South Africa. *General Household Survey Statistical Release: 2019*.; 2020.

161. Organization for Economic Cooperation and Development. *OECD Guidelines on Measuring Subjective Well-Being.*; 2013. doi:http://dx.doi.org/10.1787/9789264191655-en

162. Maphumulo WT, Bhengu BR. Challenges of quality improvement in the healthcare of South Africa post-apartheid: A critical review. *Curationis*. 2019;42(1):1-9. doi:10.4102/curationis.v42i1.1901

163. Frijters P, Beatton T. The mystery of the U-shaped relationship between happiness and age. *J Econ Behav Organ*. 2012;82(2-3):525-542. doi:10.1016/j.jebo.2012.03.008

164. Easterlin RA. Explaining happiness. *Proc Natl Acad Sci*. 2003;100(19):11176-11183. doi:10.1007/s00534-009-0125-3

165. van Hoorn A. A Short Introduction to Subjective Well-Being: Its Measurement, Correlates and Policy Uses. *Stat Knowl Policy 2007 Meas Foster Prog Soc*. 2008;(January 2008):215-229.

166. Haller M, Hadler M. How social relations and structures can produce happiness and unhappiness: An international comparative analysis. *Soc Indic Res*. 2006;75(2):169-216. doi:10.1007/s11205-004-6297-y

167. Diener E, Inglehart R, Tay L. Theory and Validity of Life Satisfaction Scales. *Soc Indic Res*. 2013;112(3):497-527. doi:10.1007/s11205-012-0076-y

168. Helliwell JF, Putnam RD. The social context of well-being. *Philos Trans R Soc B Biol Sci*. 2004;359(1449):1435-1446. doi:10.1098/rstb.2004.1522

169. Diener E. Assessing Well-Being. The Collected Works of Ed Diener. *Springer*. Published online 2009:101-102. doi:10.1007/978-90-481-2354-4

170. National Research Council. *Subjective Well-Being: Measuring Happiness, Suffering, and Other Dimensions of Experience*. (Stone AA, Mackie C, eds.). National Academies Press; 2013. doi:10.17226/18548

171. Zhang W, Braun KL, Wu YY. The educational, racial and gender crossovers in life satisfaction: Findings from the longitudinal Health and Retirement Study. *Arch Gerontol Geriatr*. 2017;73:60-68. doi:10.1016/j.archger.2017.07.014

172. Meeks S, Murrell SA. Contribution of education to health and life satisfaction in older adults mediated by negative affect. *J Aging Health*. 2001;13(1):92-119. doi:10.1177/089826430101300105

173. Tan JJX, Kraus MW, Carpenter NC, Adler NE. The association between objective and subjective socioeconomic status and subjective well-being: A meta-analytic review. *Psychol Bull*. 2020;146(11):970-1020. doi:10.1037/bul0000258

174. Tang F, Chen H, Zhang Y, Mui AC. Employment and Life Satisfaction Among Middle- and Old-Aged Adults in China. *Gerontol Geriatr Med*. 2018;4:233372141877820. doi:10.1177/2333721418778202

175. Ruggeri K, Garcia-Garzon E, Maguire Á, Matz S, Huppert FA. Well-being is more than happiness and life satisfaction: A multidimensional analysis of 21 countries. *Health Qual Life Outcomes*. 2020;18(1):1-16. doi:10.1186/s12955-020-01423-y

176. Dingemans E, Henkens K. Working After Retirement and Life Satisfaction: Cross-National Comparative Research in Europe. *Res Aging*. 2019;41(7):648-669. doi:10.1177/0164027519830610

177. Valois RF, Kerr JC, Carey MP. Neighborhood Stress and Life Satisfaction : Is there a Relationship for African American Adolescents? *Appl Res Qual Life*. 2020;15(1):273-296. doi:10.1007/s11482-018-9679-z.Neighborhood

178. Teixeira Vaz C, De Souza Andrade AC, Proietti FA, Coelho Xavier C, De Lima Friche AA, Teixeira Caiaffa W. A multilevel model of life satisfaction among old people: Individual characteristics and neighborhood physical disorder. *BMC Public Health*. 2019;19(1):1-12. doi:10.1186/s12889-019-7228-9

179. Schimmack U, Oishi S. The influence of chronically and temporarily accessible information on life satisfaction judgments. *J Pers Soc Psychol*. 2005;89(3):395-406. doi:10.1037/0022-3514.89.3.395

180. Lyubomirsky S, King L, Diener E. The benefits of frequent positive affect: Does happiness lead to success? *Psychol Bull*. 2005;131(6):803-855. doi:10.1037/0033-2909.131.6.803

181. Kahneman D, Krueger AB. Developments in the Measurement of Subjective Well-Being. *J Econ Perspect*. 2006;20(1):3-24. https://pubs.aeaweb.org/doi/pdfplus/10.1257/089533006776526030

182. Michalos AC. Social Indicators Research and Health-Related Quality of Life Research. *Soc Indic Res*. 2004;65:27-72.

183. Karadag Arli S, Bakan AB, Varol E, Aslan G. Investigation of pain and life satisfaction in older adults. *Geriatr Gerontol Int*. 2018;18(1):5-11. doi:10.1111/ggi.13125

184. Łopuszańska M, Szklarska A, Lipowicz A, Jankowska EA, Kozieł S. Life satisfaction and cardiovascular disease risk in Poland. *Arch Med Sci*. 2013;9(4):629-634. doi:10.5114/aoms.2013.36909

185. Baumann M, Tchicaya A, Lorentz N, Le Bihan E. Life satisfaction and longitudinal changes in physical activity, diabetes and obesity among patients with cardiovascular diseases. *BMC Public Health*. 2017;17(1):1-10. doi:10.1186/s12889-017-4925-0

186. Astell-Burt T, Feng X. Urban green space, tree canopy and prevention of cardiometabolic diseases: a multilevel longitudinal study of 46 786 Australians. *Int J Epidemiol*. 2020;49(3):926-933. doi:10.1093/ije/dyz239

187. Christina Hart EA, Lakerveld J, McKee M, et al. Contextual correlates of happiness in European adults. *PLoS One*. 2018;13(1):1-17. doi:10.1371/journal.pone.0190387

188. Larson LR, Jennings V, Cloutier SA. Public parks and wellbeing in urban areas of the United States. *PLoS One*. 2016;11(4):1-19. doi:10.1371/journal.pone.0153211

189. Chirinda W, Phaswana-Mafuya N. Happy life expectancy and correlates of happiness among older adults in South Africa. *Aging Ment Heal*. 2019;23(8):1000-1007. doi:10.1080/13607863.2018.1471581

190. Sabatini F. The relationship between happiness and health: Evidence from Italy. *Soc Sci Med*. 2014;114:178-187. doi:10.1016/j.socscimed.2014.05.024

191. Koivumaa-Honkanen H, Honkanen R, Viinamäki H, Heikkilä K, Kaprio J, Koskenvuo M. Life satisfaction and suicide: A 20-year follow-up study. *Am J Psychiatry*. 2001;158(3):433-439. doi:10.1176/appi.ajp.158.3.433

192. Kirkcaldy B, Furnham A. Positive Affectivity, Psychological Well-Being, Accident- and Traffic-Deaths, and Suicide: An International Comparison. *Stud Psychol (Bratisl)*. 2000;42:97-104.

193. Koivumaa-Honkanen H, Honkanen R, Koskenvuo M, Viinamäki H, Kaprio J. Life dissatisfaction as a predictor of fatal injury in a 20-year follow-up. *Acta Psychiatr Scand*. 2002;105:444-450.

194. Goudie RJB, Mukherjee S, De Neve J-E, Oswald AJ, Wu S. Happiness as a Driver of Risk-avoiding Behaviour: Theory and an Empirical Study of Seatbelt Wearing and Automobile Accidents. *Economica*. 2014;81:674-697. doi:10.1111/ecca.12094

195. Veenhoven R. Is happiness relative? *Soc Indic Res*. 1991;24(1):1-34. doi:10.1007/BF00292648

196. Easterlin RA. Income and happiness: Towards a unified theory. *Econ J*. 2001;111(473):465-484. doi:10.1111/1468-0297.00646

197. Di Tella R, MacCulloch RJ, Oswald AJ. The macroeconomics of happiness. *Rev Econ Stat*. 2003;85(4):809-827. doi:10.1162/003465303772815745

198. Frey BS, Stutzer A. The Economics of Happiness. *World Econ*. 2002;3(1):1-17. doi:10.1089/SUS.2012.9931

199. Miret M, Caballero FF, Chatterji S, et al. Health and happiness: cross-sectional household surveys in Finland, Poland and Spain. *Bull World Health Organ*. 2014;92(10):716-725. doi:10.2471/blt.13.129254

200. Subramanian S V., Kim D, Kawachi I. Covariation in the socioeconomic determinants of self rated health and happiness: A multivariate multilevel analysis of individuals and communities in the USA. *J Epidemiol Community Health*. 2005;59(8):664-669. doi:10.1136/jech.2004.025742

201. Blanchflower DG, Oswald AJ. Is well-being U-shaped over the life cycle? *Soc Sci Med*. 2008;66(8):1733-1749. doi:10.1016/j.socscimed.2008.01.030

202. Wang SQ, Ying J, Zhang ML, et al. Health-related life satisfaction and its influencing factors: A cross-sectional study in China. *Japan J Nurs Sci*. 2018;15(4):285-297. doi:10.1111/jjns.12201

203. Garrido S, Méndez I, Abellán JM. Analysing the Simultaneous Relationship Between Life Satisfaction and Health-Related Quality of Life. *J Happiness Stud*. 2013;14(6):1813-1838. doi:10.1007/s10902-012-9411-x

204. Frey BS, Stutzer A. Maximizing Happiness? *Ger Econ Rev*. 2000;1(2):145-167. doi:10.1111/1468-0475.00009

205. Helliwell JF, Shiplett H, Barrington-Leigh CP. How happy are your neighbours? Variation in life satisfaction among 1200 Canadian neighbourhoods and communities. *PLoS One*. 2019;14(1):1-24. doi:10.1371/journal.pone.0210091

206. Tate DG, Forchheimer M. Quality of life, life satisfaction, and spirituality: Comparing outcomes between rehabilitation and cancer patients. *Am J Phys Med Rehabil*. 2002;81(6):400-410. doi:10.1097/00002060-200206000-00002

207. Janicki W, Dłużewska A. Subjectively felt and objectively measured: Wellbeing in the context of globalization. *Appl Psychol Heal Well-Being*. 2022;(January):1-19. doi:10.1111/aphw.12342

208. VanderWeele TJ, Trudel-Fitzgerald C, Allin P, et al. Current recommendations on the selection of measures for well-being. *Prev Med (Baltim)*. 2020;133(January):0-5. doi:10.1016/j.ypmed.2020.106004

209. Helliwell J, Layard R, Sachs J. *World Happiness Report*.; 2012. doi:10.1007/978-3-319-74336-3_371-1

210. Helliwell JF, Layard R, Sachs J. *World Happiness Report 2013*.; 2013.

211. Helliwell JF, Layard R, Sachs J. *World Happiness Report 2015*.; 2015.

212. Helliwell JF, Layard R, Sachs J. *World Happiness Report 2016, Update (Vol. I)*. Vol 1.; 2016. http://worldhappiness.report/ed/2016/

213. Helliwell J, Layard R, Sachs J. *World Happiness Report 2017*.; 2017. http://eprints.lse.ac.uk/47487/

214. Helliwell JF, Huang H, Wang S, Shiplett H. *World Happiness Report 2018*.; 2018. https://s3.amazonaws.com/happiness-report/2018/WHR_web.pdf

215. Helliwell JF, Layard R, Sachs JD. *World Happiness Report 2019*.; 2019. http://www.oecd-ilibrary.org/economics/how-s-life-2017_how_life-2017-en%0Ahttps://www.wwfindia.org/about_wwf/reducing_footprint/cce/about_climate_change_and_energy/%0Ahttps://www.mfe.govt.nz/sites/default/files/Climate change potential effects on human he

216. Helliwell JF, Layard R, Sachs JD, De Neve J-E. *World Happiness Report 2021*.; 2021.

217. Helliwell JF, Layard R, Sachs JD, Neve J De, Aknin LB, Wang S. *World Happiness Report 2022*.; 2022.

218. Martínez L. Trust, life satisfaction and health: Population data in mid-size city in the Global South. *Data Br*. 2019;27:104639. doi:10.1016/j.dib.2019.104639

219. Rözer J, Kraaykamp G. Income Inequality and Subjective Well-being: A Cross-National Study on the Conditional Effects of Individual and National Characteristics. *Soc Indic Res*. 2013;113(3):1009-1023. doi:10.1007/s11205-012-0124-7

220. Menec VH, Nowicki S. Examining the relationship between communities' "age-friendliness" and life satisfaction and self-perceived health in rural Manitoba, Canada. *Rural Remote Health*. 2014;14(1):1-14. doi:10.22605/rrh2594

221. World Health Organization. *Global Age-Friendly Cities: A Guide*.; 2007. http://www.who.int/ageing/publications/Global_age_friendly_cities_Guide_English.pdf

222. Gallup Inc. Gallup World Poll: Global Happiness Center. Accessed August 16, 2022. https://www.gallup.com/analytics/349487/gallup-global-happiness-center.aspx

223. Gauteng City-Region Observatory. Media release: GCRO's 5th Quality of Life survey (2017/18).https://cdn.gcro.ac.za/media/documents/GCRO_QoL_Survey_2018_Release_2.pdf. Published 2018. Accessed April 14, 2021.

224. Westaway MS, Olorunju SAS, Rai LCJ. Which personal quality of life domains affect the happiness of older South Africans? *Qual Life Res*. 2007;16(8):1425-1438. doi:10.1007/s11136-007-9245-x

225. Ginsburg C, Collinson MA, Iturralde D, et al. Migration and Settlement Change in South Africa: Triangulating Census 2011 with Longitudinal Data from the Agincourt Health and Demographic Surveillance System in the Rural North-east. *South African J Demogr*. 2016;17(1):133. http://www.jstor.org/stable/90009869

226. Mulcahy K, Kollamparambil U. The Impact of Rural-Urban Migration on Subjective Well-Being in South Africa. *J Dev Stud*. 2016;52(9):1357-1371. doi:10.1080/00220388.2016.1171844

227. Diener E, Lucas RE, Oishi S, Suh EM. Looking up and looking down: Weighting good and bad information in life satisfaction judgments. *Personal Soc Psychol Bull*. 2002;28(4):437-445. doi:10.1177/0146167202287002

228. Glatzer W, Gulyas J. Encyclopedia of Quality of Life and Well-Being Research. In: Michalos AC, ed. *Encyclopedia of Quality of Life and Well-Being Research*. Springer Science and Business Media; 2014:509-511. doi:10.1007/978-94-007-0753-5

229. Pavot W, Diener E. Review of the Satisfaction With Life Scale. *Psychol Assess*. 1993;5(2):164-172. doi:10.1037/1040-3590.5.2.164

230. E.Ackerman. Life Satisfaction Theory and 4 Contributing Factors. *Posit Psychol*. 2021;(14):1-19. https://positivepsychology.com/life-satisfaction/%0Ahttps://positivepsychologyprogram.com/life-satisfaction/

231. Gallup poll. World Poll Methodology. *World Poll Surv Data*. 2008;(October):84. http://www.gallup.com/178667/gallup-world-poll-work.aspx

232. Żemojtel-Piotrowska M, Piotrowski JP, Cieciuch J, et al. Measurement Invariance of Personal Well-Being Index (PWI-8) Across 26 Countries. *J Happiness Stud*. 2017;18:1697-1711.

233. Diener E, Suh EM, Lucas RE, Smith HL. Subjective Well-Being: Three Decades of Progress. *Psychol Bull*. 1999;125(2):276-302. doi:10.1006/pupt.1998.0157

234. de Ree J, Alessie R. Life satisfaction and age: Dealing with underidentification in age-period-cohort models. *Soc Sci Med*. 2011;73(1):177-182. doi:10.1016/j.socscimed.2011.04.008

235. Adedeji A, Idemudia ES, Bolarinwa OA, Metzner F. Racial relations and life satisfaction among South Africans: Results from the 2017 South African Social Attitudes Survey (SASAS). *J Psychol Africa*. 2021;31(5):522-528. doi:10.1080/14330237.2021.1978183

236. Westaway MS. Life and Neighborhood Satisfaction of Black and White Residents in a Middle-Class Suburb of Johannesburg. *Psychol Rep*. 2007;(100):489-494.

237. Masuda YJ, Williams JR, Tallis H. Does Life Satisfaction Vary with Time and Income? Investigating the Relationship Among Free Time, Income, and Life Satisfaction. *Physiol Behav*. 2017;176(5):139-148. doi:10.1016/j.physbeh.2017.03.040

238. Lobos G, Grunert KG, Bustamante M, Schnettler B. With Health and Good Food, Great Life! Gender Differences and Happiness in Chilean Rural Older Adults. *Soc Indic Res*. 2016;127(2):865-885. doi:10.1007/s11205-015-0971-0

239. Zweig JS. Are Women Happier than Men? Evidence from the Gallup World Poll. *J Happiness Stud*. 2015;16(2):515-541. doi:10.1007/s10902-014-9521-8

240. Pollmann-Schult M. Parenthood and life satisfaction: Why don't children make people happy? *J Marriage Fam*. 2014;76(2):319-336. doi:10.1111/jomf.12095

241. Han WJ, Li Y, Whetung C. Who We Live With and How We Are Feeling: A Study of Household Living Arrangements and Subjective Well-Being Among Older Adults in China. *Res Aging*. 2021;43(9-10):388-402. doi:10.1177/0164027520961547

242. Silverstein M, Cong Z, Li S. Intergenerational transfers and living arrangements of older people in rural China: Consequences for psychological well-being. *Journals Gerontol - Ser B Psychol Sci Soc Sci*. 2006;61(5):256-266. doi:10.1093/geronb/61.5.S256

243. Krämer MD, Rodgers JL. The impact of having children on domain-specific life satisfaction: A quasi-experimental longitudinal investigation using the Socio-Economic Panel (SOEP) data. *J Pers Soc Psychol*. 2020;119(6):1497-1514. doi:10.1037/pspp0000279

244. Liu J, Zhou Z. Mothers' subjective well-being after having a second child in current China: A case study of Xi'an City. *Int J Environ Res Public Health*. 2019;16(20). doi:10.3390/ijerph16203823

245. Su Y, Arcy CD, Li M, Meng X. Trends and patterns of life satisfaction and its relationship with social support in Canada , 2009 to 2018. *Sci Rep*. 2022;(0123456789):1-11. doi:10.1038/s41598-022-13794-x

246. Mikucka M, Rizzi E. The Parenthood and Happiness Link: Testing Predictions from Five Theories. *Eur J Popul*. 2020;36(2):337-361. doi:10.1007/s10680-019-09532-1

247. Cetre S, Clark AE, Senik C. Happy People Have Children: Choice and Self-Selection into Parenthood. *Eur J Popul*. 2016;32(3):445-473. doi:10.1007/s10680-016-9389-x

248. Andersson MA, Glass J, Simon RW. Users Beware: Variable Effects of Parenthood on Happiness Within and Across International Datasets. *Soc Indic Res*. 2014;115(3):945-961. doi:10.1007/s11205-013-0244-8

249. Schröder M. Men Lose Life Satisfaction with Fewer Hours in Employment: Mothers Do Not Profit from Longer Employment—Evidence from Eight Panels. *Soc Indic Res*. 2020;152(1):317-334. doi:10.1007/s11205-020-02433-5

250. Salinas-Jiménez M del M, Artés J, Salinas-Jiménez J. How Do Educational Attainment and Occupational and Wage-Earner Statuses Affect Life Satisfaction? A Gender Perspective Study. *J Happiness Stud*. 2013;14(2):367-388. doi:10.1007/s10902-012-9334-6

251. Lenzi C, Perucca G. Are urbanized areas source of life satisfaction? Evidence from EU regions. *Pap Reg Sci*. 2018;97(March 2018):S105-S122. doi:10.1111/pirs.12232

252. FitzRoy FR, Nolan MA. Income Status and Life Satisfaction. *J Happiness Stud*. 2022;23(1):233-256. doi:10.1007/s10902-021-00397-y

253. Cooke GB, Hutchings D, Donaghey J, Zeytinoglu IU. Happy at a price: employment challenges, life satisfaction, and lifestyle benefits among older individuals in rural communities in Canada and Ireland. *Community, Work Fam*. 2021;24(1):39-59. doi:10.1080/13668803.2019.1661830

254. Dumitrache CG, Rubio L, Rubio-Herrera R. Perceived health status and life satisfaction in old age, and the moderating role of social support. *Aging Ment Heal*. 2017;21(7):751-757. doi:10.1080/13607863.2016.1156048

255. Kapteyn A, Lee J, Tassot C, Vonkova H, Zamarro G. *Dimensions of Subjective Well-Being*. Vol 123. Springer Netherlands; 2015. doi:10.1007/s11205-014-0753-0

256. Mwanyangala M, Mayombana C, Urassa H, et al. Health status and quality of life among older adults in rural Tanzania. *Glob Health Action*. 2010;3(1):2142. doi:10.3402/gha.v3i0.2142

257. Kirkcaldy B, Furnham A, Siefen G. The relationship between health efficacy, educational attainment, and well-being among 30 nations. *Eur Psychol*. 2004;9(2):107-119. doi:10.1027/1016-9040.9.2.107

258. World Health Organization Division of Mental Health and Prevention of Substance Abuse. *WHOQOL User Manual*.; 1998. doi:10.4091/iken1991.9.1_123

259. Chen J, Yang H. Geographical Mobility, Income, Life Satisfaction and Family Size Preferences: An Empirical Study on Rural Households in Shaanxi and Henan Provinces in China. *Soc Indic Res*. 2016;129(1):277-290. doi:10.1007/s11205-015-1102-7

260. Blanchflower DG, Oswald AJ. Well-being over time in Britain and the USA. *J Public Econ*. 2004;88(7-8):1359-1386. doi:10.1016/S0047-2727(02)00168-8

261. Pollmann-Schult M. Parenthood and Life Satisfaction in Europe: The Role of Family Policies and Working Time Flexibility. *Eur J Popul*. 2018;34(3):387-411. doi:10.1007/s10680-017-9433-5

262. Easterlin RA, Sawangfa O. Happiness and Domain Satisfaction: Theory and Evidence. *SSRN Electron J*. 2021;(2584). doi:10.2139/ssrn.961644

263. Shavers VL. Measurement of socioeconomic status in health disparities research. *J Natl Med Assoc*. 2007;99(9):1013-1023.

264. Braveman PA, Cubbin C, Egerter S, et al. Socioeconomic Status in Health Research. *Jama*. 2005;294(22):2879. doi:10.1001/jama.294.22.2879

265. Salinas Jiménez M del M, Artés Caselles J, Salinas Jiménez FJ. Education and satisfaction with life: the role of positional concerns. *XVIII Encuentro Econ pública, 2011*. Published online 2011:5. https://dialnet.unirioja.es/servlet/articulo?codigo=3630637

266. Diener E, Tay L, Oishi S. Rising income and the subjective well-being of nations. *J Pers Soc Psychol*. 2013;104(2):267-276. doi:10.1037/a0030487

267. Kim KM, Chung US. Can Money Buy Happiness for a Family? Family Income, Parenting Style, and Life Satisfaction in Parents and Adolescents. *Clin Child Psychol Psychiatry*. 2021;26(3):823-838. doi:10.1177/13591045211000781

268. Li X, Chen H, Zhu Z. Exploring the relationship between life quality and the perceptions of living-environment crises. *BMC Public Health*. 2021;21(1):1-10. doi:10.1186/s12889-021-10861-2

269. Ghose B, Etowa J. Relationship between Self-Reported Neighborhood Safety and Happiness and Life Satisfaction among Women in Low-Middle Income Countries. *Safety*. 2022;8(2). doi:10.3390/safety8020031

270. Cha YJ. Correlation between leisure activity time and life satisfaction: Based on Kostat time use survey data. *Occup Ther Int*. 2018;2018. doi:10.1155/2018/5154819

271. Ralston M. The Role of Older Persons' Environment in Aging Well: Quality of Life, Illness, and Community Context in South Africa. *Gerontologist*. 2018;58(1):111-120. doi:10.1093/geront/gnx091

272. Koen V, Robertson ND. A qualitative exploration of psychosocial well-being experiences in a South African rural community. *J Community Psychol*. 2021;49(5):1195-1211. doi:10.1002/jcop.22590

273. Ott JC. Government and Happiness in 130 Nations: Good Governance Fosters Higher Level and More Equality of Happiness. *Soc Indic Res*. 2011;102(1):3-22. doi:10.1007/s11205-010-9719-z

274. The World Bank. *World Bank - Civil Society Engagement Review of Fiscal Years 2010-2012*.; 2013.

275. World Economic Forum. The Future Role of Civil Society. *World Scenar Ser*. 2013;(January).

276. Wallace C, Pichler F. More participation, happier society? A comparative study of civil society and the quality of life. *Soc Indic Res*. 2009;93(2):255-274. doi:10.1007/s11205-008-9305-9

277. Cutler SJ. Membership in different types of voluntary associations and psychological well being. *Gerontologist*. 1976;16(4):335-339. doi:10.1093/geront/16.4.335

278. Ibsen B, Elmose-Østerlund K, Iversen EB, Høyer-Kruse J, Pedersen MRL. Civil society's impact on quality of life. *J Civ Soc*. 2021;17(3-4):345-363. doi:10.1080/17448689.2021.2018806

279. Sakuraya A, Imamura K, Watanabe K, et al. What Kind of Intervention Is Effective for Improving Subjective Well-Being Among Workers? A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Front Psychol*. 2020;11(November). doi:10.3389/fpsyg.2020.528656

280. Allin P, Hand DJ. *The Wellbeing of Nations : Meaning, Motive and Measurement*. John Wiley & Sons, Incorporated; 2014.

281. Diener E, Pressman SD, Hunter J, Delgadillo-Chase D. If, Why, and When Subjective Well-Being Influences Health, and Future Needed Research. *Appl Psychol Heal Well-Being*. 2017;9(2):133-167.

282. Stiglitz J, Fitoussi J, Durand M. *Beyond GDP. Measuring What Counts for Economic and Social Performance*.; 2018. doi:10.24833/2071-8160-2019-5-68-172-180

283. The World Bank Group. *World Development Report 2021: Data for Better Lives*.; 2021. https://www.researchgate.net/publication/269107473_What_is_governance/link/548173090cf22525dcb61443/download%0Ahttp://www.econ.upf.edu/~reynal/Civilwars_12December2010.pdf%0Ahttps://think-asia.org/handle/11540/8282%0Ahttps://www.jstor.org/stable/41857625

284. Statistics South Africa. General Household Survey 2019 [dataset]. Version 1. doi:https://doi.org/10.25828/vtvj-pv21

285. University of Cape Town. DataFirst. Accessed January 25, 2022. https://www.datafirst.uct.ac.za/

286. StataCorp. STATA Statistical Software. Published online 2019.

287. Thadewald T, Büning H. Jarque-Bera test and its competitors for testing normality - A power comparison. *J Appl Stat*. 2007;34(1):87-105. doi:10.1080/02664760600994539

288. Place N, Anagnoson JT. Comment on sg3.4 and an Improved D'Agostino Test. *Stata Tech Bull*. 1991;1(3).

289. Statistics South Africa. *General Household Survey Statistical Release: 2017*.; 2018.

290. Statistics South Africa. *General Household Survey Statistical Release: 2009*.; 2009. http://www.statssa.gov.za/publications/P0318/P03182009.pdf

291. Statistics South Africa. *General Household Survey Statistical Release: 2010*.; 2010. doi:10.1016/s0022-5223(14)01847-9

292. Naidoo S. The South African national health insurance: A revolution in health-care delivery! *J Public Health (Bangkok)*. 2012;34(1):149-150. doi:10.1093/pubmed/fds008

293. Hendricks S, Seekoe E, Roberts M, Buch E, Bossert T. Decentralisation in South Africa : options for District Health Authorities in South Africa. *South African Heal Rev*. 2014;2014/2015(1):59-72. http://www.hst.org.za/publications/south-

294. Benatar S, Sullivan T, Brown A. Why equity in health and in access to health care are elusive: Insights from Canada and South Africa. *Glob Public Health*. 2018;13(11):1533-1557. doi:10.1080/17441692.2017.1407813

295. Garciá-Altés A, Ruiz-Munõz D, Colls C, Mias M, Martín Bassols N. Socioeconomic inequalities in health and the use of healthcare services in Catalonia: Analysis of the individual data of 7.5 million residents. *J Epidemiol Community Health*. 2018;72(10):871-879. doi:10.1136/jech-2018-210817

296. Keane C, Regan M, Walsh B. Failure to take-up public healthcare entitlements: Evidence from the Medical Card system in Ireland. *Soc Sci Med*. 2021;281(May):114069. doi:10.1016/j.socscimed.2021.114069

297. Statistics South Africa. *Midyear Population Estimate 2018*.; 2018.

298. Gauteng City-Region Observatory (GCRO). Quality of Life Survey V 2017-2018 [dataset]. Round 5. Version 2. doi:https://doi.org/10.25828/8yf7-9261

299. This is the average salary in South Africa right now. BusinessTech. Published 2018. Accessed April 15, 2021. https://businesstech.co.za/news/finance/290484/this-is-the-average-salary-in-south-africa-right-now/

300. Williams R. Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *Stata J*. 2006;6(1):58-82. doi:10.1177/1536867x0600600104

301. Powdthavee N. Unhappiness and crime: Evidence from South Africa. *Economica*. 2005;72(287):531-547. doi:10.1111/j.0013-0427.2005.00429.x

302. Cramm JM, Møller V, Nieboer AP. Individual- and Neighbourhood-Level Indicators of Subjective Well-Being in a Small and Poor Eastern Cape Township: The Effect of Health, Social Capital, Marital Status, and Income. *Soc Indic Res*. 2012;105(3):581-593. doi:10.1007/s11205-011-9790-0

303. Borghesi S, Vercelli A. Happiness and health: Two paradoxes. *J Econ Surv*. 2012;26(2):203-233. doi:10.1111/j.1467-6419.2010.00635.x

304. Morgan J, Robinson O, Thompson T. Happiness and age in european adults: The moderating role of gross domestic product per capita. *Psychol Aging*. 2015;30(3):544-551. doi:10.1037/pag0000034

305. Kadt J De, Ballard R, Cheruiyot K, Culwick C, Graeme G. *Insights From GCRO's Quality of Life V Survey (2017/18)*.; 2019. https://gcro.ac.za/research/project/detail/quality-of-life-survey-v-201718/

306. Theodossiou I. The effects of low-pay and unemployment on psychological well-being: A logistic regression approach. *J Health Econ*. 1998;17(1):85-104. doi:10.1016/S0167-6296(97)00018-0

307. Hansen T. Parenthood and Happiness: A Review of Folk Theories Versus Empirical Evidence. *Soc Indic Res*. 2012;108(1):29-64. doi:10.1007/s11205-011-9865-y

308. Nelson SK, Kushlev K, Lyubomirsky S. The pains and pleasures of parenting: When, why, and how is parenthood associated with more or less well-being? *Psychol Bull*. 2014;140(3):846-895. doi:10.1037/a0035444

309. Nelson SK, Kushlev K, English T, Dunn EW, Lyubomirsky S. In Defense of Parenthood: Children Are Associated With More Joy Than Misery. *Psychol Sci*. 2013;24(1):3-10. doi:10.1177/0956797612447798

310. Aassve A, Goisis A, Sironi M. Happiness and Childbearing Across Europe. *Soc Indic Res*. 2012;108(1):65-86. doi:10.1007/s11205-011-9866-x

311. Moller V. Monitoring quality of life in cities: The Durban case. *Dev South Afr*. 2001;18(2):217-238. doi:10.1080/037/68350120041910

312. Møller V. South African quality of life trends in the late 1990s: major divides in perceptions. *Soc Transit*. 1999;30(2):93-105. doi:10.1080/10289852.1999.10520175

313. Liu Y, Zhang F, Wu F, Liu Y, Li Z. The subjective wellbeing of migrants in Guangzhou, China: The impacts of the social and physical environment. *Cities*. 2017;60:333-342. doi:10.1016/j.cities.2016.10.008

314. Siahpush M, Spittal M, Singh GK. Happiness and life satisfaction prospectively predict self-rated health, physical health, and the presence of limiting, long-term health conditions. *Am J Heal Promot*. 2008;23(1):18-26. doi:10.4278/ajhp.061023137

315. McMaughan DJ, Oloruntoba O, Smith ML. Socioeconomic Status and Access to Healthcare: Interrelated Drivers for Healthy Aging. *Front Public Heal*. 2020;8(June):1-9. doi:10.3389/fpubh.2020.00231

316. Hogan MJ, Leyden KM, Conway R, Goldberg A, Walsh D, McKenna-Plumley PE. Happiness and health across the lifespan in five major cities: The impact of place and government performance. *Soc Sci Med*. 2016;162:168-176. doi:10.1016/j.socscimed.2016.06.030

317. Ngamaba KH, Panagioti M, Armitage CJ. Income inequality and subjective well-being: a systematic review and meta-analysis. *Qual Life Res*. 2018;27(3):577-596. doi:10.1007/s11136-017-1719-x

318. Liao PA, Chang HH, Sun LC. National Health Insurance program and life satisfaction of the elderly. *Aging Ment Heal*. 2012;16(8):983-992. doi:10.1080/13607863.2012.692765

319. Zhang T, Liu C, Ni Z. Association of access to healthcare with self-assessed health and quality of life among old adults with chronic disease in china: Urban versus rural populations. *Int J Environ Res Public Health*. 2019;16(14). doi:10.3390/ijerph16142592

320. Dudley L, Garner P. Strategies for integrating primary health services in low- and middle-income countries at the point of delivery. *Cochrane Database Syst Rev*. 2011;2019(8). doi:10.1002/14651858.CD003318.pub3

VITA

Tamara Chavez-Lindell was raised in Kingsburg, CA, in the state's agricultural Central Valley. She earned a degree in History at the University of California, Berkeley (BA, 1995), with minors in both Spanish Language and Literature, and Literature in English. Following a 3-year tour of Peace Corps service in Ecuador, she completed a degree in Public Health at the Tulane University School of Public Health and Tropical Medicine (MPH, 2002), with a concentration in Epidemiology. As an epidemiologist with the Tennessee Department of Health during 15 years, she coordinated tuberculosis research projects, conducted reportable disease surveillance, investigated outbreaks, and created and delivered food safety education at locations across the southeastern United States. Since 2016, she has served as adjunct faculty in the University of Tennessee's Department of Public Health, where she taught Introduction to Public Health, Epidemiology, and Global Health courses before pursuing her PhD in Comparative and Experimental Medicine with a concentration in epidemiology at the University of Tennessee, Knoxville.