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2024

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Ndlovu, Philisiwe. (2024). Access to Healthcare Services among Youth Enrolled in Post School Training and Education (PSET) during the First Wave of COVID-19 Pandemic in South Africa [Master`s dissertation, University of the Witwatersrand, Johannesburg]. WIReDSpace. https://hdl.handle.net/10539/48023

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Access to Healthcare Services among Youth Enrolled in Post School Training and Education (PSET) during the First Wave of COVID-19 Pandemic in South Africa



A Research Report submitted to the School of Public Health, Faculty of Health Sciences, University of the Witwatersrand. In partial fulfilment of the requirements for the degree of Master of Public Health

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Date: November 2024

Declaration

I, **Phillisiwe Ndlovu**, student number **1799691**, declare that this Research Report is my own unaided work, and that acknowledgements have been made to all sources used throughout the report. This report is submitted to the Faculty of Health Science at the University of the Witwatersrand in partial fulfilment of the requirements for a Degree of Master of Public Health (Maternal & Child Health). It has not been previously submitted for any other degree or examination at any university.

Date: November 2024

Signature of Student: 

Dedication

To my parents & late brother:

Duduzile Ndlovu & Duma Ndlovu

Sifiso Siphamandla Ndlovu

Thank you for the unconditional love, support, and encouragement throughout my pursuit for education. I hope this achievement will fulfil the dream they envisioned for me.

Abstract

Background: The global impact of the COVID-19 pandemic affected healthcare access, driven by demographic, social, and environmental factors. The study's rationale is to investigate the access of young people enrolled in higher institutions to healthcare services and determine the most frequently used communication (online, telephone or face-to-face) platforms for health and social support services during the first COVID-19 wave in South Africa.

Methods: A secondary data analysis was conducted on a cross-sectional online survey conducted in 2020. Descriptive statistics were used to characterize healthcare access by socio-demographic, substance use and COVID-19-related factors. A multivariable forward stepwise logistic regression analysis was conducted to determine factors associated with young people's access to healthcare services during the COVID-19 pandemic.

Results: Among 4 404 participants, 71% accessed healthcare services. Youth aged 25-29 years (AOR=1.49, 95% CI [1.18-187]), White (AOR=2.78, 95% CI [1.79-4.32]) and Indian/Asian (AOR=2.04, 95% CI [1.19-3.54]) students were more likely to access services. Low COVID-19 risk perceptions were associated with increased access to healthcare services (AOR=1.23, 95% CI [0.96-1.56]). Those residing in informal settlements (AOR=0.60, 95% CI [0.38–0.95]), unaware of parental whereabouts (AOR=0.49, 95% CI [0.29-0.83]), and using recreational drugs (AOR=0.50, 95% CI [0.29-0.87]) had lower odds of accessing healthcare services. Awareness of COVID-19 transmission modes and loss of social contact with family or friends were also associated with reduced access to healthcare services.

Conclusion: The COVID-19 pandemic exacerbated existing healthcare access disparities among youth. Targeted efforts, especially for Black Africans in informal settlements, are needed including youth-friendly services; telemedicine integration; and referral systems to local clinics.

Keywords: healthcare service access; COVID-19 pandemic; youth; young people; South Africa

Acknowledgements

Achievement is the result of collaborative endeavours, and thus, I want to express my gratitude to all those individuals who played a role in bringing this research report to fruition.

To my supervisors: Dr Jackie Dunlop, Dr Thabang Manyaapelo and Prof Wiedaad Slemming, I would like to express my sincere gratitude for their continuous guidance and supervision. I can never thank you enough.

To my sister Lethiwe Ndlovu, thank you for always supporting my research, especially when I most needed the motivation and encouragement. Words alone cannot express how grateful I am indeed to them.

Lastly, I would also like to thank the Human Science Research Council for allowing me to use their data to write this research report.

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List of abbreviations

ART	Antiretroviral Therapy
COVID-19	Coronavirus Disease of 2019
NCD	Noncommunicable Diseases
NHI	National Health Insurance
PHC	Primary Healthcare Facilities
PSET	Post School Education and Training
PrEP	Pre-Exposure Prophylaxis
TVET	Technical, Vocational, Educational and Training
UNFPA	United Nations Population Fund
WHO	World Health Organization
TB	Tuberculosis

Introduction

Background

During the novel coronavirus disease 2019 (COVID-19) first lockdown in South Africa, access to healthcare for all was reduced(1). For youth, aged 15 to 34 years, this meant their access to routine, preventative and chronic care health services were disrupted (2, 3). The National Youth Commission Act of 1996 defines "youth" as individuals aged 14 to 35 years old(4). This report interchangeably uses the term “youth” and “young people”.

COVID-19 is an infectious respiratory illness that initially occurred in Wuhan city, China (December 2019)(5). It presented as a respiratory illness that affected the elderly and those with co-morbidities more severely(6), while younger people typically had milder presentations of COVID-19 infection(7). In South Africa, the first cases were confirmed on 5 March 2020(8). Later that month, a state of disaster and a nationwide lockdown were declared. During this initial lockdown period (from 26 March to 31 April 2020) only essential services remained operational, including medical facilities, primarily for severe and urgent cases, food production, distribution and sale. Lockdown had an impact on communities, affecting access to education, routine health services, and social support services(9). In addition, COVID-19 isolation and quarantine post-exposure guidelines of 14 days, which later decreased in duration(10) led to severe shortages in staff at these facilities(11).

The expanding population of South Africa, partly because of an increase in refugees and migrants entering the country, has sparked concerns regarding sustainability of the public healthcare system(12). In addition, the COVID-19 pandemic led to a decrease in disposable income among the South African population, further straining an already burdened healthcare system (13, 14). Contributing to this, job losses and the reduced affordability of private medical insurance led to more individuals relying on the public healthcare system. This highlighted the need for improved equity around access to health care in South Africa. A solution is to advocate for the implementation of a universal health financing system in South Africa, which would aim to deliver quality and affordable healthcare services to all patients(15). The proposed National Health Insurance Scheme (NHI) intends to address healthcare inequality by providing universal access to quality healthcare services, enhancing healthcare quality, and addressing current financial challenges in the public healthcare sector (16).

While the NHI represents a positive step towards eliminating the two-tier health system which has created a disparity where those who can afford private healthcare receive better treatment and outcomes than those relying on the public system addressing the model's funding remains a critical hurdle.

The public health sector in South Africa provides services through primary, secondary, and tertiary health facilities. Primary healthcare facilities (PHC) provide routine preventive, curative and chronic illness health services(17). These services include sexual and reproductive health services (e.g., family planning, antenatal, delivery and postnatal services and breast and cervical cancer screening, HIV testing and sexually transmitted infection screening and management), chronic disease care for both non-communicable (e.g., hypertension and diabetes) and communicable diseases (HIV treatment services); child health services and other curative, preventative, and health promotion services(18). During the first COVID-19 lockdown, these services were severely impacted and the impact on young people is largely unexplored.

Literature Review

The COVID-19 pandemic significantly disrupted access to healthcare services globally, with far-reaching consequences for vulnerable populations, including young people. This literature review focuses on the impact of lockdown measures on healthcare access and utilization among youth attending Post-School Education and Training (PSET) institutions in South Africa. Understanding this issue requires a conceptual framework that distinguishes between healthcare access (the ability to obtain services) and healthcare utilization (the actual use of services), both of which are influenced by various barriers.

Theoretical Framework

To navigate the complex dynamics of healthcare access and utilization, this review employs a conceptual framework rooted in the Social Determinants of Health (SDOH) model(77). This framework highlights how health outcomes are influenced by a range of social factors, including socioeconomic status, education, physical environment, and access to healthcare services (68, 77). In this context, healthcare access is understood as a multi-dimensional concept encompassing availability, affordability, accessibility, acceptability, and accommodation of healthcare services. Understanding these dimensions is crucial for identifying barriers and facilitators to healthcare access for young people (67).

Additionally, the Health Belief Model (HBM) serves as a valuable lens for examining the individual factors that influence young people's decisions to seek healthcare (77). This model posits that perceptions of susceptibility to health issues, the perceived severity of those issues, the perceived benefits of taking action, and the barriers to action significantly shape health behaviours (69). By applying the it, we can better understand how young people's beliefs and attitudes towards health may affect their healthcare-seeking behaviours, especially in the context of the COVID-19 pandemic. Integrating these frameworks allows this review to identify existing gaps in knowledge and highlight areas that warrant further research. Current literature has explored aspects of sexual and reproductive health (SRH), chronic diseases, non-communicable diseases (NCDs), and mental health among youth. However, significant gaps remain in our understanding of how COVID-19 and related lockdown measures have uniquely impacted these areas. For example, while research has documented the importance of SRH services for young people (70), it has not sufficiently addressed how disruptions during the pandemic specifically affected access to contraception, STI screenings, and reproductive health education (71). Similarly, while chronic diseases and NCDs are increasingly prevalent among youth, there is limited evidence on how the pandemic has influenced early diagnosis and management of these conditions in this population (72).

Mental health, particularly in the context of heightened stress and anxiety during global crises, remains a critical area of concern (73). Yet, there is a lack of comprehensive studies that explore how COVID-19 has affected mental health service utilization among young people, especially in institutional settings. By prioritizing these key areas of focus, this review aims to foster a deeper understanding of the unique challenges young people face in accessing healthcare during the pandemic. Identifying these gaps will inform targeted interventions and policy responses that can improve healthcare access and outcomes for this vulnerable population, ultimately contributing to more resilient healthcare systems in future public health crises.

Global impact of COVID-19 pandemic on healthcare access

Globally, the COVID-19 pandemic disrupted access to routine health services and information(19). Disruptions in non-emergency services led to delays in routine screenings, and reduced access to chronic and preventive health care, potentially impacting long-term health outcomes. The economic impact of the pandemic led to job losses resulting in loss of

health insurance coverage for many individuals. Additionally, healthcare systems faced staffing shortages among healthcare workers, challenging their capacity to provide care(20, 21). Staff shortages were caused by staff being redeployed to identifying and caring for COVID-19 patients, contracting COVID-19, or quarantining following exposure to COVID-19. This resulted in the rationing of health services(22, 23).

During the COVID-19 pandemic, access to healthcare services was profoundly affected, exacerbating existing disparities in healthcare access. Marginalised communities, including racial and ethnic minorities, low-income individuals, and rural populations, faced greater challenges in accessing care(24). Telehealth services rapidly expanded, with a 50% increase in telehealth visits in March 2020 compared to the previous year, as reported by the Centers for Disease Control and Prevention (CDC), to help mitigate the spread of the virus(25).

Challenges in Healthcare Access for Young People during the COVID-19 Pandemic

Access to healthcare services during the COVID-19 pandemic has presented multifaceted challenges for young people, impacting their health and well-being. According to a study by the Kaiser Family Foundation, approximately 41% of young adults aged 18 to 29 reported delaying or forgoing medical care during the pandemic due to concerns about COVID-19(26). Educational disruptions, exacerbated by school closures and remote learning, have raised concerns about developmental impacts and educational inequalities, with studies indicating that students from low-income families and marginalized communities being disproportionately affected by the shift to remote learning(27-29). In line with the Social Determinants of Health framework (ref), health disparities have been evident, with marginalized youth facing greater challenges in accessing care and experiencing greater impacts of the pandemic. Vulnerable populations of youth, including the homeless or those incarcerated by the juvenile justice system, have faced additional challenges due to limited access to healthcare and social services(30). Overall, the pandemic has underscored the importance of addressing the unique healthcare needs of youth and ensuring equitable access to care to mitigate the long-term impacts on their health and well-being.

Access to services for young people during the COVID-19 pandemic has been impacted by various factors, resulting in both challenges and adaptations. The pandemic also exacerbated mental health issues among young people, with increased levels of stress and anxiety reported(33). Disruptions in routine healthcare services, including preventive screenings,

have occurred(31). However, the rapid expansion of telehealth services has allowed young people to access healthcare remotely, including consultations and mental health support(32). Additionally, school closures have affected access to school-based health services, prompting adaptations such as virtual counseling sessions.

Furthermore, access to healthcare services for young people during the COVID-19 pandemic has been marked by significant disruptions, with studies indicating challenges in accessing timely care for diseases such as tuberculosis (TB), which disproportionately affects South Africa's population (20, 34, 35). Additionally, disruptions in healthcare services have impacted HIV/AIDS care and treatment, including HIV testing and antiretroviral therapy (ART) distribution, further underscoring the challenges faced by young people in accessing essential healthcare services during this time(36). These challenges have also led to difficulty accessing pre-exposure prophylaxis (PrEP), chronic medication management, termination of pregnancy, family planning and sexually transmitted disease screening and treatment(37, 38).

In sub-Saharan Africa, it was modelled that the worst-case scenario of stopping ART for six months for 50% of patients was estimated to result in an additional 296 000 HIV-related deaths in 2020(39, 40). To mitigate against this, the World Health Organization (WHO) recommended that countries should provide three to six months antiretroviral therapy (ART) supply during the pandemic(41). This recommendation was based on evidence that multi-month dispensing was an effective strategy to curb the spread of COVID-19 as it requires fewer routine clinic visits(42). Despite these recommendations by the WHO, there were patients who could not access care and treatment due to challenges such as supply chain and procurement of ART during lockdown(43, 44). In South Africa, the Treatment Action Campaign survey showed that 28% of the people living with HIV were given ART that only lasted for a month during the first wave of COVID-19(45). Surveys conducted in Nigeria, Kenya and Zimbabwe found that between 14% and 19% of people attempting to get a refill of ART were unsuccessful(46). Patients who required more active support and monitoring to ensure adherence and retention in care were adversely affected, with many of them discontinuing their ART(47).

During the lockdown period, primary healthcare utilization decreased by roughly 500 000 visits across the Gauteng province, a nearly 30% decrease, during March and April 2020, in comparison to pre-lockdown(48). Reproductive healthcare services such as family planning were particularly affected. Demand-driven family planning trends fell in the two months

leading up to the COVID-19 outbreak and continued to decline during the lockdown. The United Nations Population Fund (UNFPA) reported that, in 115 low to middle income countries, there were approximately 12 million women who could not access contraceptive services due to the disrupted services that lasted for approximately four months in 2020. This resulted in 1.4 million unwanted pregnancies(23).

In Gauteng province, where norethisterone enanthate injection was a commonly used long-acting contraceptive injectable, a decrease in usage of 22% to 10% among those who used contraception between April 2018 and April 2020 was noted(48). Furthermore there were 23 000 deliveries to adolescent girls less than 18 years between April 2020 and March 2021, a 60% increase from the previous period(49). It is anticipated that there was also a rise in unsafe abortions, resulting in increased expenditure in the future on sexual and reproductive health outcomes(50-52).

Healthcare access for youth enrolled in PSET institutions

In 2019, there were over 1,2 million young people enrolled in Post School Education and Training (PSET) institutions in South Africa, with 56.3% being enrolled in higher education institutions (both public and private), followed by Technical, Vocational, Educational and Training (TVET) colleges, Community Education and Training colleges and private colleges, 29.5%, 7.5% and 6.6% respectively(53). Young people who attend PSET institutions often access their routine and preventative health services through the PSET's Higher Health programs. Higher Health in South Africa is an organization dedicated to coordinating and implementing health programs for the higher education sector, addressing various health challenges faced by students and staff (54). Table 1 shows the range of healthcare services that young people in South Africa had routine access to before the COVID-19 lockdown. These services encompassed preventative health measures, sexual reproductive health services, curative health interventions, and mental health support.

Table 1. Overview of healthcare services accessible to young people before lockdown

Healthcare Services	Before Lockdown
Preventative Health Services	HIV testing; HIV prevention medications such as ART, PrEP, and Pre- Exposure Prophylaxis; Referral for medical male circumcision
Sexual Reproductive Health Services	Family planning and emergency contraception; STI screening and treatment; Referral for termination of pregnancy or antenatal care; Follow-up treatment and cancer screenings such as pap smear
Curative Health Services	Early detection and management of non-communicable diseases (NCDs)
Mental Health Services	Counselling and referral to specialist care

These services were provided through institution-based or mobile clinics depending on the type of institution(54). During lockdown, these services were not available due to temporary closure of institutions and imposed social distancing requirements. Thus, it is hypothesized that the non-availability of these institution-based clinics would have led to declined access to healthcare for this population. Although research focusing on the impacts of the lockdown on the health of the general population has been undertaken(55), little is known about the effects of the lockdown on health service utilization among young people attending PSET institutions.

Transition to Digital Healthcare Communication Platforms during the pandemic?

Due to the government mandated restrictions imposed on travel and physical contact, people in their personal capacity and businesses were forced to consider alternative means to communicate and conduct business. Digital communication platforms (video and telephone calls) and other remote work technologies became more widely used. Technologies such as telemedicine (remote treatment or diagnosis of patients through telecommunication technologies) were encouraged to reduce physical contact between health care staff and patients and between patients in health facilities(56). These remote work communication alternatives are reported to be an effective and safe method of assisting with health services and adherence(57, 58).

However, studies have shown that underserved patient populations, such as low-income and rural residents, are less likely to use telemedicine than other populations(59-61). Commentators reported that during the COVID-19 pandemic, the most vulnerable populations may face overlapping barriers to telemedicine, such as limited access to technology, low telehealth literacy, and financial constraints(62-65). Little is known about access to healthcare services through different communication platforms or technologies for young people during the pandemic.

The significance of this study lies in its exploration of how COVID-19 lockdown measures specifically impacted young people's access to healthcare services at Post-School Education and Training (PSET) institutions in South Africa, highlighting critical barriers such as restricted services, heightened exposure risks, and logistical challenges. The implications of the findings are substantial, as they aim to inform targeted interventions and policy responses that enhance healthcare access and outcomes for this vulnerable population, ultimately contributing to the development of more resilient healthcare systems during future public health crises.

Therefore, this study aims to investigate young peoples' access to healthcare services and determine the most frequently used communication (online, telephone or face-to-face) platforms for health and social support services for young people enrolled in higher institutions during the first wave of COVID-19.

Problem Statement

The central problem to be addressed by this research study is the impact of COVID-19 lockdown measures on young people's access to healthcare services, particularly those attending PSET institutions in South Africa. This issue arose from the significant disruptions caused by lockdown measures, which have particularly affected routine healthcare services, thereby posing challenges for young people in accessing essential healthcare resources during the pandemic. To delve deeper into this problem, the researcher identified three main facets:

Firstly, it is essential to examine how restricted healthcare services have affected young people's access to care. Lockdown measures necessitated the reallocation of resources towards managing COVID-19, leading to the suspension or reduction of routine and preventive services. According to a World Health Organization report, approximately 90% of countries experienced significant disruptions in essential health services during the early months of the pandemic, including reductions in immunization services and mental health

support (74). These disruptions are particularly concerning for young people who rely on routine healthcare for vaccinations, sexual and reproductive health services, and mental health support.

Secondly, the heightened risk of COVID-19 exposure among young people attending PSET institutions presented a critical barrier to healthcare access. Many young individuals faced increased risks in communal living and crowded campus environments. A study from the Kaiser Family Foundation revealed that around 48% of young adults aged 18 to 29 reported delaying or forgoing medical care due to concerns about COVID-19 transmission (75). This fear has led to a significant decline in healthcare utilization, exacerbating existing health disparities and preventing young people from accessing essential services.

Finally, logistical challenges, such as transportation disruptions and the need for students to relocate from campus residences, further complicated access to healthcare. These barriers disproportionately affected young people from marginalized communities. A report from the United Nations Population Fund highlighted that low-income and marginalized populations faced increased challenges in accessing healthcare during the pandemic, emphasizing the intersection of socioeconomic status and health access (76).

Addressing these multifaceted challenges requires a comprehensive understanding of how lockdown measures have influenced young people's access to healthcare services. By exploring the effects of restricted healthcare services, the risks of COVID-19 exposure, and logistical barriers, this study aims to provide valuable insights into the unique challenges faced by young people during the pandemic. The findings will inform targeted interventions and policy responses designed to enhance healthcare access and improve outcomes for young people attending PSET institutions in South Africa amidst this ongoing public health crisis.

Justification

The proposed research study aimed to describe the effects of COVID-19 lockdown measures on access to healthcare services among young people attending PSET institutions in South Africa during the first wave of the pandemic. While access to healthcare services in facilities was reported to be lower for the general population, the researcher is interested in learning if young people enrolled in higher institutions experienced similar difficulties accessing routine healthcare, particularly given the temporary closure of PSET institutions and the health services provided through them. Digital health systems were rapidly adopted by health professionals during the pandemic, however there is limited data on how accessible these

were to young people. Studies have found that young people with higher education levels, often referred to as "post-education," are more proficient in accessing digital healthcare services compared to those with no higher education(66). This difference may stem from increased digital literacy skills among individuals who have pursued further education, enabling them to navigate digital platforms effectively. This is one of few studies that will provide evidence on young people's access to routine healthcare during the COVID-19 pandemic and the potential to help place better structures to improve access to healthcare during future pandemics.

Research Question

How was access to healthcare services among youth attending PSET institutions affected during the first COVID-19 wave by lockdown measures?

Study Aim

The aim of this study is to report on access to healthcare services among youth attending PSET institutions during the first wave of the COVID-19 pandemic in South Africa.

Objectives

1. To describe access to healthcare services among PSET youth during the first wave of the COVID-19 pandemic.
2. To describe the most frequently used communication (online, telephone or face to face) platforms for health and social support services among the PSET youth during the first wave of the COVID-19 pandemic.
3. To determine the factors associated with access to health services among the PSET youth during the first wave of the COVID-19 pandemic.

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Manuscript in Submissible Format

Access to Healthcare Services among Youth Enrolled in Post School Training and Education (PSET) during the First Wave of the COVID-19 Pandemic in South Africa

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Abstract

Background: The global healthcare landscape has faced unprecedented challenges in the wake of the COVID-19 pandemic, with barriers to access driven by a myriad of demographic, social, and environmental factors. This paper aimed to report on access to healthcare services among young people attending Post School Training and Education (PSET) institutions during the first wave of the COVID-19 pandemic in South Africa.

Methods: A secondary data analysis was done based on a cross-sectional online survey conducted in 2020. Between 18 June and 18 September 2020, N=13 119 youth aged 18-35 years completed the survey of which n=4 404 met the inclusion criteria for this analysis. Descriptive statistics were used to characterize access to healthcare services by socio-demographic, substance use and COVID-19 related factors. A multivariable forward stepwise logistic regression analysis was conducted to determine factors associated with access to healthcare services during the COVID-19 pandemic.

Results: Of 4 404 students, 71% reported having accessed healthcare services during the COVID-19 pandemic. Students aged 25-29 years had increased odds of healthcare access (AOR=1.49, 95% CI [1.18-1.87]). White students demonstrated significantly increased odds of accessing healthcare (AOR=2.78, 95% CI [1.79-4.32]), along with Indian/Asian individuals (AOR=2.04, 95% CI [1.19-3.54]). Those reporting alcohol use showing a higher likelihood of accessing healthcare services (73.1%, p=0.04). In contrast, young people using recreational drugs were significantly less likely to access healthcare services (AOR=0.50, 95% CI [0.29-0.87]). Students with lower COVID-19 risk perceptions were more likely to have access to healthcare services (AOR=1.23, 95% CI [0.96-1.56]).

Conclusions: The COVID-19 pandemic has worsened existing healthcare access disparities among students, requiring targeted efforts for the well-being of students, especially in the Black Africans residing in informal settlements. These findings underscore the urgent need for tailored interventions. Future research should prioritize pandemic-ready, targeted interventions, like youth-friendly services and telemedicine integration, to enhance healthcare accessibility and to ensure continuity of care by connecting students receiving healthcare in higher institutions to local clinics.

Keywords: healthcare service access; COVID-19 pandemic; young people; South Africa

Introduction

COVID-19 is a respiratory illness that emerged in Wuhan, China, in December 2019(1). It primarily affected the elderly and individuals with underlying health conditions, causing severe respiratory symptoms(2). Younger people typically experienced milder symptoms when infected with COVID-19(3). In South Africa, the first COVID-19 cases were confirmed on March 5, 2020(4). A nationwide COVID-19 lockdown, imposed from March 26 to April 31, allowed only essential services like medical facilities to operate(5). During the first COVID wave, which lasted from the 24th week of 2020 (35.7 cases per 100 000 persons) to the 34th week of 2020 (<30 cases per 100 000 persons), health resources were focused on COVID-19 testing and management (6). Isolation guidelines caused staff shortages at medical facilities, severely affecting access to health education and routine health and social support services(6-11). The impact of health service disruption on the youth was largely unexplored (13). The second wave occurred from the 47th week of 2020 (30.2 cases per 100 000 persons) to the 5th week of 2021 (<30 cases per 100 000 persons). The third wave took place from the 19th week of 2021 (30.9 cases per 100 000 persons) to the 37th week of 2021 (<30 cases per 100,000 persons). As the waves continued healthcare services access for the general population gradually improved(12).

During the COVID-19 pandemic in South Africa, the accessibility to healthcare faced a notable decline(13). Healthcare access refers to ease or ability to obtain needed healthcare services and it is affected by other barriers such as social, cultural, financial and organizational issues(14). Primary healthcare utilization decreased by roughly 500 000 visits across the Gauteng province, a nearly 30% decrease, during March and April 2020(15). Primary public health facilities in South Africa provide routine preventive, curative and chronic health services. Access to routine healthcare services during the first wave of COVID-19 was influenced by a complex interplay of demographic, individual, social, environmental, and communication-related factors. These factors collectively shaped how individuals could seek and receive healthcare services during a challenging and unprecedented time. For students, this meant their access to routine, preventative and chronic care health services were disrupted(16).

Globally, the COVID-19 epidemic disrupted access to standard medical services and information(17). During the COVID-19 pandemic, people were forced to consider alternative means to communicate and conduct business. Digital communication platforms (video and

telephone calls) and other remote work technologies became more widely used. Telemedicine was encouraged to reduce physical contact between health care staff and patients(18). These remote work alternatives were reported to be an effective and safe method of assisting with accessing health services and adherence support(19). However, studies have shown that low-income and rural populations may be less likely to use digital communication platforms than other populations(20-25). Little is known about access to healthcare services through different communication platforms or technologies for young people during the pandemic.

In 2019, 1.2 million young people in South Africa were enrolled in Post School Education and Training (PSET) institutions. Before the lockdown, they had regular access to healthcare services through the institutions' Higher Health programs. Higher Health works on behalf of the Department of Higher Education and Training to collaborate with other higher education institutions, the private sector, the United Nations, and civil society formations to provide a range of primary health care services across colleges and university campuses. While research on the general population's health impacts during the lockdown exists(26), little is known about how it affected healthcare utilization among youth in PSET institutions. This study is significant because it examines the effects of COVID-19 lockdown measures on young people's access to healthcare services at Post-School Education and Training (PSET) institutions in South Africa, identifying crucial barriers like limited service availability, increased exposure risks, and logistical difficulties. The findings have important implications, as they seek to guide targeted interventions and policy initiatives aimed at improving healthcare access and outcomes for this vulnerable group, thereby helping to build more resilient healthcare systems for future public health emergencies.

The two theoretical frameworks that best explain access to healthcare and barriers that influence young people's healthcare seeking behaviours in the context of the current study are the Social Determinants of Health (SDOH) and the Health Belief Model (HBM). The Social Determinants of Health model examines how various social factors such as socioeconomic status, education, environment, and healthcare access impact health outcomes (70). Healthcare access is viewed through multiple dimensions, including availability, affordability, accessibility, acceptability, and accommodation, which are critical to understanding barriers young people face in seeking healthcare. The Health Belief Model further aids in exploring how individual beliefs about susceptibility, severity, benefits, and barriers influence young people's healthcare-seeking behavior, particularly during the COVID-19 pandemic (66, 70). By integrating SDOH and HBM, this analysis identifies research gaps in understanding the pandemic's impact on young people's access to sexual and reproductive health (SRH), chronic diseases, non-

communicable diseases (NCDs), and mental health services, emphasizing the need for further research on pandemic-specific disruptions in these areas (79). Therefore, this study aims to report on access to healthcare services, determine factors associated with access to healthcare services by youth enrolled in higher institutions and to determine the most frequently used communication platforms (online, telephone or face to face) for health and social support services for students enrolled in higher institutions during the first wave of COVID-19 in South Africa.

Methods

Study design and setting

This study is a secondary analysis of cross-sectional data sourced from an online survey titled 'Social Impact of the COVID-19 Pandemic among Post School Education and Training (PSET) Sector Youth in South Africa. The focus of this secondary analysis was to examine the accessibility of healthcare services among youth attending PSET institutions during the first wave of the COVID-19 pandemic in South Africa.

The Human Sciences Research Council (HSRC) conducted a study from June 18 to September 18, 2020, to investigate the effects of the first COVID-19 lockdown, surveying individuals about their experiences and circumstances during that period. All young people enrolled in PSET institutions were invited to participate; with 13 119 completing the survey. Higher education institutions were categorized based on their locality, including urban, rural, and township (underdeveloped urban areas). The online survey was hosted on the biNu data free platform: https://hsrc.datafree.co/r/CovidYouth.

To publicize the study and encourage participation among young people, a variety of mainstream media channels- including email, television and radio broadcasts, and social media were utilized, alongside two bulk SMS campaigns. These efforts aimed to recruit young people from all provinces, as well as strategic partners within the South African government and higher education institutions.

Communication alerts included both the invitation and data-free survey link which directed potential participants to the online survey. The survey comprised 58 closed-ended questions that took approximately 25 minutes to complete and was automatically uploaded to the server once the participant had completed it.

Study population and sample

The primary study targeted young people aged 18 to 35 years enrolled in either public or private higher institutions in South Africa, excluding those who were unable to comprehend or provide informed consent.

For this study, the sample includes only young people enrolled in any PSET institutions in South Africa during 2020. Variables lacking data on both the outcome (access to healthcare services) and key explanatory factors, such as socio-demographic, substance use and COVID 19, were excluded. Consequently, the final sample for the secondary data analysis comprised 4 404 participants for the study.

Data collection procedures

The outcome variable was access to healthcare services (yes=1 and no=0) among youth enrolled in PSET institutions. Access to healthcare services is based on responses to the following questions (yes=1, no=0): during the past three months were you able to access birth control, barrier contraceptives, chronic medication, antiretroviral therapy (ART), medical care, and counselling support with a single positive response to accessing any service being considered "1"? Responses were pooled and dichotomized into a binary outcome (yes=1, no=0) indicating access to healthcare services.

Explanatory variables were socio-demographic variables such as age group in years (18-24 years, 25-29 years, and 30-35 years); sex (male or female); race groups as designated by Statistics South Africa (Stats SA), which include five groups(27): Black African, Coloured, White, Indian/Asian, and Other; locality (city, suburb, township, informal settlements, rural and farm); and orphanhood status/ parents still alive (both my parents are alive, only my mother is alive, only my father is alive, neither of them are alive, do not know the whereabouts of my parents).

Respondents were also asked questions on substance use, viz. how often do currently use the following: (Smoked marijuana/dagga, Vapes/ electronic cigarettes, Drink alcohol, take recreational drugs, Smoked cigarettes, response options were: 1= yes, daily, 2= yes, but occasionally and 3= no, not at all. All above mentioned substance use questions were dichotomized, with 1 = yes (yes, daily, and yes, but occasionally) and 0 = no. See table 1 for

COVID-19 related questions.

Table 1. COVID-19 related questions

COVID-19 Related Factors	Response Options
COVID-19 Knowledge	
"How is COVID-19 spread?"	1 = Infected persons coughing or sneezing
	2 = By being in a public gathering with an infected person
	3 = Touching virus-contaminated surfaces
	4 = Touching your face after contact with an infected person
	5 = I don't know
Risk Perception for COVID-19	
"How do you rate your PERSONAL RISK of contracting COVID-19?"	1 = Very high risk
	2 = High risk
	3 = Moderate risk
	4 = Low risk
	5 = Very low risk

Response categories were aggregated into three response categories (1 = Low risk (very low risk and low risk), 2 = Moderate risk, 3 = High risk (very high risk and high risk).

COVID-19 challenges during the pandemic based on the question, “What do you think are the main challenges (if any) you have faced in your daily life with the outbreak of Coronavirus (COVID-19)?” Response options included: 1= loss of study time, 2= not enough money for food, 3= not enough money for essentials (personal items, studying), 4= unable to pay rent, 5= unable to pay home load / bond, 6= no transport, 7= faced no challenges, 8= loss of social contact with family and friends, 9= loss due to death in the family or community, and 10= inability to access medical care or chronic medication, with participants able to select one or more options.

Most frequently used communication (online, telephone calls or face to face) platforms to access social and health support included: Financial Aid, Mental health support, Health care services, international students support, Diversity Support (disability, LGBTQI), Student admin support, Student accommodation support and Student Representative council).

Response options for each were 1= Online, 2=Face-to-face and 3=Telephone.

Statistical Analysis

Data extraction was conducted in Microsoft Excel to extract data from the primary dataset for PSET youth access to healthcare services. This data was then saved, screened, and imported into STATA version 17 for data cleaning(28). This was then followed by validation of the new data set. Validation was conducted through frequency tables of all variables to check for extreme values. Cross tabulation was done for variables that were similar, to check for inconsistency.

Descriptive statistics were performed to provide a comprehensive summary and characterization of individuals who had access to healthcare services during the COVID-19 pandemic. This analysis used a range of statistical techniques, such as frequencies and proportions to describe categorical variables. These variables included demographics, healthcare utilization, and factors related to COVID-19.

Bivariate logistic regression analysis was conducted to assess the relationship between access to healthcare services and potential explanatory variables. A cut-off of $p<0.2$ for variables associated with the outcome in the bivariate analysis was used to determine variables to include in the multivariable logistic regression analysis. Unadjusted and adjusted odds ratios (AOR) are presented with 95% confidence intervals (CI) for the bivariate and multivariable analyses, respectively. A p-value <0.05 was considered statistical significance.

Studies showed that re-weighted online samples can produce response patterns that are statistically similar to population characteristics(29, 30). Therefore, the survey data were then benchmarked (weighted) to the distribution of South Africa's estimated PSET population by age, sex, population group, and province using the estimated sampling frame database. Benchmarking was aimed at correcting for potential bias that may result due to the convenient sampling. Benchmarking ensures that the views and perceptions of overrepresented sectors of the PSET youth population are scaled downwards and those of less represented are illuminated. This in turn enabled us to increase generalizability to the national sample of youth enrolled in higher institutions.

Results

Characteristics of the study sample

The study sample consisted of 4 404 participants (Table 2). Majority of the youth were aged 18-24 years (73%), females (74%) and were black Africans (79%). In terms of province of study, the majority of participants were studying in Gauteng (48.7%), followed by KwaZulu-Natal (15.6%) and the Western Cape (7.2%). More than half of the participants reported to have both their parents alive (58%). Income was reported to be earned by either the mother (24%) or the sibling (20%). Over a third of the participants resided in townships (36%). Most participants reported that they do not drink alcohol (55%), do not smoke marijuana/dagga (88%), and do not take recreational drugs (97%). During the pandemic, over seventy percent of the youth were living at home (78%). Despite less than half having low COVID-19 risk perceptions (47%), the majority believed that COVID-19 is spread through touching contaminated areas (89%). Approximately a third of the youth used scientific journals as their COVID-19 source of information (34%) during the pandemic followed by government sources (18%). Losing contact with family and friends was the most commonly experienced COVID-related challenge (31%). Additionally, 11.6% indicated that they were unable to access medical care or chronic medication during this time. Over a quarter of the participants reported needing birth control (24.8%) and barrier contraception (24.9%) during the last three months, but a significant portion of participants were unable to access these services when needed. Specifically, 14.4% were unable to access birth control and 7.7% faced barriers to accessing barrier contraception. More than forty percent (40.6%) were able to access medical care when needed, but 15.6% reported being unable to do so. Access to chronic medication (14.7%) and ART (7%) was lower, with large percentages of participants either not needing or not attempting to access these services.

The service that many youth needed but couldn’t access was counseling support (30.6%), including bereavement counseling (18.8%). In total, 11.6% were able to access general counseling services when needed, while only 6.6% could access bereavement counseling. Overall, while the majority of participants (72%) reported being able to access healthcare, significant gaps remain in accessing reproductive health, chronic care, and mental health services.

306 **Table 2.** Characteristics of the study sample (N= 4 404)

307

Variables	Total	%	Missing data
Age groups in years (n=4396)			
18-24	3 227	73.4	8
25-29	873	19.9	
30-35	296	6.7	
Sex (n=4238)			
Female	3 125	73.7	166
Male	1113	26.3	
Race (n=4381)			
Black African	3 458	78.9	23
White	554	12.6	
Colored	211	4.8	
Indian/Asian	158	3.6	
Which province are you studying in? (n= 4404)			
Western Cape	319	7.2	
Eastern Cape	236	5.4	
Northern Cape	51	1.2	
Free State	197	4.5	
KwaZulu-Natal	686	15.6	
North-West	350	7.9	
Gauteng	2,146	48.7	
Mpumalanga	152	3.5	
Limpopo	267	6.1	
Who earns a salary (n=3812)			
Mother	905	23.7	592
Brother/Sister	875	23.0	
Father	795	20.9	
Myself	466	12.2	
Aunt/Uncle	369	9.7	
Boyfriend/Girlfriend	224	5.9	
Grandmother	140	3.7	
Grandfather	38	1.0	
Locality (n=4404)			

Township	1 591	36.1	-
Suburb	1 162	26.4	
Rural (traditional tribal area)	822	18.7	
City	502	11.4	
Informal settlement	256	5.8	
Farm	71	1.6	
Orphanhood status (parents are still alive) (n=4366)			
Both my parents are alive	2 545	58.3	38
Only my mother is alive	1 124	25.7	
Neither of them are alive	395	9.0	
Only my father is alive	202	4.6	
Don't know the whereabouts of my parent/s	100	2.3	
Alcohol use (n=4322)			
No	2 366	54.7	82
Yes	1 956	45.3	
Marijuana / Dagga (n=4252)			
No	3 746	88.1	152
Yes	506	11.9	
Other recreational drugs (n=4213)			
No	4 091	97.1	191
Yes	122	2.9	
Place of residence during the lock down (n=4364)			
At home like I usually do	1 770	40.6	40
I returned home because of the COVID -19 outbreak	1 642	37.6	
Staying with family/Relatives	373	8.5	
I had to rent a place due to the crisis	257	5.9	
Staying in a campus residence	232	5.3	
Staying with friends	66	1.5	
I have no place to stay	24	0.5	
How is covid-19 spread (n=4340)			
Touching virus contaminated surfaces	3 853	88.8	64
Coughing/Sneezing	205	4.7	
I don't know	147	3.4	

Public gathering where there is an infected person	135	3.1	
COVID-19 risk perceptions (n=4385)			
High risk	789	18.0	19
Moderate risk	1 520	34.7	
Low risk	2 076	47.3	
COVID-19 information source (select all that apply) (n=4389)			
Scientific journals	1 493	34.0	15
Government sources (President, Minister of health, etc.)	803	18.3	
Have not considered what I would do	573	13.1	
News websites or mobile apps	350	8.0	
Social media (excluding WhatsApp)	213	4.9	
Email	191	4.4	
SMS	178	4.1	
Friends Family	152	3.5	
Government WhatsApp Groups (WHO, Department of Health)	104	2.4	
Personal doctor	98	2.2	
Radio	87	2.0	
Satellite television (DSTV, Open View)	65	1.5	
Local television	42	1.0	
Spouse or children	20	0.5	
Other mobile chat services	11	0.3	
Private WhatsApp messages	9	0.2	
Life challenges during COVID-19 (n=4328)			
Loss of social contact with family/friends	1 356	31.3	76
Not enough money for essentials (personal items, studying)	769	17.8	
Loss due to death in the family/community	567	13.1	
Inability to access medical care/chronic medication	502	11.6	
Loss of study time	344	7.9	

Unable to pay rent	234	5.4	
Faced no challenges	192	4.4	
No transport	169	3.9	
Not enough money for food	133	3.1	
Unable to pay home load/bond	62	1.4	
During the last 3 months did you need the following and were NOT able to access healthcare?			
Birth Controls (n=4,351)			
YES, I needed it and was ABLE to access	1,079	24.8	53
YES, I needed it and was NOT ABLE to access	627	14.4	
NO I did not need it and did not try to	2,645	60.8	
Barrier Contraception (n=4,334)			
YES, I needed it and was ABLE to access	1,097	24.9	70
YES, I needed it and was NOT ABLE to access	332	7.7	
NO I did not need it and did not try to	2,905	67	
Chronic Medication (n=4,299)			
YES, I needed it and was ABLE to access	634	14.7	105
YES, I needed it and was NOT ABLE to access	175	4.1	
NO I did not need it and did not try to	3,490	81.2	
ART (n=4,298)			
YES, I needed it and was ABLE to access	300	7	
YES, I needed it and was NOT ABLE to access	109	2.5	
NO I did not need it and did not try to	3,889	90.5	
Medical Care (n= 4,314)			
YES, I needed it and was ABLE	1,750	40.6	90

to access			
YES, I needed it and was NOT ABLE to access	675	15.6	
NO I did not need it and did not try to	1,889	43.8	
Counselling support (n=4,314)			
YES, I needed it and was ABLE to access	499	11.6	90
YES, I needed it and was NOT ABLE to access	1,320	30.6	
NO I did not need it and did not try to	2,495	57.8	
Counselling support and bereavement (n=4,299)			
YES, I needed it and was ABLE to access	283	6.6	105
YES, I needed it and was NOT ABLE to access	809	18.8	
NO I did not need it and did not try to	3,207	74.6	
Access to healthcare (4404)			
No	1,234	28	
Yes	3,170	72	

Access to healthcare services among PSET youth

Table 3 shows access to healthcare services by socio-demographic, substance use and COVID-19 related characteristics among study participants. Overall, 72% of the youth had access to healthcare services. Young people aged 18-24 and 25-29 years had more access to healthcare services (70% and 76%) compared to the older age group 30-35 years (26%). Access to healthcare services was significantly (p=0.001) low among Black African (32%) and Coloured youth (30%) compared to the other population groups (White 87% and Indian/Asian youth 84%). Most youth who did not access healthcare services resided on farms (38%) and settlements (42%, p=0.001), and did not know the whereabouts of their parents (44%, p=0.01). Access to healthcare services was significantly higher among those who reported alcohol use (73%; p=0.04) while those who used recreational drugs were significantly less likely to access healthcare (71%; p=0.03). Access to healthcare services was

significantly higher among those who stayed at home during lockdown (75%; p=0.01) compared to those who had no place to stay (42%). Those who had low risk perceptions (74%), and youth who did not have social contact with family/friends (24%) had lower access to healthcare services.

Table 3. Bivariate Analysis of Healthcare Access by Socio-Demographic, Substance Use, and COVID-19 Factors (N=4 212)

Access to healthcare services	No (%)	Yes (%)	p-value
Total (N= 4 212)	1 198(28)	3 014(72)	
Age groups (n= 4 212)			
18-24	922 (29.8)	2 173 (70.2)	**0.03***
25-29	204 (24.3)	634 (75.7)	
30-35	72 (25.7)	207 (74.3)	
Sex (n= 4 211)			
Female	873 (28.1)	2 234 (71.9)	0.26
Male	332 (30.1)	772 (69.9)	
Race (n= 4 211)			
Black African	1 044 (31.5)	2 270 (68.5)	**0.001*****
White	70 (13)	471 (87)	
Coloured	60 (30.2)	139.6 (69.8)	
Indian/Asian	25 (16)	131 (84)	
Locality (n= 4 211)			
Township	491 (32.4)	1 025 (67.6)	**0.001*****
Suburb	243 (21.6)	880 (78.4)	
Rural (Traditional tribal area)	236 (30.2)	545 (69.8)	
City	116 (24.1)	365 (75.9)	
Informal settlement	93 (38.1)	150 (61.9)	
Farm	28 (41.9)	39 (58.1)	
Orphanhood status (parents are still alive) (n=4174)			
Both my parents are alive	654 (26.9)	1 776 (73.1)	**0.01****
Only My mother is alive	334 (31)	744 (69)	
Neither of them are alive	108 (28.6)	269 (71.4)	
Only My father is alive	67 (34.3)	129 (65.7)	

Don't know the whereabouts of my parent/s	41 (44.1)	52 (55.9)	
Alcohol use (n=4134)			
No	23 (30.6)	1 577 (69.4)	**0.04***
Yes	501 (26.9)	1 360 (73.1)	
Marijuana / Dagga (n=4068)			
No	1 043 (29.1)	2 541 (70.9)	0.81
Yes	144 (29.8)	339.7 (70.2)	
Other recreational drugs (n=4028)			
No	1 119 (28.6)	2 794 (71.4)	**0.03***
Yes	46 (40.1)	69 (59.9)	
Place of residence during the lock down (n=4172)			
I returned home because of the COVID -19 outbreak	499.5 (31.9)	1066.5(68.1)	**0.01****
At home like I usually do	423 (24.8)	1282(75.2)	
Staying with family/Relatives	97 (27.8)	253(72.2)	
I had to rent a place due to the crisis	80 (32.5)	167(67.5)	
Staying in a campus residence	67 (31)	149.7 (69)	
Staying with friends	22 (34.5)	43(65.5)	
I have no place to stay	9 (41.7)	13(58.3)	
How is covid spread (n=4150)			
Touching virus contaminated surfaces	1 090 (29.6)	2594 (70.4)	0.26
Coughing/Sneezing	43 (22.1)	152 (77.9)	
I don't know	40 (27.8)	104 (72.2)	
Public Gathering where there is an infected person	32 (25.3)	94 (74.7)	
COVID-19 risk perceptions (n=4192)			
High risk	233 (31.1)	515 (68.9)	**0.001*****
Moderate risk	476 (32.5)	989 (67.5)	
Low risk	507 (25.6)	1472 (74.4)	
COVID-19 source of information (n=4197)			
Scientific journals	432 (30.5)	986 (69.5)	0.32
Government sources (President, Minister of Health, etc.)	212 (27.4)	561 (72.6)	
News websites or mobile apps	102 (30.8)	228 (69.2)	

Social media (excluding WhatsApp)	60 (29)	70 (71)	333
Friends Family	50 (34.3)	78 (65.7)	
Satellite television (DSTV, Open View)	23 (37.8)	38 (62.2)	
Radio	21 (25)	62 (75)	
Government WhatsApp Groups (WHO, Department of Health)	21 (21.7)	9 (78.3)	
Personal doctor	15 (16.2)	(83.8)	
Local television	14 (33.8)	27 (66.2)	
Spouse or children	9 (44.5)	11 (55.5)	
No information source considered	6 (25.1)	413 (74.9)	
Other mobile chat services	5 (43.6)	6 (56.4)	
Private WhatsApp messages	3 (27.8)	6 (72.2)	
Life challenges during COVID-19 (n=4141)			
Loss of study time	83 (25.4)	243 (74.6)	**0.001*** **
Not enough money for food	34 (26.2)	95 (73.8)	
Not enough money for essentials (personal items, studying)	224 (30.2)	517 (69.8)	
Unable to pay rent	62 (28.1)	159.6(71.9)	
Unable to pay home load/bond	23 (37.7)	37 (62.3)	
No transport	52 (32.7)	106 (67.3)	
Faced no challenges	29 (15.9)	154 (84.1)	
Loss of social contact with family/friends	318 (24.4)	987 (75.6)	
Loss due to death in the family/community	174 (32.2)	366 (67.8)	
Inability to access medical care/chronic medication	202 (42.4)	275 (57.6)	

***P<0.001; **P<0.01; *P<0.05

Communication platforms used to access health and social support services

Table 4 shows the most frequently used communication platforms to access health and social support services among young people who stayed at home, with relatives, or rented accommodationdue to the outbreak. The data showed that 4, 37.8% (n=1603) had face-to-face communication for healthcare services, which is higher than 7.2% for financial aid support- place of residence-specific services 48% (N=4238), mental health support 60% (N=4243), financial aid 58% (N=4274), international student support 77% (N=4171) and diversity support 79% (N=4149).

Table 4. Communication platforms used to access health and social support services

Communication Platforms	Total	%
Mental health support (n=4243)		
Online	1212	28.6
Face-to-face	469	11.1
Telephone	2562	60.4
Healthcare services (n=4238)		
Online	623	14.7
Face-to-face	1603	37.8
Telephone	2012	47.5
Financial Aid Support (National Student Financial Aid Scheme-NSFAS) (n=4274)		
Online	1496	35.0
Face-to-face	308	7.2
Telephone	2470	57.8
International student support (n=4171)		
Online	834	20.0
Face-to-face	130	3.1
Telephone	3207	76.9
Diversity Support (people with disability, LGBTQI+) (n=4149)		
Online	653	15.7
Face-to-face	213	5.1
Telephone	3283	79.1

Factors associated with access to healthcare service among PSET youth

Table 5 presents the bivariable analysis of factors associated with access to healthcare services amongst PSET youth. Young adults aged 25-29 years, individuals of White and Indian/Asian ethnicity, those who stayed at home prior to COVID-19, and those with low COVID-19 risk perceptions were all more likely to have access to healthcare services (OR=1.33, 95% CI [1.08-1.64], OR=3.07, 95% CI [2.14-4.40], OR=2.41, 95% CI [1.48-3.91], OR=1.42, 95% CI [1.17-1.72], and OR=1.31, 95% CI [1.0-1.65]). Lack of transport and alcohol consumption were also associated with increased odds of accessing healthcare

(OR=1.71, 95% CI [1.03-3.15] and OR=1.19, 95% CI [1.01-1.41]), respectively.

Conversely, individuals residing in townships (OR=0.66, 95% CI [0.49-0.88]), informal settlements (OR=0.51, 95% CI [0.34-0.78]), and farms (OR=0.44, 95% CI [0.23-0.83]) had significantly lower odds of accessing healthcare services. Participants who use recreational drugs (OR=0.51, 95% CI [0.37- 0.96]) were less likely to have access to healthcare services. Those who did not know the whereabouts of their parents and those who only had a mother still alive significantly had less access to healthcare (OR=0.47, 95% CI [0.28- 0.78]) and (OR=0.82, 95% CI [0.68- 0.91]), respectively. As well as those who lost family or community members to death (OR=0.46, 95% CI [0.32- 0.66]).

Multivariable logistic regression results (Table 5) showed that some of the significant factors in the unadjusted analysis remained associated with healthcare access in the adjusted analysis. Those who knew that COVID-19 is spread through touching virus-contaminated surfaces were less likely to access healthcare services (AOR=0.63 (95% CI [0.40- 0.91]). The odds of accessing healthcare services were also significantly lower among those who reported loss of social contact with family/friends (AOR=0.66, 95% CI [0.45- 0.99].

Table 5. Factors associated with access to healthcare services (N=4 212)

Access to healthcare	Unadjusted OR [95% CI]	Adjusted OR [95% CI]
Age (years) (n= 4 212)		
18-24	ref	ref
25-29	**1.33[1.08- 1.64] ****	**1.49[1.18- 1.87] *****
30-35	1.23[0.89- 1.72]	1.52[1.03- 2.23]
Sex (n= 4 211)		
Female	ref	ref
Male	0.90[0.76- 1.08]	1.04[0.86- 1.27]
Race (n= 4 211)		
Black African	ref	ref
White	**3.07[2.14- 4.40] *****	**2.78[1.79- 4.32] *****
Coloured	1.06[0.74- 1.53]	1.05[0.70- 1.57]
Indian/Asian	**2.41[1.48- 3.91] *****	**2.04[1.19- 3.54] ****
Locality (n= 4 211)		
City	ref	ref

Suburb	1.15[0.84- 1.57]	0.96[0.68- 1.36]
Township	**0.66[0.49- 0.88] ****	0.79[0.57- 1.09]
Informal settlement	**0.51[0.34- 0.78] *****	**0.60[0.38- 0.95] ***
COVID-19 risk perceptions (n= 4 192)		
High risk	ref	ref
Moderate risk	0.94[0.74- 1.18]	0.91[0.71- 1.16]
Low risk	**1.31[1.05- 1.65] ***	**1.23[0.96- 1.56] ****
Life challenges during COVID- 19 (n=4 141)		
Inability to access medical care/chronic medication	ref	ref
Loss of study time	0.96[0.55- 1.66]	0.79[0.44- 1.41]
Not enough money for food	0.78[0.55- 1.11]	0.74[0.51- 1.07]
Not enough money for essentials (personal items, studying)	0.87[0.55- 1.38]	0.85[0.51- 1.42]
Unable to pay rent	0.56[0.28- 1.13	0.49[0.23- 1.05]
Unable to pay home load/bond	0.61[0.43- 1.15]	0.64[0.38- 1.08]
No transport	**1.71[1.03- 3.15] ***	1.28[0.71- 2.32]
Faced no challenges	1.05[0.76- 1.46]	0.77[0.54- 1.10]
Loss of social contact with family/friends	0.72[0.41- 1.03]	**0.66[0.45- 0.99] ***
Loss due to death in the family/community	**0.46[0.32- 0.66] *****	**0.41[0.28- 0.61] *****

***P<0.001; **P<0.01; *P<0.05

Discussion

Using nationally representative cross-sectional data, this study sought to report on access to healthcare services among youth attending PSET institutions during the first wave of the COVID-19 pandemic in South Africa. Our findings show that the first COVID-19 wave had an impact on healthcare access among youth attending PSET institutions, revealing disparities based on age, ethnicity, and COVID-19 risk related factors. Communication preferences highlighted the prevalence of telephone usage for accessing various health and social support services, despite there being more advanced, affordable methods available.

The study findings highlighted that young people residing in informal settlements faced difficulties in accessing healthcare services which may have led to young people experiencing poorer health. This aligns with the Social Determinants of Health (SDOH) framework, which emphasizes how socioeconomic factors affect health access (65). Our results concur with a recent survey conducted in Nairobi, Kenya, which reported that people living in informal settlements were more likely to find the pandemic unendurable which worsened their physical and psychosocial health outcomes(31). Given current socioeconomic disparities in South Africa, partly due to the Apartheid era policies as well as a lack of universal healthcare services(32), it is crucial to address these systemic issues. This context is not unique, as prior pandemics in other countries, such as the Ebola Virus Disease in central and west Africa, have demonstrated disproportionate and adverse impacts on employment, with disparities seen geographically (33). Addressing these challenges requires comprehensive strategies that prioritize equal access to healthcare and employment opportunities, regardless of location or historical injustices.

The results of this study also shed light on access to healthcare services in those young people with no parents present in their lives. Unsurprisingly, students who were unaware of their parents' whereabouts were less likely to access healthcare services during the pandemic. This issue relates to the HBM, which posits that perceived barriers to healthcare can significantly affect health-seeking behaviors (66, 70). This is possibly due to the fact that many orphaned and vulnerable young people in South Africa reside with extended family members, are homeless, live alone, or are in institutions, which may pose challenges to healthcare accessibility. Even though young people are able to make their own decisions about their healthcare use, there are a substantial number of them that are still dependent on their parents or guardians to access healthcare services especially when facing financial constraint, illness, or injury(34-36). For instance, seeking treatment in a private or public healthcare facility when unwell or injured may be greatly influenced by the usage of a particular healthcare facility by a household head, parent or medical aid plan(37,38).

Young people aged 25-29 years were more likely to have access to healthcare services compared to those aged 18-24 years. This age-related discrepancy may stem from factors such as the 18-24 age group being relatively new to post-secondary education and training (PSET) institutions, which may result in unfamiliarity with healthcare services available through these institutions and within their home communities. This study highlights a need for improved education or messaging on available healthcare services, especially for young people transitioning from high school into higher institutions. Orientation programs during the first year should include information on accessing low-cost or free routine healthcare services and provide clear guidance on navigating healthcare within their communities.

Similar findings from other studies, including one conducted by the Pew Research Center, show that young people often seek affordable or free healthcare services due to the lack of medical aid or funds to pay out-of-pocket costs (39, 40). This aligns with the HBM, which posits that perceived barriers (such as lack of information, cost concerns, and lack of familiarity with healthcare systems) can strongly influence whether individuals engage in health-seeking behaviors (70). For young people, particularly those in the 18-24 age group, these barriers are likely heightened due to the transitional phase they are experiencing, which can impact their access to healthcare services.

The implications for policy and practice are significant. First, demand creation for healthcare services can be enhanced through targeted, youth-friendly informational campaigns and orientation programs that address the specific needs of young people entering higher education. Institutions can improve accessibility by training healthcare professionals in youth-centered approaches, ensuring confidentiality, reducing wait times, and promoting respectful, supportive staff attitudes. Such characteristics are essential, as studies show that young people often delay or avoid care for sensitive health issues when they perceive confidentiality breaches, experience long wait times, or encounter poor staff attitudes (10, 11). By adopting these youth-centered practices, institutions and policymakers can help bridge the gap in healthcare access for younger age groups and foster a supportive environment for lifelong healthcare engagement.

Our results showed that low COVID-19 risk perceptions were associated with an increased likelihood of accessing healthcare services. This finding is consistent with research conducted in Odisha, India, which demonstrated that young people’s risk perceptions significantly influenced their healthcare usage patterns (41). Specifically, our study indicates that fear or the perceived likelihood of contracting COVID-19 at healthcare facilities did not deter young people who believed themselves to be at low risk of infection from seeking healthcare. In contrast, those who viewed themselves as having a high risk of contracting COVID-19 were less likely to visit health facilities, likely due to concerns over potential infection.

This aligns with findings from other regions, where high-risk perceptions led to reduced healthcare utilization out of fear of exposure.

For instance, a similar study in the United States found that individuals with high COVID-19 risk perceptions were less likely to seek routine medical care or preventive services during the pandemic, choosing instead to delay or avoid visits due to fear of infection (67). An analysis in Italy also highlighted that perceived high risk of COVID-19 was correlated with a significant decrease in non-emergency healthcare visits, as individuals avoided medical facilities unless absolutely necessary (68). Additionally, an interrupted time series analysis in Kenya provided further support, revealing that low COVID-19 risk perceptions were linked with riskier social behaviors during the pandemic, including decreased adherence to quarantine directives and increased social contact, such as leaving home to access healthcare services (42). This behavior aligns with findings in Nigeria, where lower risk perceptions were also associated with continued social activity and a willingness to seek in-person healthcare services despite pandemic-related concerns (69).

The Health Belief Model (HBM) helps to explain these patterns, as it suggests that individuals' perceived susceptibility and severity of a health threat play a critical role in their health-seeking behavior (70). According to the HBM, when young people perceive themselves as being at low risk of contracting COVID-19, they may experience fewer psychological barriers and feel more comfortable accessing healthcare facilities, as they do not expect adverse outcomes (70). Conversely, individuals who perceive a high risk of infection may experience heightened fears, which can act as a deterrent, preventing them from seeking necessary healthcare.

Implications for policy and practice underscore the need for targeted communication strategies that address risk perceptions and their impact on healthcare access. To reduce barriers for those with high-risk perceptions, healthcare facilities could implement visible infection control measures and provide clear messaging about safety protocols, which may reassure individuals and encourage them to seek care when needed. Additionally, outreach programs aimed at educating young people on realistic COVID-19 risks and the importance of timely healthcare access balanced with safety measures could help mitigate unnecessary delays in healthcare-seeking behaviors (71). By applying insights from the HBM and tailoring communication to address these risk perceptions, policymakers and healthcare providers can foster a safer and more accessible healthcare environment during times of public health crises.

Our results revealed that young people who understood that COVID-19 could spread through contact with virus-contaminated surfaces were less likely to access healthcare services. This finding aligns with a study conducted in Kenya, which showed that knowledge about COVID-19 influenced protective behaviors, particularly in terms of avoiding contaminated areas (20).

Our study suggests that some young people adhered to preventive measures, including reducing healthcare visits due to fears of surface contamination. This behavior indicates the need to further investigate the relationship between COVID-19 risk perception, knowledge, and social contact, as these factors significantly impact both COVID-19 transmission rates and young people's willingness to engage with healthcare services (72).

From the perspective of the HBM (70), these findings can be interpreted through the lens of perceived susceptibility and perceived barriers. The young people who understood the risks of contamination may have perceived themselves at high risk of contracting the virus by accessing healthcare facilities, and thus, avoided seeking care. Their fear of exposure could act as a barrier to healthcare access, even though healthcare might be necessary. Conversely, those with lower risk perceptions may have seen less need to avoid healthcare settings and were more likely to seek care. The HBM suggests that in order to encourage healthcare-seeking behavior, healthcare providers must address and mitigate these perceived barriers, such as fear of contamination, and emphasize the safety measures in place at healthcare facilities (73).

Our study also found that recreational drug use was associated with decreased healthcare service utilization. This supports findings from studies conducted in Canada, where young people turned to substances like alcohol and drugs to cope with mental health stressors, particularly when faced with limited access to healthcare services (43, 44). These behaviors were likely exacerbated by the isolation and uncertainty during lockdowns, as social support networks were disrupted. This indicates that substance use may be a coping mechanism, replacing healthcare-seeking behavior, both during and before the pandemic.

The Health Belief Model again offers an explanation for these findings. If young people perceive the barriers to accessing healthcare such as stigma, lack of confidentiality, or uncertainty about the benefits of care as significant, they may turn to substance use as a more immediate solution. According to the HBM, individuals are less likely to engage in health-promoting behaviors when they believe the perceived barriers to taking action outweigh the benefits (70). In this case, the perceived barriers to seeking care for physical or mental health problems may be high, leading to the use of substances as a means of self-medication (74). To address this, public health initiatives should focus on reducing stigma, improving confidentiality in healthcare settings, and promoting mental health care as a critical and accessible option for young people.

The stigma surrounding substance use was also identified as a key barrier preventing young people from seeking healthcare. The fear of judgment or discrimination by healthcare providers, along with concerns about confidentiality, can deter individuals from disclosing substance use and seeking the help they need.

This finding is consistent with other studies showing that stigma associated with substance use is a significant barrier to healthcare access (46, 47). In addition, internalized stigma and fears of legal repercussions further discourage young people from accessing care, exacerbating their mental and physical health problems (46, 48). Studies in the UK also highlight the role of stigma in deterring young people from seeking help for substance use, emphasizing the need for supportive, non-judgmental healthcare environments (75, 76).

From the Health Belief Model perspective (70), the perceived severity and perceived barriers associated with substance use can deter young people from seeking help. If young people fear judgment or legal consequences, they may not see the benefits of seeking healthcare as outweighing the risks. This highlights the need for public health campaigns aimed at reducing stigma and promoting harm reduction approaches in healthcare settings. Moreover, healthcare providers should be trained to offer compassionate, non-judgmental care and to ensure strict confidentiality, which would likely encourage more young people to seek the help they need.

Additionally, our findings showed that young people who experienced social isolation, loss of contact with family or friends, or the death of a loved one were less likely to access healthcare services. This aligns with existing evidence suggesting that social support plays a critical role in maintaining both physical and mental health, and disruptions to this support can have serious consequences (50-52). Loss of social support, particularly during the pandemic, may lead to feelings of learned helplessness or hopelessness, which can discourage healthcare utilization. These findings highlight the need to address the mental health impacts of social isolation, loss, and grief during crises.

It can be argued that the loss of social support increases perceived susceptibility to negative health outcomes and decreases self-efficacy, or the belief in one's ability to manage health. Young people who feel isolated or unsupported may perceive themselves as more vulnerable to mental health problems and less capable of seeking or receiving care (70). This reinforces the need for policies that provide psychosocial support to help young people cope with loss and isolation. Governments and health organizations should ensure that resources for mental health support are readily available and accessible to young people, particularly during times of crisis (78).

Telemedicine emerged as a significant means of accessing healthcare services during the pandemic, as young people increasingly turned to telephone consultations to receive essential services. This finding is consistent with studies from Saudi Arabia, which highlighted the effectiveness of telemedicine in maintaining patient care while minimizing the risk of COVID-19 transmission (57-59). Our study revealed that most young people utilized telephone calls as their primary mode of accessing healthcare services, underscoring the importance of telehealth solutions in times of crisis.

From the Health Belief Model perspective (70), the shift to telemedicine can be seen as a way of overcoming perceived barriers to accessing in-person healthcare, such as fears of exposure to COVID-19. However, reliance on telephone consultations rather than more advanced digital platforms suggests that young people may still face challenges in accessing digital healthcare services, such as limited access to high-speed internet or digital literacy skills. This highlights the need for policies that improve digital access and healthcare accessibility, particularly for young people in underserved communities (79).

To address these barriers, policymakers should ensure that digital health platforms are both technologically accessible and user-friendly. Providing digital literacy training and improving access to affordable internet can help young people take full advantage of telemedicine services. Moreover, expanding telemedicine infrastructure can make healthcare more accessible and flexible, particularly in rural or isolated areas, ensuring that young people can continue to access essential services during crises. The COVID-19 pandemic revealed several barriers that young people face when seeking healthcare, including fears of contamination, substance use, stigma, social isolation, and limited access to telemedicine. These barriers are closely linked to perceptions of susceptibility and benefits outlined in the Health Belief Model (7)). To improve healthcare access for young people, interventions must address these perceptions by reducing stigma, enhancing mental health support, and improving digital access. Moreover, policies should be designed to ensure inclusive communication, reduced stigma, and improved mental health services, all of which are crucial to ensuring young people receive the care they need during public health crises.

Strengths and Limitations

To our knowledge, this is one of the few studies that report on access to healthcare services among youth enrolled in higher institutions in South Africa. Therefore, this work contributes significantly to the growing body of knowledge about healthcare access during the COVID-19 pandemic, particularly among a demographic often overlooked in health research. The findings highlight critical disparities based on age, ethnicity, and socioeconomic status, adding nuanced insights into how the pandemic exacerbated existing inequalities in healthcare access. Specifically, the study identifies key barriers, such as the stigma surrounding substance use, lack of parental support, and logistical challenges faced by young people in informal settlements. These insights can inform targeted interventions and policy responses tailored to the unique needs of this population, thereby enhancing overall healthcare accessibility.

However, a limitation of this study is its cross-sectional design, which limits the generalizability of the findings. Because the study commenced shortly after the national lockdown, individuals who did not need to access healthcare services during that period may not have been adequately represented. This may

obscure the long-term implications of the lockdown on healthcare service access. For instance, some participants may not have been due for ART refills or contraceptives prior to the interview, potentially skewing the data. Additionally, youth who did not access higher education institutions were excluded from the study, meaning differences in help-seeking behavior between those in PSET and those outside of it could not be assessed.

Overall, while this study has limitations, its contributions to understanding the healthcare access landscape for youth during the pandemic are invaluable. The findings underscore the importance of considering social determinants of health and individual perceptions in future research and policy-making efforts aimed at improving healthcare access for vulnerable populations

Conclusion

This study highlights that while most youth in higher education had access to healthcare services during the first wave of the COVID-19 pandemic, significant disparities affected specific groups. Black African students, those in informal settlements, individuals unaware of their parents' whereabouts, recreational drug users, and those facing COVID-19-related challenges were notably less likely to access necessary healthcare. These findings emphasize the urgent need for targeted interventions to ensure equitable healthcare access, particularly for marginalized youth. Efforts should focus on outreach programs that address the unique needs of these populations, bridging gaps in access. Moving forward, policymakers and educational institutions must collaborate to create supportive environments that facilitate healthcare access for all young people. Future research should also explore the factors contributing to these disparities and assess the effectiveness of interventions to promote a more inclusive healthcare system.

List of abbreviations

ART	Antiretroviral Therapy
COVID-19	Coronavirus Disease of 2019
NCD	Noncommunicable Diseases
PHC	Primary Healthcare Facilities
PSET	Post School Education and Training
PrEP	Pre-Exposure Prophylaxis
TVET	Technical, Vocational, Educational and Training
UNFPA	United Nations Population Fund
WHO	World Health Organization

Declarations

Ethics approval and consent to participate

The study adhered to the ethical guidelines set forth in the Declaration of Helsinki. Approval for the primary study was secured from the Human Science Research Council (HSRC) Research Ethics Committee, granted under the protocol REC 5/03/20. Furthermore, approval for the secondary study was obtained from the University of the Witwatersrand's Human Research Ethics Committee (HREC) Medical, REC 01/02/2023. Informed consent was obtained from all participants that participated in the study.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no conflict of interest.

Funding

The primary study conducted by the HSRC was funded by the Department of Science and Innovation, Higher Health, and the United Nations Population Fund (UNFPA). This secondary analysis did not receive any funding.

Authors Contributions

Conceptualization and draft preparation, P.N; methodology, P.N.; data cleaning and analysis, P.N.; draft review and editing, J.D., T.M., & W.S.; supervision, J.D., T.M., & W.S. All authors have read and agreed to the published version of the manuscript.

Acknowledgments

We thank all our study participants who participated in the survey. Thank you to the collaborating partners and funders, Higher Health, Department of Science and Innovation, Department of Higher Education and Training, United Nations Population Fund (UNFPA). to promote a more inclusive healthcare system.

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Extended Methods

The methods section is adequately explained in the manuscript. The below is a brief overview of the method.

This study is a secondary analysis of cross-sectional data sourced from an online survey titled 'Social Impact of the COVID-19 Pandemic among Post School Education and Training (PSET) Sector Youth in South Africa.' The secondary analysis aimed to examine the accessibility of healthcare services among youth attending PSET institutions during the first wave of the COVID-19 pandemic in South Africa. The Human Sciences Research Council (HSRC) conducted the online survey from June 18 to September 18, 2020, surveying individuals about their experiences and circumstances during that period. All students enrolled in PSET institutions were invited to participate, and 13,119 completed the survey. The online survey was hosted on the BINU data-free platform. To publicize the study and encourage participation, mainstream media channels, email, television broadcasters, radio, and social media, alongside two bulk SMS campaigns, were utilized. The survey comprised of 58 closed-ended questions that took approximately 25 minutes to complete. The study population were young people aged 18 to 35 years enrolled in public or private higher institutions in South Africa, excluding those who were unable to comprehend the written survey or provide informed consent. The population of interest was youth attending PSET institutions, which explicitly refers to individuals who are pursuing post-school education and training, such as those enrolled in universities, technical colleges, and other higher education settings.

The final sample for the secondary data analysis comprised 4,404 participants. The outcome variable was access to healthcare services (yes=1 and no=0) among youth enrolled in PSET institutions. Explanatory variables included socio-demographic variables, substance use, and COVID-19 related questions. Data extraction, cleaning, and analysis were conducted using Microsoft Excel and STATA version 17. Descriptive statistics and bivariate logistic regression analysis were performed, and the survey data were benchmarked to the distribution of South Africa's estimated PSET population to increase generalizability to the national sample of youth enrolled in higher institutions.

Study design

This study will analyse data from an online cross-sectional survey, titled 'Social impact of the COVID-19 pandemic among PSET Sector youth in South Africa', which was conducted by the Human Sciences Research Council (HSRC) in 2020 therefore this study is a secondary data analysis.

Data Source

Primary Study

The aim of the primary study was to investigate young people's experiences and perspectives of the impact of COVID-19 on their well-being, education, and learning in South Africa. The questionnaire comprised 58 close-ended questions, investigating themes such as demographic characteristics, socio-economic conditions during lockdown, COVID-19 knowledge and COVID-19 sources of information, risk perceptions, opinions on government response, impact of COVID-19 on learning, institutional support during lockdown, mental health, social support, substance use, exposure to violence and lastly, access to wellbeing and healthcare services during the first wave of COVID-19 (HSRC, 2020).

Study Site

Young people between the ages of 18- and 35-years old residing in all nine provinces in South Africa enrolled in any post school education and training institution.

Study population and sample

The primary study had a total sample of 13 119 participants. The inclusion criteria were young people aged 18 to 35 years across the country, both men and women who were enrolled in tertiary institutions, TVET colleges or other training programmes such as Sector Education and Training Authorities (SETA) and other learnerships. It excluded participants who were unable to understand and/or unable to provide informed consent.

No sampling was done, all the students were invited to participate with a total of 13 119 participants who participated. Institutions were clustered according to locality which includes categorisation into urban, rural and township. Media platforms such as television

and radio interviews, social media (Facebook and Twitter) and two bulk SMS campaigns were used to recruit youth from all provinces. The survey was conducted online during lockdown. The HSRC engaged with various partners, stakeholders, and media platforms to encourage participation and to distribute the survey hosted on the BiNU data free platform (HSRC, 2020 & Jackson, 2019).

Data Collection

Survey data was collected electronically by participants on the BiNU data free platform from 18 June to 18 September 2020. The survey comprised 58 close-ended questions that took approximately 25 minutes to complete. The survey was automatically uploaded to the server once the participant had completed it. The data was then exported into Microsoft Excel and then later onto STATA (Stata, 2017).

Secondary analysis

Conducting a secondary analysis on the cross-sectional data from the 'Social impact of the COVID-19 pandemic among Post School Education and Training (PSET) Sector youth in South Africa" survey, this study will report on access to healthcare services among youth attending PSET institutions during the first wave of the COVID-19 pandemic in South Africa.

Study Sample

Of the original surveyed 13 119 participants, this study only included PSET youth who had answered questions related to access to healthcare services during the first wave of COVID-19 and outcome variables.

Inclusion and Exclusion Criteria

Table 1: Inclusion and exclusion criteria

Inclusion Criteria	**Exclusion Criteria**
Youth enrolled in any PSET institutions in South Africa in the year 2020	Variables without data on both outcome and explanatory variables

Data Extraction and Management

` The data for this secondary analysis was derived from the “Social Impact of the COVID-19 Pandemic among Post School Education and Training (PSET) Sector Youth in South Africa” survey. The dataset was retrieved on a Microsoft Excel spreadsheet from the principal investigator. Following this, a process of verifying whether the dataset had any incorrect entries, missing values, or outliers was undertaken. Variables were recoded, regrouped, and new variables were created as needed to answer the study's research questions. Some variables were dichotomized to simplify analysis, presentation, and interpretation of the results. Data extraction was conducted in Microsoft Excel to extract data from the primary dataset for PSET youth access to healthcare services. This data was then saved, screened, and imported into STATA for data cleaning (25). This was followed by validation of the new dataset. Validation was conducted through frequency tables of all variables to check for extreme values. Cross-tabulation was also done for similar variables to check for inconsistency.

Measurements (variables)

The study will use six different measurement variables to help answer the proposed research question about access to healthcare services among youth attending PSET institutions in South Africa. The variables are demographic information, COVID-19 knowledge and risk, substance use, COVID-19 challenges, health and social support communication platforms and access to healthcare service. Further details of the variables of interest are below on table 1.

Table 2: Study Measures		
Variable Name	**Measures**	**Details**
Demographic Information (independent variable)	HSRC demographic form	Includes: education, age, race, gender, residence during lockdown, socio-economic status, province, and institution type
COVID-19 knowledge & risk (independent variable)	HSRC COVID-19 questionnaire	Asks about covid-19 knowledge and risk for instance: Have you been doing any of the following DURING THE PAST WEEK because of the COVID-19 emergency? (Select all that apply) 1= using face masks, 2=covering coughs or sneezes with a tissue or flexed elbow, 3=wearinghand gloves, 4=using hand sanitizer, 5= washing my hands more frequently, 6= staying in my house and decreased my social interaction, 7= self-isolating, 8= other (specify) and 9= I haven't taken any precautionary procedures yet.
Substance use (independent variable)	HSRC questionnaire	The types and frequency of alcohol, drug and cigarette use is assessed. Respondents were also asked questions on substance use, during the past 30 days have you used any of the following: 1= smoked marijuana/dagga, 2=drank alcohol, 3= myope/wonga/tik, 4= other recreational drugs, 5=cigarettes and 6=none of these. Followed by questions on how often do currently use the following: 1= yes, daily, 2= yes, but occasionally and 3= no, not at all.
COVID-19 challenges (independent variable)	HSRC questionnaire	Self-reported challenges during the pandemic, yes/no response option. Access to transport, not enough money for food, unable to pay rent, faced no challenges, loss due to death in the family or community

Health and social support communication platforms (independent variable)	HSRC COVID-19 questionnaire	Type of communication platforms (online, telephone or face to face) used to access social and health support. Most frequently used communication (online, telephone or face to face) platforms (1= Online, 2=Face-to-face, 3=Telephone and 4= Not available / NA) for financial aid, mental health support, health care services, international students support and diversity support (disability, LGBTIAQ).
Access to healthcare service (outcome variable)	HSRC questionnaire	Self-reported access to family planning methods, chronic medication, ART etc. For instance, were you able to access the following healthcare services during lockdown (first wave of the pandemic): respondents were asked if they were able to access birth control (e.g.: the pill), barrier contraception (condoms, etc.), chronic medications (TB, Diabetes etc.), access to antiretroviral medication etc., yes/no response

Data Analysis

All data will be exported from the Microsoft Excel spreadsheet to STATA Version 17 for analysis (25).

This study used descriptive statistics to summarize and describe young people who had access to healthcare during the pandemic. A description of the most frequently used communication platforms (online, telephone, or face-to-face) for health and social support services was provided. This was followed by a bivariate logistic regression analysis to assess the relationship between access to healthcare services and potential explanatory variables (demographic information, substance use, COVID-19 knowledge and risk, and COVID-19 challenges). A cut-off of $p<0.2$, for variables associated with the outcome in the bivariate analysis, was used to determine which variables to include in the multivariable logistic regression analysis to determine factors associated with access to healthcare services. A forward stepwise regression analysis was done to build the multivariable regression model that consisted of the selection of explanatory variables. Unadjusted and adjusted Odds Ratios were presented with 95% Confidence Intervals (95% CI) for the bivariate and multivariable analyses, respectively.

A p-value <0.05 was used to determine statistical significance.

The interpretation of the results was guided by two theoretical frameworks—the Social Determinants of Health (SDOH) model and the Health Belief Model (HBM). Employing these frameworks was essential to provide a comprehensive understanding of how both structural and individual factors influenced young people's access to healthcare during the pandemic. The SDOH model allowed for the identification of systemic barriers and facilitators, such as socioeconomic disparities and healthcare system challenges, while the HBM provided insights into how individual perceptions and beliefs shaped healthcare-seeking behaviors. By integrating these frameworks, the study ensured that the findings were not only statistically robust but also contextually meaningful, aligning with broader public health priorities and interventions.

Ethical Considerations

The research project will seek ethical approval from the University of the Witwatersrand's Human Research Ethics Committee (HREC) Medical. Confidentiality was maintained during the primary study with all personal information and names of participants were anonymized before analysis. Ethics clearance for the primary study was obtained from the Human Science Research Council Research Ethics Committee (REC 5/03/20). Approval for the currently proposed secondary study was received from the principal investigators of the primary study. Before approval was granted from principal investigator, it was ensured that the proposed study analysis has not been written up before by the primary study team or anyone at the HSRC.

Extended Results

Table 1: Description of Study Sample

Variables	Total	%	Missing data
Age groups in years (n=4396)			
18-24	3 227	73.4	8
25-29	873	19.9	
30-35	296	6.7	
Sex (n=4238)			
Female	3 125	73.7	166
Male	1113	26.3	
Race (n=4381)			
Black African	3 458	78.9	23
White	554	12.6	
Colored	211	4.8	
Indian/Asian	158	3.6	
Which province are you studying in? (n= 4404)			
Western Cape	319	7.2	
Eastern Cape	236	5.4	
Northern Cape	51	1.2	
Free State	197	4.5	
KwaZulu-Natal	686	15.6	
North-West	350	7.9	
Gauteng	2,146	48.7	
Mpumalanga	152	3.5	
Limpopo	267	6.1	
Who earns a salary (n=3812)			
Mother	905	23.7	592
Brother/Sister	875	23.0	
Father	795	20.9	
Myself	466	12.2	
Aunt/Uncle	369	9.7	
Boyfriend/Girlfriend	224	5.9	

Grandmother	140	3.7	
Grandfather	38	1.0	
Locality (n=4404)			
Township	1 591	36.1	-
Suburb	1 162	26.4	
Rural (traditional tribal area)	822	18.7	
City	502	11.4	
Informal settlement	256	5.8	
Farm	71	1.6	
Orphanhood status (parents are still alive) (n=4366)			
Both my parents are alive	2 545	58.3	38
Only my mother is alive	1 124	25.7	
Neither of them are alive	395	9.0	
Only my father is alive	202	4.6	
Don't know the whereabouts of my parent/s	100	2.3	
Alcohol use (n=4322)			
No	2 366	54.7	82
Yes	1 956	45.3	
Marijuana / Dagga (n=4252)			
No	3 746	88.1	152
Yes	506	11.9	
Other recreational drugs (n=4213)			
No	4 091	97.1	191
Yes	122	2.9	
Place of residence during the lock down (n=4364)			
At home like I usually do	1 770	40.6	40
I returned home because of the COVID -19 outbreak	1 642	37.6	
Staying with family/Relatives	373	8.5	
I had to rent a place due to the crisis	257	5.9	
Staying in a campus residence	232	5.3	
Staying with friends	66	1.5	
I have no place to stay	24	0.5	
How is covid-19 spread (n=4340)			
Touching virus contaminated	3 853	88.8	64

surfaces			
Coughing/Sneezing	205	4.7	
I don't know	147	3.4	
Public gathering where there is an infected person	135	3.1	
COVID-19 risk perceptions (n=4385)			
High risk	789	18.0	19
Moderate risk	1 520	34.7	
Low risk	2 076	47.3	
COVID-19 information source (select all that apply) (n=4389)			
Scientific journals	1 493	34.0	15
Government sources (President, Minister of health, etc.)	803	18.3	
Have not considered what I would do	573	13.1	
News websites or mobile apps	350	8.0	
Social media (excluding WhatsApp)	213	4.9	
Email	191	4.4	
SMS	178	4.1	
Friends Family	152	3.5	
Government WhatsApp Groups (WHO, Department of Health)	104	2.4	
Personal doctor	98	2.2	
Radio	87	2.0	
Satellite television (DSTV, Open View)	65	1.5	
Local television	42	1.0	
Spouse or children	20	0.5	
Other mobile chat services	11	0.3	
Private WhatsApp messages	9	0.2	
Life challenges during COVID-19 (n=4328)			
Loss of social contact with family/friends	1 356	31.3	76
Not enough money for essentials (personal items, studying)	769	17.8	
Loss due to death in the	567	13.1	

family/community			
Inability to access medical care/chronic medication	502	11.6	
Loss of study time	344	7.9	
Unable to pay rent	234	5.4	
Faced no challenges	192	4.4	
No transport	169	3.9	
Not enough money for food	133	3.1	
Unable to pay home load/bond	62	1.4	
During the last 3 months did you need the following and were NOT able to access healthcare?			
Birth Controls (n=4,351)			
YES, I needed it and was ABLE to access	1,079	24.8	53
YES, I needed it and was NOT ABLE to access	627	14.4	
NO I did not need it and did not try to	2,645	60.8	
Barrier Contraception (n=4,334)			
YES, I needed it and was ABLE to access	1,097	24.9	70
YES, I needed it and was NOT ABLE to access	332	7.7	
NO I did not need it and did not try to	2,905	67	
Chronic Medication (n=4,299)			
YES, I needed it and was ABLE to access	634	14.7	105
YES, I needed it and was NOT ABLE to access	175	4.1	
NO I did not need it and did not try to	3,490	81.2	
ART (n=4,298)			
YES, I needed it and was ABLE to access	300	7	
YES, I needed it and was NOT ABLE to access	109	2.5	

NO I did not need it and did not try to	3,889	90.5	
Medical Care (n= 4,314)			
YES, I needed it and was ABLE to access	1,750	40.6	90
YES, I needed it and was NOT ABLE to access	675	15.6	
NO I did not need it and did not try to	1,889	43.8	
Counselling support (n=4,314)			
YES, I needed it and was ABLE to access	499	11.6	90
YES, I needed it and was NOT ABLE to access	1,320	30.6	
NO I did not need it and did not try to	2,495	57.8	
Counselling support and bereavement (n=4,299)			
YES, I needed it and was ABLE to access	283	6.6	105
YES, I needed it and was NOT ABLE to access	809	18.8	
NO I did not need it and did not try to	3,207	74.6	
Access to healthcare (4404)			
No	1,234	28	
Yes	3,170	72	

As shown in table 1, the study sample is predominantly composed of young adults, with 73.4% falling within the 18-24 age group. A notable majority (73.7%) are female, and Black Africans represent the largest ethnic group (78.9%). The majority of respondents reside in urban environments, with a high concentration from Gauteng (48.7%), reflecting the province's status as an educational and economic hub.

The data also suggests a reliance on family for household income, with mothers (23.7%) and siblings (23.0%) identified as the primary earners. A significant proportion (45.3%) of participants reported alcohol use, while marijuana use was lower at 11.9%. In terms of the COVID-19 impact, 40.6% of participants stayed at home as usual, and 37.6% returned home due to the pandemic. Most respondents correctly identified surface contamination as

the primary mode of COVID-19 transmission (88.8%), although some misinformation remains, particularly regarding transmission through coughing or public gatherings.

When it comes to healthcare access, 72% of participants reported being able to access healthcare services, though barriers remain for a portion of the sample, particularly in accessing birth control, medical care, and counseling support. The pandemic appears to have exacerbated challenges related to healthcare access, especially for marginalized groups.

Table 2: Bivariate Analysis of Healthcare Access by Socio-Demographic, Substance Use, and COVID-19 Factors (N=4,212)

Access to healthcare services	**No (%)**	**Yes (%)**	**p-value**
Total (N= 4 212)	1 198(28)	3 014(72)	
Age groups (n= 4 212)			
18-24	922 (29.8)	2 173 (70.2)	**0.03***
25-29	204 (24.3)	634 (75.7)	
30-35	72 (25.7)	207 (74.3)	
Sex (n= 4 211)			
Female	873 (28.1)	2 234 (71.9)	0.26
Male	332 (30.1)	772 (69.9)	
Race (n= 4 211)			
Black African	1 044 (31.5)	2 270 (68.5)	**0.001*****
White	70 (13)	471 (87)	
Coloured	60 (30.2)	139.6 (69.8)	
Indian/Asian	25 (16)	131 (84)	
Locality (n= 4 211)			
Township	491 (32.4)	1 025 (67.6)	**0.001*****
Suburb	243 (21.6)	880 (78.4)	
Rural (Traditional tribal area)	236 (30.2)	545 (69.8)	
City	116 (24.1)	365 (75.9)	
Informal settlement	93 (38.1)	150 (61.9)	
Farm	28 (41.9)	39 (58.1)	
Orphanhood status (parents are still alive) (n=4174)			
Both my parents are alive	654 (26.9)	1 776 (73.1)	**0.01****

Only My mother is alive	334 (31)	744 (69)	
Neither of them are alive	108 (28.6)	269 (71.4)	
Only My father is alive	67 (34.3)	129 (65.7)	
Don't know the whereabouts of my parent/s	41 (44.1)	52 (55.9)	
Alcohol use (n=4134)			
No	23 (30.6)	1 577 (69.4)	**0.04***
Yes	501 (26.9)	1 360 (73.1)	
Marijuana / Dagga (n=4068)			
No	1 043 (29.1)	2 541 (70.9)	0.81
Yes	144 (29.8)	339.7 (70.2)	
Other recreational drugs (n=4028)			
No	1 119 (28.6)	2 794 (71.4)	**0.03***
Yes	46 (40.1)	69 (59.9)	
Place of residence during the lock down (n=4172)			
I returned home because of the COVID -19 outbreak	499.5 (31.9)	1066.5(68.1)	**0.01****
At home like I usually do	423 (24.8)	1282(75.2)	
Staying with family/Relatives	97 (27.8)	253(72.2)	
I had to rent a place due to the crisis	80 (32.5)	167(67.5)	
Staying in a campus residence	67 (31)	149.7 (69)	
Staying with friends	22 (34.5)	43(65.5)	
I have no place to stay	9 (41.7)	13(58.3)	
How is covid spread (n=4150)			
Touching virus contaminated surfaces	1 090 (29.6)	2594 (70.4)	0.26
Coughing/Sneezing	43 (22.1)	152 (77.9)	
I don't know	40 (27.8)	104 (72.2)	
Public Gathering where there is an infected person	32 (25.3)	94 (74.7)	
COVID-19 risk perceptions (n=4192)			
High risk	233 (31.1)	515 (68.9)	**0.001*****
Moderate risk	476 (32.5)	989 (67.5)	
Low risk	507 (25.6)	1472 (74.4)	
COVID-19 source of information (n=4197)			

Scientific journals	432 (30.5)	986 (69.5)	0.32
Government sources (President, Minister of Health, etc.)	212 (27.4)	561 (72.6)	
News websites or mobile apps	102 (30.8)	228 (69.2)	
Social media (excluding WhatsApp)	60 (29)	70 (71)	
Friends Family	50 (34.3)	78 (65.7)	
Satellite television (DSTV, Open View)	23 (37.8)	38 (62.2)	
Radio	21 (25)	62 (75)	
Government WhatsApp Groups (WHO, Department of Health)	21 (21.7)	9 (78.3)	
Personal doctor	15 (16.2)	(83.8)	
Local television	14 (33.8)	27 (66.2)	
Spouse or children	9 (44.5)	11 (55.5)	
No information source considered	6 (25.1)	413 (74.9)	
Other mobile chat services	5 (43.6)	6 (56.4)	
Private WhatsApp messages	3 (27.8)	6 (72.2)	
Life challenges during COVID-19 (n=4141)			
Loss of study time	83 (25.4)	243 (74.6)	**0.001*** **
Not enough money for food	34 (26.2)	95 (73.8)	
Not enough money for essentials (personal items, studying)	224 (30.2)	517 (69.8)	
Unable to pay rent	62 (28.1)	159.6(71.9)	
Unable to pay home load/bond	23 (37.7)	37 (62.3)	
No transport	52 (32.7)	106 (67.3)	
Faced no challenges	29 (15.9)	154 (84.1)	
Loss of social contact with family/friends	318 (24.4)	987 (75.6)	
Loss due to death in the family/community	174 (32.2)	366 (67.8)	
Inability to access medical care/chronic medication	202 (42.4)	275 (57.6)	

***P<0.001; **P<0.01; *P<0.05

The bivariate analysis in table 2 reveals significant disparities in healthcare access based on various socio-demographic, substance use and COVID-19-related factors. The total sample of 4,212 participants showed that 28% (1,198) of individuals reported not having access to healthcare, while 72% (3,014) were able to access healthcare services. The analysis explores differences across subgroups, with statistical significance determined by p-values.

Age Group: Significant differences were observed in healthcare access across age groups ($p = 0.03$). The 18-24 age group had the highest proportion of individuals without access to healthcare, with 29.8% reporting no access compared to 24.3% and 25.7% in the 25-29 and 30-35 age groups, respectively. This suggests that younger individuals are more likely to face barriers to healthcare access, though the effect size is modest.

Sex: There was no significant difference in healthcare access based on sex ($p = 0.26$). Both males and females had similar proportions of individuals with and without access to healthcare, indicating that gender does not appear to influence healthcare access in this sample.

Race: Racial disparities in healthcare access were significant ($p = 0.001$). Black African participants had the highest proportion of non-access, with 31.5% reporting no access to healthcare, compared to 13.0% of White participants and 16.0% of Indian/Asian participants. These findings highlight the significant barriers to healthcare faced by Black African individuals, while White and Indian/Asian individuals experience far fewer access issues.

Locality: Significant differences in healthcare access by locality were also observed ($p = 0.001$). Participants living in townships, informal settlements, and on farms faced the most significant barriers, with farm residents having the highest proportion of non-access (41.9%). In contrast, suburban residents had the best healthcare access (78.4%), followed by city dwellers (75.9%). These results underscore the urban-rural divide in healthcare access, with urban areas having better access compared to rural and informal settlement areas.

Orphanhood Status: There were significant differences in healthcare access based on orphanhood status ($p = 0.01$). Participants who had lost both parents or only one parent had higher proportions of non-access. The group with the highest proportion of non-access (44.1%) were those who did not know the whereabouts of their parents, suggesting that the lack of family support may be associated with greater difficulty in accessing healthcare services.

Alcohol Use: Alcohol use was associated with a small but statistically significant difference in healthcare access ($p = 0.04$). Participants who did not use alcohol had a slightly higher

proportion of non-access (30.6%) compared to those who used alcohol (26.9%). This suggests that alcohol use may be linked to better healthcare access, possibly due to higher engagement with health services, though the relationship is not large.

Marijuana Use: There was no significant difference in healthcare access between marijuana users and non-users ($p = 0.81$). This indicates that marijuana use does not have a major impact on the ability to access healthcare services, and both groups had similar proportions of access and non-access.

Use of Other Recreational Drugs: Significant differences were found in healthcare access based on the use of other recreational drugs ($p = 0.03$). Drug users were significantly more likely to have no access to healthcare, with 40.1% of recreational drug users reporting no access compared to 28.6% of non-users. This suggests that drug use might act as a barrier to healthcare access, possibly due to stigma or other socio-economic factors that discourage seeking care.

Place of Residence During the Lockdown: The place of residence during the COVID-19 lockdown was significantly associated with healthcare access ($p = 0.01$). Participants who had to return home due to COVID-19 (31.9%) or had no place to stay (41.7%) were more likely to face barriers in accessing healthcare. In contrast, those who stayed at home as usual or with family had better access to healthcare services. This indicates that unstable living conditions during the pandemic contributed to increased difficulties in accessing healthcare.

COVID-19 Risk Perception: There were significant differences in healthcare access based on COVID-19 risk perception ($p = 0.001$). Participants who perceived COVID-19 as a high risk were more likely to access healthcare services (31.1% without access) compared to those with moderate (32.5% without access) or low (25.6% without access) risk perceptions. This suggests that higher risk perceptions may encourage healthcare utilization, while lower perceptions of risk might reduce the perceived need for care.

Conclusion: The bivariate analysis demonstrates that various socio-demographic factors, including race, locality, orphanhood status, and substance use (particularly recreational drug use), significantly impact healthcare access. Black Africans, residents of townships and informal settlements, and individuals with lower family support (such as orphans) were particularly likely to experience healthcare access challenges. Additionally, COVID-19 risk perception played a role, with those perceiving higher risk being more likely to seek healthcare.

These findings underscore the importance of addressing socio-economic and geographical disparities in healthcare access and suggest that targeted interventions are needed to reduce barriers for the most vulnerable populations.

Table 3: Communication Platforms Used to Access Health and Social Support Services

Communication Platforms	Total	%
Mental health support (n=4243)		
Online	1212	28.6
Face-to-face	469	11.1
Telephone	2562	60.4
Healthcare services (n=4238)		
Online	623	14.7
Face-to-face	1603	37.8
Telephone	2012	47.5
Financial Aid Support (National Student Financial Aid Scheme-NSFAS) (n=4274)		
Online	1496	35.0
Face-to-face	308	7.2
Telephone	2470	57.8
International student support (n=4171)		
Online	834	20.0
Face-to-face	130	3.1
Telephone	3207	76.9
Diversity Support (people with disability, LGBTQI+) (n=4149)		
Online	653	15.7
Face-to-face	213	5.1
Telephone	3283	79.1

As shown in table 3, the analysis of communication platform usage for accessing various support services reveals clear trends in the preferences for remote communication methods, with telephone being the most commonly used platform across all services. Among individuals seeking **mental health support** (n=4,243), the majority relied on telephone communication (60.4%), followed by online platforms (28.6%). A smaller proportion used

face-to-face support (11.1%). This suggests that, for mental health services, people prefer the convenience and privacy that telephone communication offers, potentially reflecting a preference for more discreet and flexible modes of support.

When accessing **healthcare services** (n=4,238), telephone was again the most frequently used platform (47.5%), closely followed by face-to-face visits (37.8%). Only 14.7% of individuals utilized online platforms to access healthcare services. This pattern indicates that while healthcare services were widely accessed through traditional means such as telephone and in-person visits, the use of online platforms was relatively low, possibly due to the nature of healthcare consultations, which often require more direct interaction.

For **financial aid support** (NSFAS) (n=4,274), the telephone was the most common method used (57.8%), with online platforms being the second most frequent option (35.0%). Face-to-face interactions were the least used (7.2%). These findings suggest that telephone communication plays a dominant role in delivering financial aid support, which may be linked to the need for direct interaction to resolve queries and provide guidance.

International student support services (n=4,171) were primarily accessed via telephone (76.9%), with a smaller proportion using online platforms (20.0%) and very few individuals relying on face-to-face communication (3.1%). This indicates that international students, likely facing geographical or logistical barriers, preferred telephone communication for support, possibly due to its immediacy and accessibility.

Similarly, **diversity support** services, which cater to individuals with disabilities or those identifying as LGBTQI+ (n=4,149), saw a similar trend, with telephone being the predominant communication platform (79.1%). A smaller proportion accessed these services via online platforms (15.7%), and face-to-face communication was the least common (5.1%). The high use of telephone for diversity support further emphasizes the importance of remote communication in providing sensitive and personal services during times of social distancing or uncertainty.

Overall, **telephone** was the most frequently used communication platform across all types of support services, with especially high usage for international student support (76.9%) and diversity support (79.1%). **Online platforms** were also commonly used, particularly for mental health support (28.6%) and financial aid support (35.0%). However, **face-to-face communication** was the least used method across all categories, suggesting a shift toward remote services, likely influenced by the COVID-19 pandemic and its associated restrictions.

These results highlight the crucial role of telephone and online platforms in delivering support

services during the study period. The preference for telephone communication in particular suggests that remote interaction methods provided a more accessible and safe means of accessing necessary services, especially during the pandemic. These findings underscore the importance of maintaining and enhancing digital and telecommunication infrastructure to ensure continued access to essential support services, particularly in times of crisis.

Table 4: Factors Associated with Access to Healthcare Services (N=4,212)

Access to healthcare	Unadjusted OR [95% CI]	Adjusted OR [95% CI]
Age (years) (n= 4 212)		
18-24	ref	ref
25-29	**1.33[1.08- 1.64] ****	**1.49[1.18- 1.87] *****
30-35	1.23[0.89- 1.72]	1.52[1.03- 2.23]
Sex (n= 4 211)		
Female	ref	ref
Male	0.90[0.76- 1.08]	1.04[0.86- 1.27]
Race (n= 4 211)		
Black African	ref	ref
White	**3.07[2.14- 4.40] *****	**2.78[1.79- 4.32] *****
Coloured	1.06[0.74- 1.53]	1.05[0.70- 1.57]
Indian/Asian	**2.41[1.48- 3.91] *****	**2.04[1.19- 3.54] ****
Locality (n= 4 211)		
City	ref	ref
Suburb	1.15[0.84- 1.57]	0.96[0.68- 1.36]
Township	**0.66[0.49- 0.88] ****	0.79[0.57- 1.09]
Informal settlement	**0.51[0.34- 0.78] *****	**0.60[0.38- 0.95] ***
COVID-19 risk perceptions (n= 4 192)		
High risk	ref	ref
Moderate risk	0.94[0.74- 1.18]	0.91[0.71- 1.16]
Low risk	**1.31[1.05- 1.65] ***	**1.23[0.96- 1.56] ****
Life challenges during COVID- 19 (n=4 141)		
Inability to access medical care/chronic medication	ref	ref

Loss of study time	0.96[0.55- 1.66]	0.79[0.44- 1.41]
Not enough money for food	0.78[0.55- 1.11]	0.74[0.51- 1.07]
Not enough money for essentials (personal items, studying)	0.87[0.55- 1.38]	0.85[0.51- 1.42]
Unable to pay rent	0.56[0.28- 1.13	0.49[0.23- 1.05]
Unable to pay home load/bond	0.61[0.43- 1.15]	0.64[0.38- 1.08]
No transport	**1.71[1.03- 3.15] ***	1.28[0.71- 2.32]
Faced no challenges	1.05[0.76- 1.46]	0.77[0.54- 1.10]
Loss of social contact with family/friends	0.72[0.41- 1.03]	**0.66[0.45- 0.99] ***
Loss due to death in the family/community	**0.46[0.32- 0.66] *****	**0.41[0.28- 0.61] *****

***P<0.001; **P<0.01; *P<0.05

Table 4 explores the various socio-demographic, COVID-19-related, and life challenge factors associated with access to healthcare services, showing both unadjusted and adjusted odds ratios (OR) along with their 95% confidence intervals (CI). These findings highlight several factors that significantly influence healthcare access, with adjustments made for other variables.

Age:

The age group of 25-29 years was significantly more likely to access healthcare compared to those aged 18-24, with an unadjusted OR of 1.33 [1.08 - 1.64] ($p = 0.01$). After adjustment, this difference strengthened, with an adjusted OR of 1.49 [1.18 - 1.87] ($p < 0.001$), indicating that individuals aged 25-29 were 1.49 times more likely to access healthcare than those in the 18-24 age group. People in the 30-35 age group also showed higher healthcare access, with an adjusted OR of 1.52 [1.03 - 2.23] ($p = 0.04$), compared to the 18-24 group, suggesting that healthcare access increases with age, particularly among young adults in their late 20s and early 30s.

Sex:

Gender did not have a significant effect on healthcare access. Both unadjusted and adjusted ORs for males compared to females were close to 1, with the adjusted OR being 1.04 [0.86 - 1.27] ($p = 0.68$).

This suggests that there is no meaningful difference in healthcare access between males and females in this population.

Race:

Race was a significant factor influencing healthcare access. White participants were significantly more likely to access healthcare compared to Black African participants, with an unadjusted OR of 3.07 [2.14 - 4.40] ($p < 0.001$). After adjustment, this disparity remained significant, with an adjusted OR of 2.78 [1.79 - 4.32] ($p < 0.001$), indicating that White participants were 2.78 times more likely to access healthcare than Black African participants. Indian/Asian participants were also more likely to access healthcare compared to Black African participants, with an adjusted OR of 2.04 [1.19 - 3.54] ($p = 0.01$), confirming a significant racial disparity in healthcare access.

Locality:

Place of residence showed varying effects on healthcare access. People living in townships were less likely to access healthcare compared to those living in cities, with an unadjusted OR of 0.66 [0.49 - 0.88] ($p = 0.01$). However, after adjusting for other factors, this effect became non-significant (adjusted OR = 0.79 [0.57 - 1.09], $p = 0.14$). In contrast, individuals living in informal settlements had significantly lower odds of accessing healthcare than those in cities, both in the unadjusted and adjusted models, with an adjusted OR of 0.60 [0.38 - 0.95] ($p = 0.03$). This suggests that living in informal settlements is a strong determinant of lower healthcare access, even after accounting for other factors.

COVID-19 Risk Perception:

Individuals who perceived COVID-19 as a low risk were more likely to access healthcare, with an unadjusted OR of 1.31 [1.05 - 1.65] ($p = 0.02$). However, after adjustment, this association became weaker, with an adjusted OR of 1.23 [0.96 - 1.56] ($p = 0.09$). The weaker effect after adjustment suggests that COVID-19 risk perception has a limited but slightly positive impact on healthcare access.

Life Challenges during COVID-19:

Several life challenges during COVID-19 were associated with reduced healthcare access. For example, people who experienced the loss of loved ones during the pandemic were significantly less likely to access healthcare, both in the unadjusted (OR = 0.46 [0.32 - 0.66], $p < 0.001$) and adjusted models (OR = 0.41 [0.28 - 0.61], $p < 0.001$). Similarly, individuals who lost social contact with family and friends also had lower healthcare access, with an adjusted OR of 0.66 [0.45 - 0.99] ($p = 0.04$). On the other hand, financial challenges such as

not having enough money for food or rent did not significantly affect healthcare access, with adjusted ORs close to 1, suggesting no meaningful relationship between these factors and healthcare access.

In conclusion, age, race, place of residence, and life challenges during COVID-19 were significant determinants of healthcare access. Younger adults in their late 20s and early 30s had higher odds of accessing healthcare, while White and Indian/Asian participants were more likely to access healthcare than Black African participants. Residents of informal settlements experienced lower healthcare access, and life challenges such as loss of loved ones and social isolation had a considerable negative impact on healthcare access. In contrast, factors such as gender and financial challenges related to COVID-19 did not show significant associations with healthcare access in this study.

Overall Discussion, Conclusions and Recommendations

Discussion

This study sought to understand access to healthcare services among South African youth attending PSET institutions during the initial COVID-19 wave. Findings unveiled significant disparities based on age, ethnicity, and COVID-19 risk perceptions. Telephone usage emerged as the primary communication platform for accessing services, reflecting existing digital access barriers. Challenges faced by youth in informal settlements underscore the need to address socioeconomic disparities and historical injustices(1, 2). Parental support significantly influences healthcare access, particularly for vulnerable young people(3). Age-related discrepancies highlight the importance of targeted education on available healthcare services for younger participants(4). Moreover, the study reveals nuanced patterns of behaviour regarding COVID-19 risk perceptions and knowledge(5). Recreational drug use presents a barrier to healthcare access, emphasizing the need for structural interventions and enhanced social support, especially for mental health services(6). Lastly, the study recognizes telemedicine's growing importance in maintaining healthcare access during the pandemic, emphasizing the need for further research to evaluate remote healthcare service.

The key findings of the discussion in relation to the study objectives are as follows:

In addressing the first objective to describe access to healthcare services among PSET youth during the first wave of the COVID-19 pandemic, the study illuminated a dual reality. While a substantial proportion of PSET youth did have access to healthcare services, the research uncovered concerning disparities. These disparities were notably influenced by factors such as ethnicity, residence in informal settlements, parental support, engagement in recreational drug use, and experiencing COVID-19 related challenges. These findings underline the pronounced existence and exacerbation of health inequities among PSET youth during the pandemic, underscoring the urgency for targeted interventions aimed at rectifying these disparities and ensuring equitable access to healthcare services for all(7-9).

Regarding the second objective to describe the most frequently used communication platforms for health and social support services among PSET youth during the first wave of the COVID-19 pandemic, the study elucidated the prevalent use of telephone calls. Despite the availability of more technologically advanced and potentially cost-effective methods,

such as online platforms, the predominance of telephone usage suggests existing barriers to accessing healthcare services through digital means(10). This finding emphasizes the importance of identifying and addressing these barriers to ensure effective and inclusive communication of health and social support services to PSET youth, especially during times of crisis(11).

Concerning the third objective to determine the factors associated with access to health services among PSET youth during the first wave of the COVID-19 pandemic, the study unveiled a multifaceted landscape. Various factors emerged as significant determinants of healthcare access among PSET youth, including age, ethnicity, COVID-19 risk perceptions, parental status, and recreational drug use. Notably, those aged 25-29 years demonstrated greater access to healthcare services compared to their younger counterparts, while low COVID-19 risk perceptions were associated with increased odds of accessing healthcare services. Conversely, knowledge about the spread of COVID-19 through touching contaminated surfaces was linked to decreased odds of accessing healthcare services. These findings underscore the complex interplay of demographic, behavioral, and perceptual factors in shaping healthcare access among PSET youth during the pandemic(12), highlighting the imperative for tailored interventions to address these disparities and ensure equitable healthcare access for all(13).

Conclusions

This study elucidates the mixed landscape of healthcare access among youth enrolled in higher education institutions during the first wave of the COVID-19 pandemic in South Africa. While a majority of young people reported some access to healthcare services, significant disparities were evident, particularly among marginalized groups such as Black African students in informal settlements, those lacking parental support, recreational drug users, and individuals facing various COVID-19-related challenges. These findings highlight the urgent need for targeted interventions to promote equitable healthcare access.

Synthesis of Findings:

The study's insights align with its objectives, revealing the nuanced healthcare access landscape among PSET youth during the pandemic. Although many youth had access to healthcare, disparities influenced by ethnicity, socioeconomic status, and geographic location were prevalent. This underscores the necessity for interventions that specifically address

these disparities, focusing on the most vulnerable populations to ensure equitable healthcare access. Moreover, the conclusion emphasizes that telephone usage emerged as the primary communication platform for accessing health and social support services. Despite the availability of online and face-to-face communication methods, the dominance of telephone usage indicates existing barriers to digital healthcare access. Addressing these barriers and enhancing access through multiple communication channels is crucial for comprehensive healthcare support for all PSET youth.

Lastly, various factors associated with access to healthcare services were identified, including age, ethnicity, socioeconomic status, and perceptions of COVID-19 risk. The complex interplay of these demographic, behavioral, and perceptual factors shapes healthcare access, necessitating tailored interventions. Strategies should focus on improving education, reducing stigma, and enhancing social support systems.

Way Forward:

To create a more inclusive and resilient healthcare system in South Africa, targeted interventions must be implemented. Future research should evaluate healthcare services at higher education institutions, improve healthcare information dissemination for incoming students, and address the needs of youth outside of higher education. By tackling these disparities and leveraging the insights gained from this study, policymakers and healthcare providers can work collaboratively to ensure that all youth, particularly those from marginalized communities, have equitable access to essential healthcare services. In doing so, we can better prepare for future health crises and support the well-being of young people across South Africa.

Recommendations

The study's recommendations underscore the imperative of addressing disparities in healthcare access among youth enrolled in higher institutions during the COVID-19 pandemic. Efforts should prioritize equitable access for all students, especially younger Black Africans from informal settlements, through interventions such as free youth-friendly services and improved healthcare information dissemination. Enhanced mobile clinics and outreach programs led by community health workers are crucial for ensuring sustained access to healthcare, particularly in marginalized areas. Bridging the gap between students in higher

institutions and local clinics is essential for seamless continuity of care during disruptions. These recommendations aim to reduce disparities and improve healthcare access, contributing to overall pandemic preparedness and response in South Africa. Evidence from studies in Brazil during the Zika virus outbreak highlighted the effectiveness of targeted interventions in improving healthcare access, particularly for marginalized populations (14).

The recommendations highlight several key findings in relation to the study objectives:

Access to Healthcare Services: The recommendations emphasize the need to address disparities in healthcare access among PSET youth during the COVID-19 pandemic. Specifically, efforts are needed to ensure equitable access for all students, with a particular focus on marginalized groups such as younger Black Africans from informal settlements. This aligns with the objective of describing access to healthcare services among PSET youth during the pandemic's first wave, highlighting the importance of targeting interventions to address disparities in healthcare access. Similar findings were noted during the Ebola outbreak, where targeted outreach significantly improved access to healthcare services for affected communities (15).

Factors Associated with Access: The recommendations underscore the significance of addressing socio-economic disparities and improving healthcare information dissemination to enhance access to health services among PSET youth. Efforts to bridge the gap between students in higher institutions and local clinics are crucial for ensuring seamless continuity of care. This aligns with the objective of determining the factors associated with access to health services among PSET youth during the pandemic's first wave, emphasizing the importance of addressing systemic barriers and implementing targeted interventions to improve overall access to healthcare services. Research indicates that improved connectivity between institutions and local healthcare facilities can lead to better healthcare outcomes, as seen in studies during the H1N1 influenza pandemic (16).

Communication Platforms: The recommendations emphasize the importance of utilizing multiple communication channels, including online platforms, telephone services, and face-to-face interactions, for health and social support services among PSET youth. While telephone calls emerged as the most frequently used platform, the efforts to enhance mobile clinics and outreach programs highlight the importance of adopting a multifaceted approach to communication. This aligns with the objective of describing the most frequently used

communication platforms among PSET youth during the pandemic's first wave, highlighting the importance of leveraging various channels to ensure effective communication and service delivery. Evidence from various health campaigns indicates that utilizing diverse communication methods increases engagement and access to services, particularly among young populations (17).

Overall, the recommendations emphasize the importance of addressing disparities, leveraging multiple communication channels, and targeting key factors influencing access to healthcare services among PSET youth during the COVID-19 pandemic. These findings contribute to enhancing pandemic preparedness and response efforts in South Africa by promoting equitable access to healthcare services for all youth enrolled in higher institutions.

1. **Increased numbers of mobile clinics:** There is a crucial need to invest in and expand mobile clinics specifically tailored to serve students living in informal settlements. These mobile clinics should be equipped to provide a comprehensive range of healthcare services, including general medical care, mental health support, and access to medications. Moreover, efforts should be made to ensure that these mobile clinics effectively target youth within these communities, providing tailored services that address their unique healthcare needs. By reaching out directly to underserved communities and implementing better targeting strategies for youth, these mobile clinics can play a vital role in ensuring sustained access to essential healthcare services. During the COVID-19 pandemic, mobile clinics were successfully implemented in various regions, improving healthcare access for marginalized groups (18).

2. **Bolster community outreach programmes**: Community health workers play a vital role in improving healthcare access and promoting preventive health behaviours. It is essential to strengthen outreach programs conducted by these workers, focusing on educating communities about available healthcare services, facilitating health screenings, and providing referrals for specialized care when needed. These programs should prioritize marginalized communities, including informal settlements, to address existing disparities in healthcare access effectively. Evidence from programs implemented during the Zika outbreak shows that community health workers significantly increased health service utilization in at-risk populations (14).

3. **Improve connectivity and bi-directional referrals between institutions and local**

public health facilities: Establishing stronger connections between higher education institutions and local healthcare facilities is imperative. This can be achieved by creating referral pathways and partnerships between university health centres and nearby clinics or hospitals. Additionally, efforts should be made to streamline administrative processes to ensure seamless access to healthcare services for students, including facilitating referrals and sharing medical records securely. Successful models from other countries have shown that bi-directional referral systems improve healthcare access and patient outcomes significantly (19).

4. **Evaluate and enhance healthcare services at higher institutions**: A comprehensive evaluation of healthcare services offered at higher education institutions is essential to identify gaps and areas for improvement. This evaluation should assess the accessibility, quality, and effectiveness of healthcare services, with a focus on understanding the unique needs of students. Based on these findings, targeted interventions can be developed, such as implementing free or low-cost youth-friendly services and expanding mental health support resources on campuses. Evaluations from universities that implemented health service assessments during health emergencies indicate significant improvements in service delivery following targeted interventions (20,21).

5. **Improve healthcare information dissemination**: Incoming students transitioning from high school to higher education may lack awareness of available healthcare services and how to access them. It's crucial to improve healthcare information dissemination through orientation programs, student handbooks, and online platforms. Providing clear guidance on where to seek healthcare services, how to schedule appointments, and what resources are available can empower students to take charge of their health and well-being. Studies during the Ebola outbreak demonstrated that effective information dissemination significantly improved healthcare-seeking behaviours among students (22).

6. **Address the needs of youth outside of higher education**: Recognizing that not all young people have the opportunity to pursue higher education, efforts should be made to address the healthcare needs of those outside of higher education institutions. This may involve expanding community-based healthcare initiatives, increasing access to affordable healthcare services, and providing targeted support for vulnerable populations, such as

unemployed youth and those living in poverty. Community healthcare programs have been shown to effectively address the needs of marginalized youth during health crises, ensuring equitable access to services (23).

7. **Utilize evidence for targeted interventions**: The findings from this study provide valuable insights into the healthcare access challenges faced by youth during the COVID-19 pandemic. Policymakers, healthcare providers, and community organizations should utilize this evidence to inform the development of targeted interventions aimed at reducing disparities and improving overall healthcare access for youth in South Africa. By implementing evidence-based strategies, we can work towards building a more inclusive and resilient healthcare system that meets the needs of all young people, regardless of their background or circumstances. The success of evidence-based interventions during past health emergencies highlights the potential for effective policy development to reduce disparities in healthcare access (24).

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Appendices

Appendices 1: Plagiarism declaration



PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I _____Philisiwe Ndlovu _____(Student number: ____1799691____) am a student

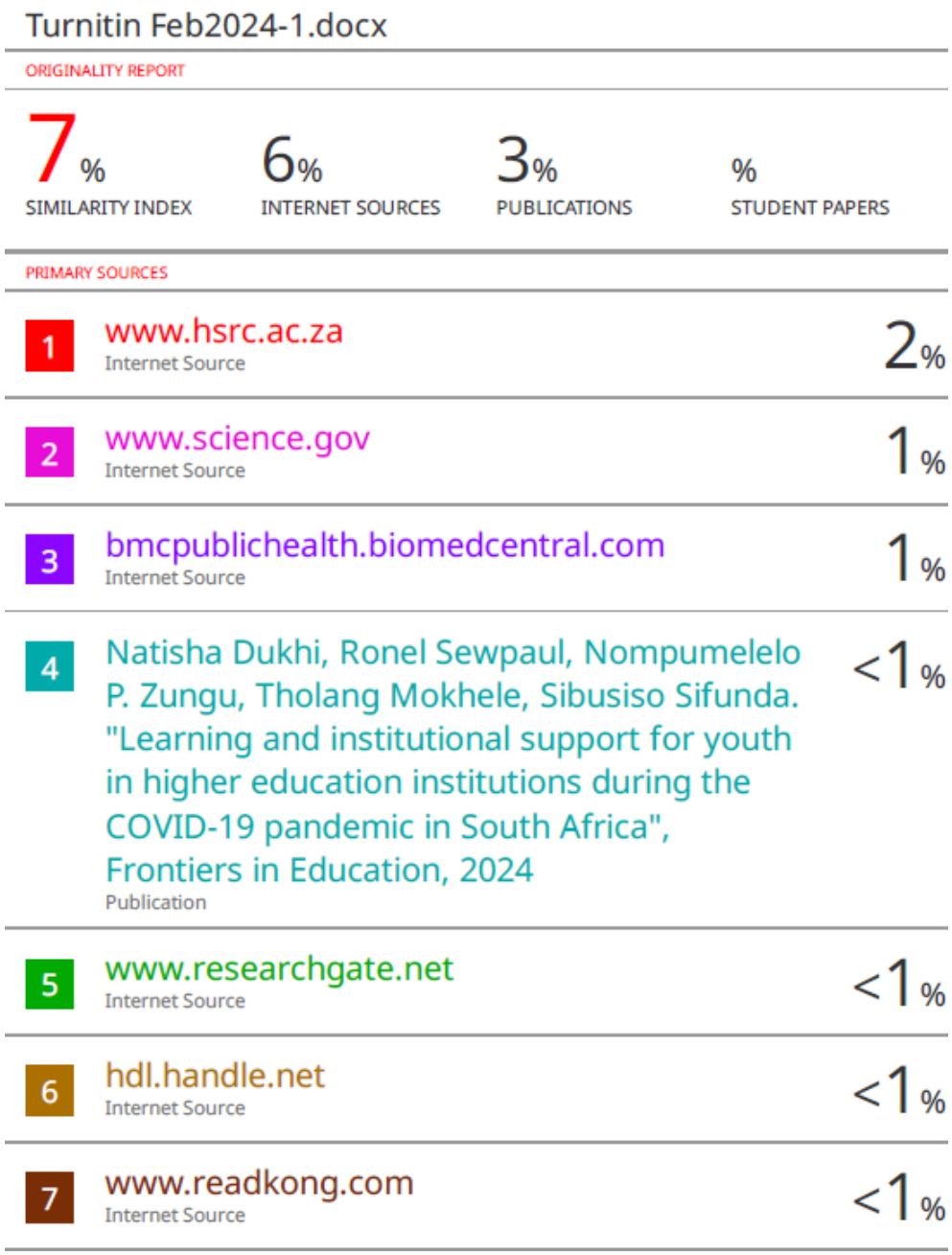
registered for the degree of _____Master of Public Health_____in the academic year __2024_.

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

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Appendices 2: Turnitin cover page



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Appendices 3: Ethics clearance certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO:	Ms P Ndlovu School of Public Health Medical School University
	E-mail: ndlovuphilisiwe3@gmail.com
CC:	Supervisor: Drs J Dunlop, W Slemming and T Manyaapelo <Jackie.Dunlop@wits.ac.za> and <HREC-Medical Research Office@wits.ac.za>
FROM:	Mr Iain Burns Human Research Ethics Committee (Medical) Tel: 011 717 1252
	E-mail: Iain.Burns@wits.ac.za
DATE:	2023/02/01
REF:	R14/49
PROTOCOL NO:	**M221143** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)
PROJECT TITLE:	*Access to healthcare services amongst youth enrolled in Post-School Training and Education (PSET) during the first wave of the COVID-19 pandemic in South Africa*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.



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UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

R49 Ms P Ndlovu

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M221143

NAME: (Principal Investigator)	Ms P Ndlovu
DEPARTMENT:	School of Public Health Medical School University
PROJECT TITLE:	*Access to healthcare services amongst youth enrolled in Post-School Training and Education (PSET) during the first wave of the COVID-19 pandemic in South Africa*
DATE CONSIDERED:	2022/11/25
DECISION:	Approved unconditionally
CONDITIONS:	
NOTE:	If contact information regarding student study participants is required, please contact the Registrar's office - <Nicoleen.Potgieter@wits.ac.za>
SUPERVISOR:	Drs J Dunlop, W Slemming and T Manyaapelo
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2023/02/01

This Clearance Certificate is valid for 5 years from the date of approval. An extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office secretariat on the 3rd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **November** and therefore reports and re-certification will be due in the month of **November** each year. Unreported changes to the study may invalidate the clearance given by the HREC (Medical).

Signature of Principal Investigator

23/03/01

Date

Appendices 4: BMC Public Health Journal guidelines for authors

Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should:

- present a title that includes, if appropriate, the study design e.g.:
    - "A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"
    - or for non-clinical or non-research studies a description of what the article reports
- list the full names and institutional addresses for all authors
    - if a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below.
    - Large Language Models (LLMs), such as ChatGPT, do not currently satisfy our authorship criteria. Notably an attribution of authorship carries with it accountability for the work, which cannot be effectively applied to LLMs. Use of an LLM should be properly documented in the Methods section (and if a Methods section is not available, in a suitable alternative part) of the manuscript.
- indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the CONSORT extension for abstracts. The abstract must include the following separate sections:

- **Background:** the context and purpose of the study
- **Methods:** how the study was performed, and statistical tests used
- **Results:** the main findings
- **Conclusions:** brief summary and potential implications
- **Trial registration:** If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be stated in this section. If it was not registered prospectively (before enrolment of the first participant), you should include the words 'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

Background

The Background section should explain the background to the study, its aims, a summary of the existing literature and why this study was necessary or its contribution to the field.

Methods

The methods section should include:

- the aim, design and setting of the study
- the characteristics of participants or description of materials

- a clear description of all processes, interventions, and comparisons. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses
- the type of statistical analysis used, including a power calculation if appropriate.

Results

This should include the findings of the study including, if appropriate, results of statistical analysis which must be included either in the text or as tables and figures.

Discussion

This section should discuss the implications of the findings in context of existing research and highlight limitations of the study.

Conclusions

This should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations should be provided.

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- Ethics approval and consent to participate
- Consent for publication
- Availability of data and materials
- Competing interests
- Funding

- Authors' contributions
- Acknowledgements
- Authors' information (optional)

Please see below for details on the information to be included in these sections.

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Ethics approval and consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must:

- include a statement on ethics approval and consent (even where the need for approval was waived)
- include the name of the ethics committee that approved the study and the committee's reference number if appropriate

Studies involving animals must include a statement on ethics approval and for experimental studies involving client-owned animals, authors must also include a statement on informed consent from the client or owner.

See our editorial policies for more information.

If your manuscript does not report on or involve the use of any animal or human data or tissue, please state "Not applicable" in this section.

Consent for publication

If your manuscript contains any individual person's data in any form (including any individual details, images, or videos), consent for publication must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent for publication.

You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).

See our editorial policies for more information on consent for publication.

If your manuscript does not contain data from any individual person, please state "Not applicable" in this section.

Availability of data and materials

All manuscripts must include an 'Availability of data and materials' statement. Data availability statements should include information on where data supporting the results reported in the article can be found including, where applicable, hyperlinks to publicly archived datasets analysed or generated during the study. By data we mean the minimal dataset that would be necessary to interpret, replicate and build upon the findings reported in the article. We recognise it is not always possible to share research data publicly, for instance when individual privacy could be compromised, and in such instances data availability should still be stated in the manuscript along with any conditions for access.

Authors are also encouraged to preserve search strings on searchRxiv https://searchrxiv.org/, an archive to support researchers to report, store and share their searches consistently and to enable them to review and re-use existing searches. searchRxiv enables researchers to obtain a digital object identifier (DOI) for their search, allowing it to be cited.

Data availability statements can take one of the following forms (or a combination of more than one if required for multiple datasets):

- The datasets generated and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]
- The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
- All data generated or analysed during this study are included in this published article [and its supplementary information files].

- The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.
- Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.
- The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name].
- Not applicable. If your manuscript does not contain any data, please state 'Not applicable' in this section.

More examples of template data availability statements, which include examples of openly available and restricted access datasets, are available here.

BioMed Central strongly encourages the citation of any publicly available data on which the conclusions of the paper rely in the manuscript. Data citations should include a persistent identifier (such as a DOI) and should ideally be included in the reference list. Citations of datasets, when they appear in the reference list, should include the minimum information recommended by Data Cite and follow journal style. Dataset identifiers including DOIs should be expressed as full URLs. For example:
Hao Z, AghaKouchak A, Nakhjiri N, Farahmand A. Global integrated drought monitoring and prediction system (GIDMaPS) data sets. figshare.
2014. http://dx.doi.org/10.6084/m9.figshare.853801

With the corresponding text in the Availability of data and materials statement:

The datasets generated during and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS].[Reference number]

If you wish to co-submit a data note describing your data to be published in *BMC Research Notes*, you can do so by visiting our submission portal. Data notes support open data and help authors to comply with funder policies on data sharing. Co-published data notes will be linked to the research article the data support (example).

Competing interests

All financial and non-financial competing interests must be declared in this section.

See our editorial policies for a full explanation of competing interests. If you are unsure whether you or any of your co-authors have a competing interest, please contact the editorial office.

Please use the authors initials to refer to each authors' competing interests in this section.

If you do not have any competing interests, please state "The authors declare that they have no competing interests" in this section.

Funding

All sources of funding for the research reported should be declared. If the funder has a specific role in the conceptualization, design, data collection, analysis, decision to publish, or preparation of the manuscript, this should be declared.

Authors' contributions

The individual contributions of authors to the manuscript should be specified in this section. Guidance and criteria for authorship can be found in our editorial policies.

Please use initials to refer to each author's contribution in this section, for example: "FC analysed and interpreted the patient data regarding the haematological disease and the transplant. RH performed the histological examination of the kidney, and was a major contributor in writing the manuscript. All authors read and approved the final manuscript."

Acknowledgements

Please acknowledge anyone who contributed towards the article who does not meet the criteria for authorship including anyone who provided professional writing services or materials.

Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements section.

See our editorial policies for a full explanation of acknowledgements and authorship criteria.

If you do not have anyone to acknowledge, please write "Not applicable" in this section.

Group authorship (for manuscripts involving a collaboration group): if you would like the names of the individual members of a collaboration Group to be searchable through their individual PubMed records, please ensure that the title of the collaboration Group is included on the title page and in the submission system and also include collaborating author names as the last paragraph of the “Acknowledgements” section. Please add authors in the format First Name, Middle initial(s) (optional), Last Name. You can add institution or country information for each author if you wish, but this should be consistent across all authors.

Please note that individual names may not be present in the PubMed record at the time a published article is initially included in PubMed as it takes PubMed additional time to code this information.

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This section is optional.

You may choose to use this section to include any relevant information about the author(s) that may aid the reader's interpretation of the article, and understand the standpoint of the author(s). This may include details about the authors' qualifications, current positions they hold at institutions or societies, or any other relevant background information. Please refer to authors using their initials. Note this section should not be used to describe any competing interests.

Footnotes

Footnotes can be used to give additional information, which may include the citation of a reference included in the reference list. They should not consist solely of a reference citation, and they should never include the bibliographic details of a reference. They should also not contain any figures or tables.

Footnotes to the text are numbered consecutively; those to tables should be indicated by superscript lower-case letters (or asterisks for significance values and other statistical data). Footnotes to the title or the authors of the article are not given reference symbols.

Always use footnotes instead of endnotes.

References

Examples of the Vancouver reference style are shown below.

Web links and URLs: All web links and URLs, including links to the authors' own websites, should be given a reference number, and included in the reference list rather than within the text of the manuscript. They should be provided in full, including both the title of the site and the URL, as well as the date the site was accessed, in the following format: The Mouse Tumor Biology Database. http://tumor.informatics.jax.org/mtbwi/index.do. Accessed 20 May 2013. If an author or group of authors can clearly be associated with a web link, such as for weblogs, then they should be included in the reference.

Example reference style:

Article within a journal

Smith JJ. The world of science. Am J Sci. 1999;36:234-5.

Article within a journal (no page numbers)

Rohrmann S, Overvad K, Bueno-de-Mesquita HB, Jakobsen MU, Egeberg R, Tjønneland A, et al. Meat consumption and mortality - results from the European Prospective Investigation into Cancer and Nutrition. BMC Medicine. 2013;11:63.

Article within a journal by DOI

Slifka MK, Whitton JL. Clinical implications of dysregulated cytokine production. Dig J Mol Med. 2000; doi:10.1007/s801090000086.

Article within a journal supplement

Frumin AM, Nussbaum J, Esposito M. Functional asplenia: demonstration of splenic activity by bone marrow scan. Blood 1979;59 Suppl 1:26-32.

Book chapter, or an article within a book

Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. p. 251-306.

OnlineFirst chapter in a series (without a volume designation but with a DOI)

Saito Y, Hyuga H. Rate equation approaches to amplification of enantiomeric excess and chiral symmetry breaking. Top Curr Chem. 2007. doi:10.1007/128_2006_108.

Complete book, authored

Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

Online document

Doe J. Title of subordinate document. In: The dictionary of substances and their effects. Royal Society of Chemistry. 1999. http://www.rsc.org/dose/title of subordinate document. Accessed 15 Jan 1999.

Online database

Healthwise Knowledgebase. US Pharmacopeia, Rockville. 1998. http://www.healthwise.org. Accessed 21 Sept 1998.

Supplementary material/private homepage

Doe J. Title of supplementary material. 2000. http://www.privatehomepage.com. Accessed 22 Feb 2000.

University site

Doe, J: Title of preprint. http://www.uni-heidelberg.de/mydata.html (1999). Accessed 25 Dec 1999.

FTP site

Doe, J: Trivial HTTP, RFC2169. ftp://ftp.isi.edu/in-notes/rfc2169.txt (1999). Accessed 12 Nov 1999.

Organization site

ISSN International Centre: The ISSN register. http://www.issn.org (2006). Accessed 20 Feb 2007.

Dataset with persistent identifier

Zheng L-Y, Guo X-S, He B, Sun L-J, Peng Y, Dong S-S, et al. Genome data from sweet and grain sorghum (Sorghum bicolor). GigaScience Database.
2011. http://dx.doi.org/10.5524/100012.

Figures, tables, and additional files

See General formatting guidelines for information on how to format figures, tables and additional files.

Preparing figures

When preparing figures, please follow the formatting instructions below.

- Figures should be numbered in the order they are first mentioned in the text, and uploaded in this order. Multi-panel figures (those with parts a, b, c, d etc.) should be submitted as a single composite file that contains all parts of the figure.
- Figures should be uploaded in the correct orientation.
- Figure titles (max 15 words) and legends (max 300 words) should be provided in the main manuscript, not in the graphic file.
- Figure keys should be incorporated into the graphic, not into the legend of the figure.
- Each figure should be closely cropped to minimize the amount of white space surrounding the illustration. Cropping figures improves accuracy when placing the figure in combination with other elements when the accepted manuscript is prepared for publication on our site. For more information on individual figure file formats, see our detailed instructions.
- Individual figure files should not exceed 10 MB. If a suitable format is chosen, this file size is adequate for extremely high quality figures.
- **Please note that it is the responsibility of the author(s) to obtain permission from the copyright holder to reproduce figures (or tables) that have previously been published elsewhere.** In order for all figures to be open access, authors must have permission from the rights holder if they wish to include images that have been

published elsewhere in non open access journals. Permission should be indicated in the figure legend, and the original source included in the reference list.

Figure file types

We accept the following file formats for figures:

- EPS (suitable for diagrams and/or images)
- PDF (suitable for diagrams and/or images)
- Microsoft Word (suitable for diagrams and/or images, figures must be a single page)
- PowerPoint (suitable for diagrams and/or images, figures must be a single page)
- TIFF (suitable for images)
- JPEG (suitable for photographic images, less suitable for graphical images)
- PNG (suitable for images)
- BMP (suitable for images)
- CDX (ChemDraw - suitable for molecular structures)

For information and suggestions of suitable file formats for specific figure types, please see our author academy.

Figure size and resolution

Figures are resized during publication of the final full text and PDF versions to conform to the BioMed Central standard dimensions, which are detailed below.

Figures on the web:

- width of 600 pixels (standard), 1200 pixels (high resolution).

Figures in the final PDF version:

- width of 85 mm for half page width figure
- width of 170 mm for full page width figure

- maximum height of 225 mm for figure and legend
- image resolution of approximately 300 dpi (dots per inch) at the final size

Figures should be designed such that all information, including text, is legible at these dimensions. All lines should be wider than 0.25 pt when constrained to standard figure widths. All fonts must be embedded.

Figure file compression

- Vector figures should if possible be submitted as PDF files, which are usually more compact than EPS files.
- TIFF files should be saved with LZW compression, which is lossless (decreases file size without decreasing quality) in order to minimize upload time.
- JPEG files should be saved at maximum quality.
- Conversion of images between file types (especially lossy formats such as JPEG) should be kept to a minimum to avoid degradation of quality.

If you have any questions or are experiencing a problem with figures, please contact the customer service team at info@biomedcentral.com.

Preparing tables

When preparing tables, please follow the formatting instructions below.

- Tables should be numbered and cited in the text in sequence using Arabic numerals (i.e. Table 1, Table 2 etc.).
- Tables less than one A4 or Letter page in length can be placed in the appropriate location within the manuscript.
- Tables larger than one A4 or Letter page in length can be placed at the end of the document text file. Please cite and indicate where the table should appear at the

relevant location in the text file so that the table can be added in the correct place during production.

- Larger datasets, or tables too wide for A4 or Letter landscape page can be uploaded as additional files. Please see [below] for more information.
- Tabular data provided as additional files can be uploaded as an Excel spreadsheet (.xls) or comma separated values (.csv). Please use the standard file extensions.
- Table titles (max 15 words) should be included above the table, and legends (max 300 words) should be included underneath the table.
- Tables should not be embedded as figures or spreadsheet files, but should be formatted using 'Table object' function in your word processing program.
- Colour and shading may not be used. Parts of the table can be highlighted using superscript, numbering, lettering, symbols or bold text, the meaning of which should be explained in a table legend.
- Commas should not be used to indicate numerical values.

If you have any questions or are experiencing a problem with tables, please contact the customer service team at info@biomedcentral.com.

Preparing additional files

As the length and quantity of data is not restricted for many article types, authors can provide datasets, tables, movies, or other information as additional files.

All Additional files will be published along with the accepted article. Do not include files such as patient consent forms, certificates of language editing, or revised versions of the main manuscript document with tracked changes. Such files, if requested, should be sent by email to the journal's editorial email address, quoting the manuscript reference number. Please do not send completed patient consent forms unless requested.

Results that would otherwise be indicated as "data not shown" should be included as additional files. Since many web links and URLs rapidly become broken, BioMed Central requires that supporting data are included as additional files, or deposited in a recognized

repository. Please do not link to data on a personal/departmental website. Do not include any individual participant details. The maximum file size for additional files is 20 MB each, and files will be virus-scanned on submission. Each additional file should be cited in sequence within the main body of text.

If additional material is provided, please list the following information in a separate section of the manuscript text:

- File name (e.g. Additional file 1)
- File format including the correct file extension for example .pdf, .xls, .txt, .pptx (including name and a URL of an appropriate viewer if format is unusual)
- Title of data
- Description of data

Additional files should be named "Additional file 1" and so on and should be referenced explicitly by file name within the body of the article, e.g. 'An additional movie file shows this in more detail [see Additional file 1]'.

For further guidance on how to use Additional files or recommendations on how to present particular types of data or information, please see How to use additional files.

Appendices 5: Signed letter stating the contribution of the candidate to the manuscript

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

WITS School of Public Health

15 November 2024

FACULTY OF HEALTH SCIENCES

Dear Prof./Dr./Sir/Madam

Manuscript Title: Access to Healthcare Services among Youth Enrolled in Post School Training and Education (PSET) during the First Wave of the COVID-19 Pandemic in South Africa

This letter serves to confirm that the above-named student contributed to the conceptualization and draft preparation, methodology, data cleaning and analysis under the supervision, Dr Jackie Dunlop, Dr Thabang Manyaapelo and Dr Wiedaad Slemming. All authors have read and agreed to the published version of the manuscript.

Yours faithfully



Philisiwe Ndlovu

Student

Appendices 6: Data Extraction Tool as Per Variables Identified

Study Measures		
Variable Name	**Measures**	**Details**
Demographic Information (independent variable)	HSRC demographic form	Includes: education, age, race, gender, residence during lockdown, socio-economic status, province, and institution type
COVID-19 knowledge & risk (independent variable)	HSRC COVID-19 questionnaire	Asks about covid-19 knowledge and risk for instance: Have you been doing any of the following DURING THE PAST WEEK because of the COVID-19 emergency? (Select all that apply) 1= using face masks, 2=covering coughs or sneezes with a tissue or flexed elbow, 3=wearing hand gloves, 4=using hand sanitizer, 5= washing my hands more frequently, 6= staying in my house and decreased my social interaction, 7= self-isolating, 8= other (specify) and 9= I haven't taken any precautionary procedures yet.
Substance use (independent variable)	HSRC questionnaire	The types and frequency of alcohol, drug and cigarette use is assessed. Respondents were also asked questions on substance use, during the past 30 days have you used any of the following: 1= smoked marijuana/dagga, 2=drank alcohol, 3= myope/wonga/tik, 4= other recreational drugs, 5=cigarettes and 6=none of these. Followed by questions on how often do currently use the following: 1= yes, daily, 2= yes, but occasionally and 3= no, not at all.
COVID-19 challenges (independent variable)	HSRC questionnaire	Self-reported challenges during the pandemic, yes/no response option. Access to transport, not enough money for food, unable to pay rent, faced no challenges, loss due to death in the family or community and inability to access medical or chronic medication

Health and social support communication platforms (independent variable)	HSRC COVID-19 questionnaire	Type of communication platforms (online, telephone or face to face) used to access social and health support. Most frequently used communication (online, telephone or face to face) platforms (1= Online, 2=Face-to-face, 3=Telephone and 4= Not available / NA) for financial aid, mental health support, health care services, international students support and diversity support (disability, LGBTIAQ).
Access to healthcare service (outcome variable)	HSRC questionnaire	Self-reported access to family planning methods, chronic medication, ART etc. For instance, were you able to access the following healthcare services during lockdown (first wave of the pandemic): respondents were asked if they were able to access birth control (e.g.: the pill), barrier contraception (condoms, etc), chronic medications (TB, Diabetes etc.), access to antiretroviral medication etc., yes/no response options?