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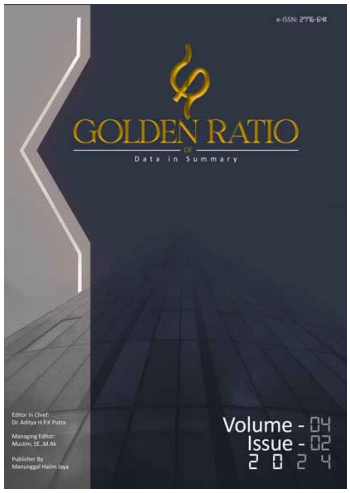
ISSN [Online]: 2776-6411



Received: April 27, 2024
Revised: April 30, 2024
Accepted: August 10, 2024

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DESCRIPTIVE OF QUANTITATIVE DATA | SUPPLEMENTARY

Cervical Cancer Screening: An Analysis of Three Large South African Medical Schemes

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Abstract: Cervical cancer poses a considerable public health challenge in South Africa, necessitating effective screening programs for early detection and prevention. However, the COVID-19 pandemic has disrupted healthcare services, including cervical cancer screening, posing challenges to disease management efforts. This study aimed to assess cervical cancer incidence and screening practices among beneficiaries within three major South African medical schemes, analysing trends from 2017 to 2022. Retrospective data were collected to evaluate incidence rates and screening coverage, considering the impact of the pandemic. Screening coverage declined during the epidemic, recovering in 2021 but declining again in 2022. Different health plans showed a more than forty per cent fall in cervical cancer screening rates between 2021 and 2022, with 2022 having the lowest level, even lower than the COVID-19 era. The trends indicate COVID-19 interruptions have a negative impact post-COVID-19. Recommendations include targeted outreach, telemedicine options, and strengthened collaboration to enhance screening programs and mitigate pandemic-related disruptions. This study contributes valuable insights into cervical cancer management, highlighting the need for proactive measures to ensure the continuity of essential healthcare interventions amid public health emergencies.

Keywords: Beneficiaries, Cervical Cancer, COVID-19, Healthcare Services, Incidence Rates, Medical Schemes, Screening Coverage, South Africa

1. INTRODUCTION

Cervical cancer remains a significant public health challenge worldwide, particularly in low- and middle-income countries, where access to screening and treatment services may be limited (Zhang, Zeng, Cai et al.., 2019; Hull, Mbele, Makhafola et al., 2020). According to the World Health Organization (WHO), cervical cancer ranks as the fourth leading cause of death among women globally (WHO, 2024). In South Africa specifically, cervical cancer stands out as the second most prevalent cancer among women, with an approximate age-standardised incidence rate of 35.3 per 100,000 women years in 2020 (Sørbye, Falang, Botha et al., 2023). Despite efforts to improve screening programs and access to human papillomavirus (HPV) vaccination, cervical cancer continues to impose a considerable burden on the healthcare system and society as a whole (Basu, 2019; Ong, Abe, Thilagaratnam et al., 2023).

The COVID-19 pandemic has exacerbated existing healthcare disparities and disrupted essential healthcare services, including cervical cancer screening and treatment (Fisher-Borne, Isher-Witt, Comstock & Perkins, 2021; Rine, Lara, Bikomeye et al., 2023). Lockdown measures, resource reallocation, and fear of contracting the virus have led to decreased utilisation of healthcare services and delays in cancer diagnosis and treatment (Kumari, Mahla, Mangone et al., 2020; Nnaji & Moodley, 2021). Studies have shown a significant decline in cancer screenings and diagnoses during the pandemic, with cervical cancer being particularly affected (Alkatout, Biebl, Momenimovahed et al., 2021; Fisher-Borne, Isher-Witt, Comstock & Perkins, 2021; Rine, Lara, Bikomeye et al., 2023). Given the impact of the pandemic on healthcare services, it is crucial to assess the effect on cervical

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cancer screening and incidence rates among beneficiaries of medical schemes in South Africa. Medical schemes are essential in facilitating access to healthcare services for a minority population, just under 15% as of December 2022. Despite serving a relatively small portion of the populace, they contribute significantly to healthcare expenditure. Hence, they represent a critical area of focus for comprehending patterns in managing cervical cancer (CMS, 2023).

Cervical cancer stands out as a formidable challenge in the realm of women's health, being the leading cause of cancer-related deaths and the fourth most diagnosed cancer among women globally (Zhang, Xu, Zhang & Qiao, 2020; WHO, 2024a). The urgency of addressing this issue is underscored by timely screening being pivotal in detecting cervical abnormalities early, enabling effective intervention and treatment (Basoya & Anjankar, 2022; Gupta, Nagtode, Chandra & Gomase, 2023). Current guidelines recommend screening every 3.5 years for individuals aged 25 to 49 and every 5.5 years for those aged 50 to 64, emphasising the critical role of regular screening in preventing the progression of cervical cancer (American College of Obstetricians and Gynecologists, 2021, Boardman & Randall, 2022). Cervical screening coverage serves as a vital metric in assessing the effectiveness of efforts to combat cervical cancer, particularly in the context of the WHO`s cervical cancer elimination plan (WHO, 2020b).

However, despite concerted efforts to increase screening rates, the data reveals concerning trends in some African countries, including South Africa. In 2019, cervical screening coverage in South Africa was reported at a mere 50%, reflecting a significant gap in access to screening services (Ndlovu & Padarath, 2024; Willie, 2024; Willie, Kabane, Kubheka, 2024a; Willie, Kabane, Kubheka, 2024b). This figure was even lower at 21.4% in 2022, marking a substantial decline from previous years (Ndlovu & Padarath, 2024). Such a precipitous drop is alarming, especially considering the WHO's target of achieving a screening coverage rate of 70% by 2030 (Willie, 2024). The substantial decrease in screening rates not only signifies a failure to meet this target but also raises concerns about the potential impact on cervical cancer-related mortality rates.

2. LITERATURE REVIEW

Cervical cancer remains a significant global health burden, particularly in low- and middle-income countries, where access to screening and treatment is limited (Hull et al., 2020; WHO, 2024a). Epidemiological studies have highlighted the prevalence of cervical cancer among women, with specific populations, such as those in Sub-Saharan Africa, experiencing disproportionately high incidence rates (Jedy-Agba, Joko, Liu et al., 2020; Yang, Boily, Rönn et al., 2022). Developing effective screening strategies is crucial for early detection and prevention of cervical cancer (WHO, 2024a; WHO, 2024b). Several screening methods have been studied and implemented worldwide, including HPV-based testing, Visual Inspection with Acetic Acid (VIA), and Pap smear testing (Lohiya, Daniel, Kumar et al., 2020; Serrano, Ibáñez, Robles et al., 2021). HPV-based screening has emerged as a susceptible and specific method for detecting high-risk HPV types associated with cervical cancer. It offers advantages in accuracy and efficiency compared to traditional Pap smear testing, particularly in resource-limited settings where access to skilled cytologists may be limited (Thomsen, Kjær, Munk 2021).

However, the success of screening programs depends not only on the choice of screening method but also on implementing effective strategies to reach underserved populations (Okunade, Adejimi, John-Olabode et al., 2022; Ponce-Chazarri, Ponce-Blandón, Immordino, et al., 2023; Sharma, Yennapu & Priyanka, 2023). Studies have highlighted disparities in screening uptake among various demographic groups, including women from low-income communities, rural areas, and marginalised populations (Petersen, Jaca, Ginindza et al. et al., 2022; Chipanta, Kapambwe, Nyondo-Mipando et al., 2023). Barriers to screening uptake include lack of awareness, cultural beliefs, financial constraints,

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and logistical challenges, further depicted in Figure 1 (Lee, Ismail-Pratt, Machalek et al., 2023; Mantula, Toefy & Sewram, 2024). The COVID-19 pandemic has exacerbated challenges in cervical cancer screening and care delivery (Wentzensen, Clarke, Perkins, 2021; Lee et al., 2023; Rine, Lara, Bikomeye, et al., 2023).

Healthcare systems worldwide have faced disruptions, leading to delays in routine screenings, diagnostic procedures, and treatment initiation (Vahabi, Shahil-Feroz, Lofters et al., 2023). Studies have documented a decline in cervical cancer screenings during the pandemic, with significant implications for cancer detection and outcomes (Bonadio, Messias, Moreira et al., 2021; Burger, E. A., Jansen, E., Killen et al., 2021; Vahabi, Shahil-Feroz, Lofters et al., 2023).

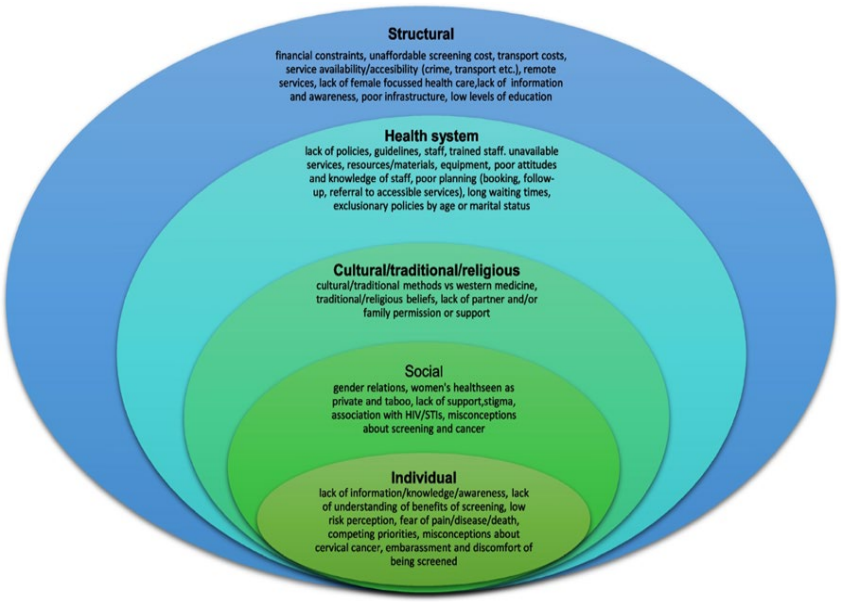

Figure 1. Barriers for cervical cancer screening
Source: Petersen et al. (2022)

This study aligns with Sustainable Development Goal (SDG) 3.4, which aims to reduce premature mortality from non-communicable diseases, including cervical cancer (United Nations, 2020; WHO,2020; Thakur, Nangia & Singh, 2021; Wang, Arcà, Sinha et al., 2022). Additionally, this study supports WHO guidelines on cervical cancer screening, which advocate for evidence-based screening and early detection approaches. This study examines trends in cervical cancer incidence and screening practices among beneficiaries of three major medical schemes in South Africa from 2017 to 2022. Through the analysis of variations in screening coverage and incidence rates over some time, we can determine the influence of the COVID-19 pandemic on the management of cervical cancer and develop methods to minimise its consequences. Additionally, this study will contribute to the literature on cervical cancer in South Africa and provide valuable insights for policymakers, healthcare providers, and researchers.

3. RESEARCH DESIGN AND METHOD

This study adopts a retrospective observational design, utilising secondary data from medical scheme databases and national cancer registries as well as other secondary data sources such as Statistics South Africa and District Health Barometer datasets (Song & Chung, 2010; Soliman, Daar, Tzoulis

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et al., 2022). The setting and study population was a select list of female beneficiaries in South African medical schemes. This study adopts a non-probability sampling method, mainly the purposive sampling sample framework was utilised to select three schemes with reliable and consistent data from the period 2017-2022 are used by researchers to learn about a population (Maree & Pietersen, 2016; Golzar, Tajik & Noor, 2022). In Wu, Huang, and Huang et al.'s (2014) study, it is asserted that purposive sampling is commonly employed in qualitative research. This method involves researchers meticulously selecting participants based on the study's objectives, anticipating that each individual will contribute distinct and valuable insights to the research endeavour (Wu et al., 2014). The study population consists of female beneficiaries who are enrolled in three prominent South African medical plans. Information regarding the extent of cervical cancer screening, occurrence rates, demographic attributes, and any disruptions caused by COVID-19 are collected and examined. The data was obtained from the DDDR database, primarily focusing on SDG goals data related to cervical cancer, pap smears, and the demographic profile of the target group.

The study focused on female beneficiaries from three large schemes eligible for cancer screening according to the standards and targets set by the WHO and SDGs. In addition, a detailed literature review contextualises the findings within the existing body of knowledge on cervical cancer epidemiology, screening strategies, and the impact of the COVID-19 pandemic on cancer care delivery. Relevant studies, guidelines, and reports are reviewed to comprehensively understand the study subject and inform the interpretation of study findings. Descriptive statistical analyses assess and trend analysis on cervical cancer screening over the study period (Wang, Shao, Yu et al., 2020; Qin, Shahangian, Saraiya et al., 2021). The analysis was conducted using SAS and Stata.

Study Objectives

1. To evaluate trends in cervical cancer screening coverage among beneficiaries of South African medical schemes from 2019 to 2022.
2. To explore the impact of COVID-19-related disruptions on cervical cancer care delivery and outcomes among medical scheme beneficiaries.
3. To provide recommendations for strengthening cervical cancer screening programs and mitigating the effects of the pandemic on cancer care within medical schemes.

Operational variables and concepts

The following table illustrates the operational variables analysed in the present study. In South Africa, medical schemes provide essential healthcare services in exchange for monthly premiums. This sector encompasses nearly 15% of the population and operates under the regulation of the Council for Medical Schemes (CMS, 2023). As of December 2022, there were 71 medical schemes, collectively covering 9.04 million individuals.

Table 1: Operational variables and concepts

Medical Schemes Act (MSA)	The Medical Schemes Act (MSA) is legislation enacted in South Africa that governs the operations and regulations of medical schemes, also known as health insurance or medical aid schemes. The MSA regulates these schemes' creation, administration, and management to safeguard scheme beneficiaries and ensure access to quality healthcare.
Council for Medical Schemes (CMS)	The Council for Medical Schemes (CMS) is a regulatory body established in South Africa under the provisions of the Medical Schemes Act (MS Act). The CMS oversees and regulates medical schemes in the country, ensuring that they comply with the MSA and the best interests of scheme members.
Open schemes	Open schemes refer to a type of medical scheme or health insurance plan available for membership to any eligible individual or family without restrictions based on

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	employment or other specific criteria.
Large schemes	Schemes with more than 30,000 beneficiaries
Members	A principal member of a medical scheme is a person responsible for contributing (s) to the medical scheme.
Dependants	Dependants in medical schemes refer to individuals covered by a healthcare plan based on their relationship with the primary member, such as spouses, children, or other eligible family members.
Benefit designs	Benefits options (Health plans) were reclassified into the following categories to assess the effect of benefits option richness. Comprehensive Plans: Provide comprehensive cover for almost all medical costs, including unlimited hospital cover and generous benefits for day-to-day expenses. Hospital Plans: Supplementary in-hospital benefits relative to PMB; no out-of-hospital (OOH) benefits. Partial Cover Plans: Partial cover for OOH benefits from risk, savings account, and no above-threshold benefits (ATB). EDOs, or Efficiency Discount Options, refer to a type of arrangement in healthcare insurance plans where members are provided with incentives to utilize preferred medical providers at negotiated rates. This arrangement allows for lower premiums compared to plans that offer more flexibility in provider selection. With EDOs, insurance companies negotiate discounted rates with specific healthcare providers or networks, and members are encouraged to use these preferred providers to receive medical services.
Num_Cervic1	Number of beneficiaries with cervical cancer
Num_Cervic2	Num_Cervic2 Number of women aged 30 -49 years screened for cervical cancer

Sources: MS Act (1998); Nkomo (2019)

4. RESULT AND DISCUSSION

4.1. Result

Demographic information

The analysis encompassed three large medical schemes, with 343,456 beneficiaries in 2021 and 353,339 female beneficiaries in 2022 (Table 2). The chosen medical schemes had similar demographics. The average age of female beneficiaries was 36.8 years for scheme 1, 37.9 years for scheme 2, and 35.0 years for scheme 3. The distribution of female recipients is illustrated in Figure 1. The percentage of female beneficiaries aged 25 to 64 was 55%, 53%, and 55% for schemes 1, 2, and 3, respectively.

Table 2: Demographic profile of the study and target population

	Scheme 1	Scheme 2	Scheme 3
Number of female beneficiaries	121 849	78 821	152 669
Number of women aged 30 -49 years	39 195	22 124	48 778
% of females aged 25-64 years	54,9%	53,7%	54,8%
Weighted average age (years)	36,8	37,8	35,0
Number of beneficiaries with cervical cancer	5 560	3 533	3 602
Number of women aged 30 -49 years screened for cervical cancer	3 151	1 666	2 143
Number of beneficiaries with cervical cancer per 100	8%	8%	4%
Number of women aged 30 -49 years screened for cervical cancer per 100	8%	8%	4%

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The number of beneficiaries with cervical cancer for Scheme 1 was 5,560 female beneficiaries, 3 533 for Scheme 2 and 3 602 for Scheme 3. Table 1 above further depicts the proportion of women aged 30 -49 years screened for cervical cancer between the three large schemes, and the proportion was 8% for schemes 1 & 2 and 3% for scheme 3.

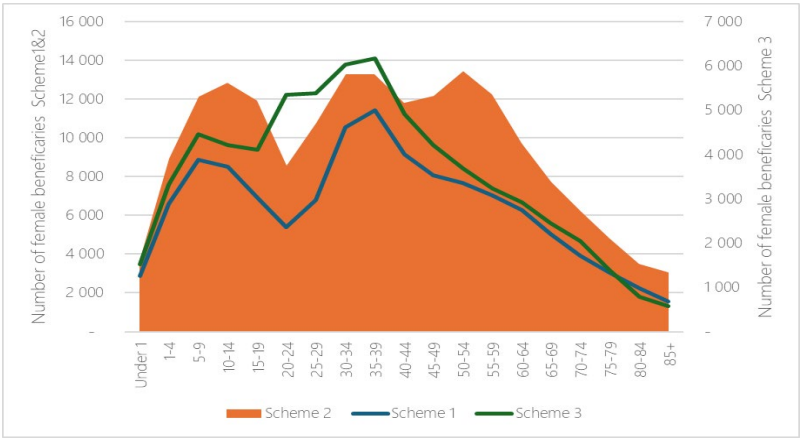
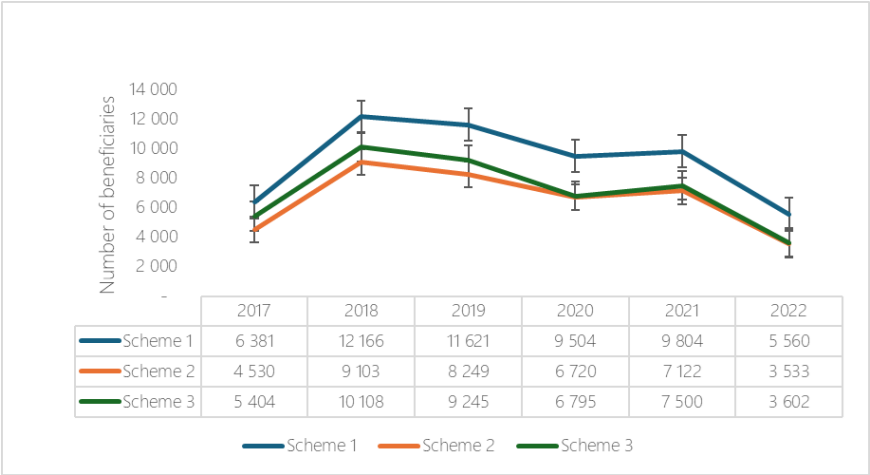


Figure 2. Distribution of female beneficiaries: Scheme 1-3: 2022

Number of females with cervical cancer and the number screened: 2017-2022

The figure 3 illustrates the count of female recipients affected by cervical cancer throughout the review period. Analysis indicates a diminishing trend across the three major schemes scrutinised. This decline was particularly significant in 2022 compared to the preceding year. Moreover, the decreasing trend mirrors the number of females screened for cervical cancer, as depicted in Figure 4.



	2017	2018	2019	2020	2021	2022
Scheme 1	6 381	12 166	11 621	9 504	9 804	5 560
Scheme 2	4 530	9 103	8 249	6 720	7 122	3 533
Scheme 3	5 404	10 108	9 245	6 795	7 500	3 602

Figure 3. Number of pap smears performed 201-2022 trend analysis

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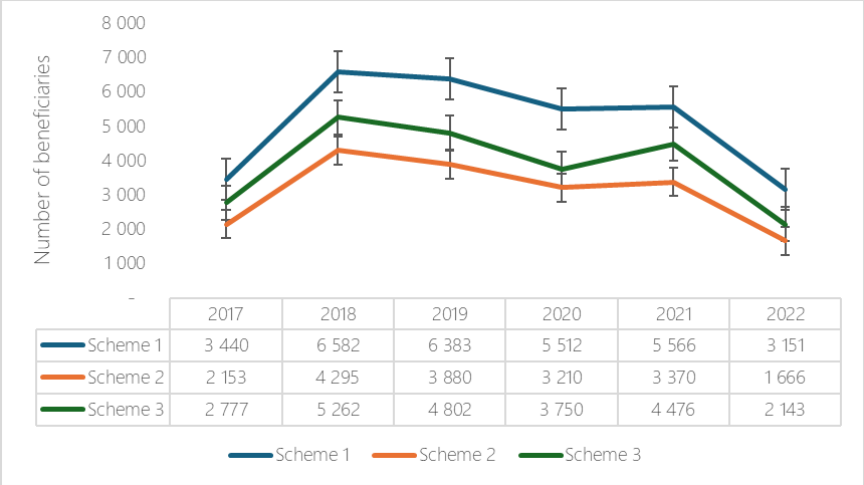

Figure 4. Number of women aged 30 -49 years screened for cervical cancer

Preventative screening- Number of pap smears performed

The figure 5 illustrates the number of pap smears conducted from 2017 to 2022. The data shows an improvement from 2017 to 2018, but a downward trend is observed from 2018 onwards. The decline is particularly significant between 2021 and 2022, by 48%.

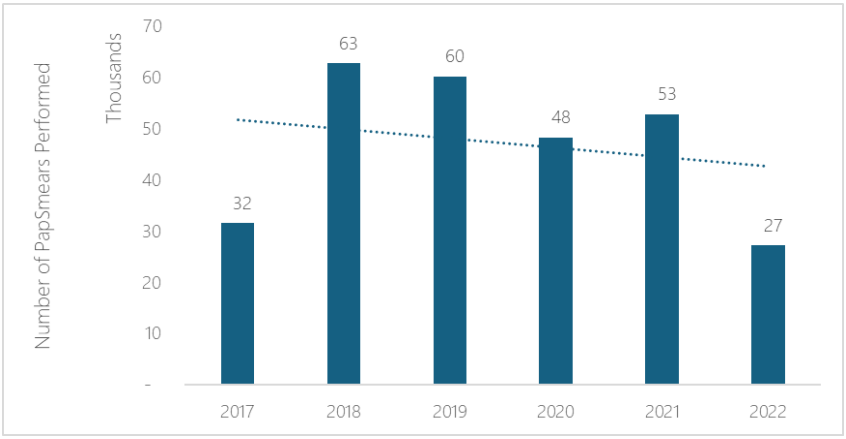

Figure 5. Number of pap smears performed 201-2022

Number of pap smears performed by benefit design

There was a discernible decrease in the trend of Pap smears performed, and this fall was consistent across all benefit designs (Figure 6). This was the case when benefit design changes were taken into consideration. A partial recovery occurred in 2021, even though COVID-19 had a noticeable impact on the situation. Despite this, the facts continue to point to a drop, even lower than the levels reached in 2020. The fact that this is the case shows that the number of women who use screening programs like Pap smears is decreasing. The comprehensive plans decreased from 22,002 in 2021 to 11,513, indicating a fall throughout the study period. Similarly, the number of EDOs decreased from 20,392 in 2021 to 10,323 in 2022, somewhat lower than the number of pap smears performed in 2017.

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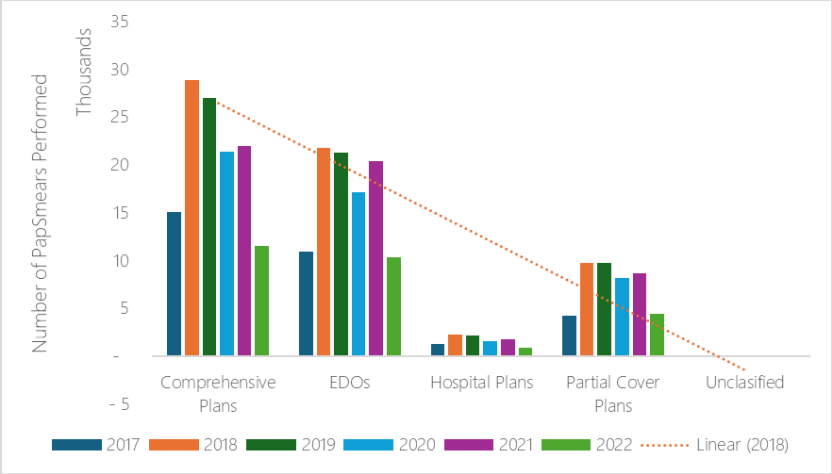

Figure 6. Number of pap smears performed by benefit design 2017-2022

4.2. Discussion

The study examined data from three major medical schemes in South Africa, revealing a concerning decline in screening services that mirrors trends observed in the public sector. This decline in screening levels has gone significantly below pre-COVID-19 levels, reversing gains made before the pandemic. These findings highlight the severity of the impact of the COVID-19 pandemic on cervical cancer screening services, not only within the medical scheme population but also more broadly across South Africa. The observation that screening levels have fallen to such an extent raises significant concerns about the potential consequences for cervical cancer incidence and mortality rates. It suggests that efforts to improve screening coverage and reduce the burden of cervical cancer may have been set back considerably by the disruptions caused by the pandemic. This underscores the urgent need for targeted interventions to address the decline in screening services and mitigate the long-term impact on cervical cancer outcomes in South Africa.

The findings of this study are consistent with existing literature regarding the challenges and disparities in cervical cancer screening and incidence rates, particularly in low- and middle-income countries such as South Africa. Cervical cancer remains a significant public health concern globally, with limited access to screening and treatment services exacerbating the burden of the disease, especially in resource-constrained settings (Zhang et al., 2019; Hull et al., 2020). The high incidence and mortality rates associated with cervical cancer underscore the importance of effective screening programs and access to preventive measures such as HPV vaccination (Basu, 2019; Ong et al., 2023). The impact of the COVID-19 pandemic on cervical cancer care delivery is evident in the decreased utilisation of healthcare services and disruptions in screening and treatment programs (Fisher-Borne et al., 2021; Rine et al., 2023). Lockdown measures, resource reallocation, and fear of contracting the virus have significantly declined cancer screenings and diagnoses, including cervical cancer screenings (Kumari et al., 2020; Nnaji & Moodley, 2021). These findings align with previous studies highlighting the pandemic's global adverse effects on cancer care (Alkatout et al., 2021). This study contributes to the literature by examining trends in cervical cancer screening and incidence rates among beneficiaries of medical schemes in South Africa, providing insights into the impact of the pandemic on cancer care within this population. Medical schemes play a crucial role in facilitating access to healthcare services for a minority of the population in South Africa, making them a pertinent focus for understanding patterns in cervical cancer management (CMS, 2023).

The findings highlight cervical cancer screening coverage trends and incidence rates among medical scheme beneficiaries. Despite efforts to increase screening rates, coverage has declined over

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the study period, with only a small proportion of eligible women receiving regular screenings. This decline is particularly alarming considering the WHO's target of achieving a screening coverage rate of 70% by 2030 (Willie, 2024). The decrease in screening rates may have significant implications for cervical cancer-related mortality rates and underscores the need for targeted interventions to improve screening uptake (Ndlovu & Padarath, 2024; Willie et al., 2024). The study findings also reveal disparities in screening uptake among different demographic groups, with women from low-income communities, rural areas, and marginalised populations facing barriers to accessing screening services (Petersen et al., 2022; Chipanta et al., 2023). Addressing these disparities requires implementing effective strategies to reach underserved populations and overcome barriers to screening uptake, including increasing awareness, addressing cultural beliefs, and addressing financial constraints (Mantula et al., 2024). The study's strengths include its use of comprehensive data from medical scheme databases and national cancer registries, allowing for a robust analysis of trends in cervical cancer screening and incidence rates over time. However, the study also has limitations, including its retrospective observational design and reliance on secondary data sources, which may be subject to biases and inaccuracies. Future research should explore strategies to improve cervical cancer screening uptake among underserved populations and evaluate the effectiveness of interventions aimed at mitigating the impact of the COVID-19 pandemic on cancer care delivery. Overall, this study underscores the importance of monitoring trends in cervical cancer screening and incidence rates, particularly in the context of the COVID-19 pandemic and highlights the need for urgent targeted interventions to improve screening uptake and mitigate the pandemic's impact on cancer care delivery, both in the private sector and public sector in South Africa.

5. CONCLUSIONS

This study provides valuable insights into the trends in cervical cancer screening and incidence rates among beneficiaries of major medical schemes in South Africa from 2017 to 2022. The findings underscore the persistent challenges in cervical cancer management, including disparities in screening uptake and the impact of the COVID-19 pandemic on cancer care delivery. Despite efforts to improve access to screening programs, the analysis reveals a concerning decline in screening coverage and incidence rates over the study period. These findings highlight the urgent need for targeted interventions to strengthen cervical cancer screening programs and mitigate the effects of the pandemic. Addressing barriers to access, enhancing awareness campaigns, and expanding screening services to underserved populations are crucial steps to improve early detection and prevention efforts. Additionally, efforts should be made to address systemic issues such as healthcare infrastructure, workforce capacity, and financial barriers that hinder equitable access to screening and treatment. Based on the findings of this study, we propose several key recommendations to enhance cervical cancer screening programs and improve outcomes. First, it is essential to launch comprehensive public awareness campaigns to promote the importance of cervical cancer screening, dispel common myths, and address cultural barriers that may prevent women from seeking screening. These campaigns should aim to educate the public about the benefits of early detection and the availability of screening services. Additionally, enhancing access to cervical cancer screening is crucial. This can be achieved by establishing mobile clinics, community outreach programs, and telemedicine services, particularly in remote and underserved areas. By doing so, we can ensure that more women have the opportunity to participate in screening programs, regardless of their location.

Investment in healthcare infrastructure is another critical component. This includes procuring necessary screening equipment, training healthcare providers to effectively conduct screenings, and establishing clear referral pathways to ensure timely diagnosis and treatment for those who test positive.

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Integrating cervical cancer screening into routine primary healthcare services is also recommended to improve accessibility and increase the uptake of screening among women of reproductive age. This integration can help normalize the screening process and make it a standard part of women's healthcare. Promoting research and evaluation initiatives is vital for the continued advancement of cervical cancer screening programs. Research should focus on evaluating the effectiveness of novel screening technologies, implementing evidence-based interventions, and addressing emerging challenges in cervical cancer prevention and control. Lastly, fostering collaboration between government agencies, non-governmental organizations, healthcare providers, and community stakeholders is essential. Such collaboration can help coordinate efforts, share resources, and leverage expertise, ultimately advancing cervical cancer prevention and control initiatives. By implementing these recommendations, we can work towards reducing the incidence of cervical cancer and improving health outcomes for women. These recommendations align with findings from the District Health Information System report, which also highlights a concerning downward trend in women's screening programs. This trend poses significant risks to health outcomes, particularly for diseases like cancer, which remains a leading cause of mortality among women. Addressing this issue requires urgent, coordinated efforts and partnerships between the government and the private sector. There is also a critical need to refocus on primary healthcare components, including prevention and health promotion initiatives.

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