

# A Three-year Audit of Dental Services at Primary Health Care Facilities in Gauteng, South Africa: 2017 to 2019

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ABSTRACT

**Aim:** The aim of this study was to determine the types and trends of dental services offered over 3 months (April, May, and June) every year from 2017 till 2019 at all full-time primary oral health care facilities (POHCFs) in Gauteng Province, South Africa. **Materials and Methods:** This was a record-based retrospective study. Data were collected from April, May, and June in 2017, 2018, and 2019, from all full-time POHCFs in Gauteng. The data were obtained from the attendance registers at each facility and included the number of patients and personnel and the type and number of procedures performed. **Results:** A total of 90 POHCFs were included. The number of clinicians remained stable, whereas the mean number of patients per month increased from 587 (2017) to 654 (2019). This resulted in an increase in the mean monthly patient-to-clinician ratio from 376 (2017) to 428 (2019). On average, 459 extractions, 64 restorations, and 43 fissure sealants were performed monthly per district. Clinicians treated on average 19 patients per day and on average 15 extractions for every restoration. The mean operator-to-dental assistant ratio was 1.3:1. **Conclusion:** Although there were differences in the types of services rendered and the workloads of clinicians across the province, a significant increase was observed in the number of patients over the study period. The most common services rendered were extractions and the extraction-to-restoration ratio was fairly high. Managers need to carry out regular audits to ensure that the facilities are operating optimally.

**KEYWORDS:** *Audit, dental services, primary health care, staff workloads*

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## INTRODUCTION

The South African health care system is made up of a public and private sector with the majority of South Africans (almost 75%) utilizing the public sector for their health care needs.<sup>[1]</sup> The public sector is based on the primary health care (PHC) approach and offers a limited package of dental services at most primary oral health care facilities (POHCFs) at no cost to the consumer. The private sector offers the full range of dental services at a cost determined either by the practitioner or by the medical aid schemes.

The majority of health professionals are employed in the private sector even though this sector caters for

less than 25% of the South African population.<sup>[1]</sup> This imbalance between the number of service providers and the utilization of the services by the patients creates a huge burden on the public sector facilities and often results in operators not coping with the workload and often forcing them to perform limited dental services such as extractions.<sup>[2,3]</sup>

POHCFs offer a basic package of dental services, which includes dental examinations, bitewing radiographs,

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extractions, simple restorations (1–3 surfaces), scaling and polishing, and emergency relief of pain.<sup>[4]</sup>

It is essential to monitor these services to plan for resources, personnel, and infrastructure.<sup>[5,6]</sup> Regular audits assist in determining patient utilization trends, types of dental services being rendered, and the disease burden within communities.<sup>[6]</sup>

South Africa (SA) has nine provinces and all of these have dental facilities that offer primary dental care. Gauteng, one of these provinces, is one of the most urbanized and densely populated. It consists of five districts, and each district has its own clinical manager for managing dental services.<sup>[7]</sup> The population density varies across these districts and as a result the number of dental facilities, number of patients attending, number of staff members, and the type of services rendered varies in each district and facility.<sup>[7]</sup> The districts consist of full- and part-time dental facilities, which operate either for 5 or less than 5 days per week, respectively. Some facilities also offer after-hours services (from 4 PM to 6:30 PM) and Saturday morning services (8 AM till 2 PM), and the patients treated during these times were referred to as overtime patients. The remaining facilities offer a 5-day service (Monday to Friday), which runs from 8 AM to 4 PM daily.

In SA, there are four cadres of oral health personnel that offer dental services. These are the oral hygienist, dental therapist, dentist, and dental specialist.<sup>[8]</sup> All of the POHCFs have a manager who manages the facility and is usually either a dentist or a dental therapist. They are responsible for the daily running of the services, ordering of consumables and materials, and supervising of the dental staff.

An audit on the type and frequency of dental services offered is essential for the planning of human resources, infrastructure development and the maintenance of equipment. It will also inform policy regarding the distribution of staff and dental resources to ensure optimum delivery of health care. The results from this study provide valuable baseline information and could be used for the motivation of additional staff and/or resources. It also assists in identifying those facilities which have a high number of attendees in order for appropriate measures to be taken.

This study will be the first study in Gauteng to determine the type and frequency of services being rendered over a 3-year period.

The aim was to determine the type and frequency of dental services offered over a 3-month period (April, May, and June) over 3 years (2017, 2018, and 2019) at all full-time POHCFs in Gauteng. The objectives

were to determine the type and frequency of dental services offered, the workload of the clinicians, and the clinician-to-patient and clinician-to-assistant ratios in Gauteng.

## MATERIALS AND METHODS

### SETTING AND DESIGN

This was a record-based retrospective study carried out in 2019. Owing to financial and time constraints, the study was limited to 3 months (April, May, and June) over a period of 3 years (2017, 2018, and 2019). These months were selected by the clinical managers who felt that these would be an accurate representation of the services offered throughout the year.

### SAMPLING CRITERIA

All clinicians and dental assistants (DAs) employed at full-time POHCFs in Gauteng were included. Only data from services rendered during normal operating hours were analyzed. Those POHCFs that operated on a part-time basis, satellite facilities, mobile clinics, and prison services were excluded. Services rendered after-hours and on Saturdays were also excluded from the analysis. Those facilities that were not fully operational over the 3-year period were also excluded to determine the trends over the 3-year period.

### DATA RECORD

All full-time POHCFs in Gauteng were included, and therefore no sampling was necessary. There was a total of 90 full-time POHCFs in Gauteng, and all of them were included. The attendance registers from each facility were obtained, and the data were entered onto an Excel spreadsheet. This included the total number of patients treated, the number of clinicians per facility, and the type and number of procedures performed. The number of DAs was also recorded, and the ratio of the clinician to assistant was calculated.

A clinician was defined as a dentist or dental therapist working either full time or part time; full time was recorded as “one” and part time as “half.”

The number of DAs were recorded and categorized as either full time or part time as a “one” or “half,” respectively.

Oral hygienists were not included as many of them perform outreach school-based activities, and these results would skew the overall data of services rendered at a facility.

Some patients received multiple treatments on the same visit and hence the number of restorations and extractions were recorded as the number of teeth and not the number of patients.

### STATISTICAL ANALYSIS

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 23.0 package (IBM Corp., Armonk, NY). Descriptive statistics including the mean, mode, and median were calculated. The chi-square, independent sample *t* test, and analysis of variance (ANOVA) was used to compare the mean values, and the level of significance was set at  $P < 0.05$ .

Permission was granted by the district clinical managers, and none of the names of the clinics was disclosed; all information was anonymous and confidential. The proposal received ethical clearance from the University of Pretoria, Faculty of Health Sciences Research Ethics Committee (646/2019).

### RESULTS

A total of 90 POHCFs in five districts were included. Table 1 represents the total mean number of patients per facility per month and year. May was the busiest month over the 3-year period with an average of 687 patients being treated. A significant increase was observed in the number of patients ( $P = 0.01$ ) who were treated between 2017 and 2019 for the month of April. The busiest year was 2018 (average of 658 patients), which was significantly higher than 2017 [Table 1].

The services included dental examinations, extractions, restorations, scaling and polishing, dentures, and fissure sealants. Although there were variations in the numbers of procedures performed in each district per month,

the most common procedures were dental extractions (mean,  $459 \pm 269.1$ ), restorations (mean,  $64 \pm 60.2$ ), and fissure sealants ( $43 \pm 71.4$ ). Most districts reported an increase in the number of services from 2017 to 2018 and 2019. The type and number of services rendered in 2018 and 2019 were similar.

The ratios of the clinicians and services rendered are presented in [Table 2]. A significant increase ( $P = 0.003$ ) was observed in the monthly average patient workload between 2017 (376) and 2019 (428). Although no significant differences were reported between the ratios of extractions and restorations, there was an increasing trend in the number of extractions performed, whereas the number of restorations tended to remain stable. The ratio of extractions to restorations spiked in 2019, but this increase was not statistically significant ( $P = 0.09$ ).

A total of 512,522 patients were examined and treated during the study period and each facility attended to an average of 632.7 (SD  $\pm 344.9$ ) patients per month. The average monthly extraction per clinician ratio was 292.9 (SD  $\pm 144.6$ ); the restoration per clinician ratio was 43.0 (SD  $\pm 38.2$ ) and the average extraction to restoration ratio was 15.3 (SD  $\pm 36.5$ ) [Table 2].

The mean clinician workload per day was calculated by dividing the number of patients by 20 working days. On average, clinicians treated 19 patients per day and almost 80% of them received extractions. The ratio between the DAs and clinicians were calculated and it was similar for all the districts. On average, all the districts had a ratio of 1.3 DAs per clinician.

**Table 1: Total mean number of patients per facility per month and year ( $n = 810$ )**

Month	Mean (SD)	<i>P</i> value
April 2017	526.3 (308.1)	<b>0.01</b>
April 2018	642.5 (348.1)	
April 2019	677.5 (396.7)	
Mean for April	615.4 (357.4)	
May 2017	669.5 (341.6)	0.81
May 2018	704.1 (369.2)	
May 2019	687.3 (363.5)	
Mean for May	687.0 (357.2)	
June 2017	563.7 (295.0)	0.40
June 2018	627.2 (318.4)	
June 2019	596.6 (324.4)	
Mean for June	595.8 (312.8)	
Year		
2017	586.5 (320.1)	<b>0.03</b>
2018	657.9 (346.2)	
2019	653.8 (363.6)	
Mean for the three years	632.7 (344.9)	

The bold values are statistically significant

### DISCUSSION

There was a total of 90 POHCFs that met the criteria and were included in the study. May was the busiest month in each of the three years. This could be due to the fact that April has many school and public holidays, and this could be a reason for the low patient attendance. June in SA is often the coldest month of the year, and it is possible together with the June midyear school holidays, staff and patients were on leave or preferred to visit the dentist when temperatures got warmer.

The year 2018 saw significantly more patients attending compared to 2017 and 2019. This translated into a significant increase ( $P = 0.003$ ) in the average patient workload for the clinicians; an increase from 376 to 428 patients per month. This increase in patient utilization could be due to the normal annual increase in the population size; improved dental knowledge or increased exposure to dental services

**Table 2: The ratio of the clinicians and mean number ( $\pm$ standard deviation) of services rendered per month in each year ( $n = 810$ )**

Ratios	2017	2018	2019	Average	P value
Clinician to patient	375.8 (184.7)	420.6 (171.9)	428.4 (219.2)	408.3 (194.2)	0.003
Clinician to extraction	283.1 (147.2)	294.3 (137.3)	301.4 (149.0)	292.2 (144.6)	0.33
Clinician to restoration	45.3 (43.9)	39.5 (31.2)	44.2 (38.4)	43.0 (38.2)	0.17
Extraction to restoration	13.4 (34.4)	13.2 (20.7)	19.3 (48.5)	15.3 (36.5)	0.09

as a result of school, outreach projects, and media campaigns.

Given the current trend, it seems as though the number of patients will continue to increase and as such government should consider increasing the number of dental facilities and resources, improving and maintaining the current facilities, and possibly increasing the number of staff members.

The clinicians rendered mostly extractions; this was similar to other studies conducted in SA.<sup>[2,3,5]</sup> An increasing trend was observed in the number of extractions performed over the 3 years, whereas the number of restorations tended to remain stable. This could be due to the high volume of patients, lack of equipment and infrastructure, and a shortage of staff.<sup>[2,3]</sup> The high number of extractions could also be due to late seeking behavior for dental care. The majority of patients who use the public sector are of a medium to low socioeconomic status (SES), and studies have reported that patients from a low SES have more barriers to seeking dental treatment compared to those from a higher SES.<sup>[9,10]</sup> As a result, they tend to present at a later stage of the disease progression, and their treatment options are limited to either endodontics or extractions. As the facilities do not offer endodontic services, dental extractions could be their only solution.

The high number of extractions could also be due to periodontal diseases, which has shown to have increased in SA over the past 10 years.<sup>[11]</sup> This increase could have led to more patients seeking dental treatment and possibly requiring more extractions. In addition to the localized effects of periodontal disease, many researchers have reported on its systemic effects on general health, including liver cirrhosis, metabolic syndrome, peripheral arterial disease, and diabetes.<sup>[12-14]</sup> Therefore, by improving the oral health of patients, it would impact positively on their general health as well.

Another possibility for the low number of restorations could be that restorations are carried out through a booking system. So patients receive an appointment for their restoration, which could be within 6 weeks to

4 months depending on the availability of resources. Many patients are in pain and cannot wait for this appointment and hence opt for an extraction. A concern of this delay in receiving treatment could result in clinicians prescribing antibiotics for their patients in an attempt to reduce the pain and symptoms associated with dental infections. There is a growing concern of developing antibiotic resistance, and this could result in drug-resistant infections causing severe morbidity and possibly even mortality.<sup>[15]</sup>

Others cannot come back to the facility due to financial constraints, lack of transport, or work commitments, and as such suggest an extraction, which is then most likely performed on the same day. Some may also attend other dental services and as such remain on the list but do not attend their appointments. Studies have shown that by staying in contact with the patient telephonically and updating them regularly, patients are more likely to return for their appointment.<sup>[16]</sup> Clinical managers should suggest that dental nurses contact the waiting list patients regularly to ensure that they will attend their appointments and hence reduce the waiting time for patients.

The extraction-to-restoration ratio varied considerably between the districts. The National Department of Health set a target of 10 extractions per restoration and only one district met the target.<sup>[17]</sup> The average ratio of extractions to restorations was 15:1, and this needs to be reduced to meet the target. However, it must be noted that the data from the oral hygienists have been excluded, and as many of them offer atraumatic restorative restorations daily, the number of restorations performed per month could have been much higher than reported. In addition, the statistics from services rendered during the overtime periods have been excluded. Many facilities book patients for restorations during this period and as these services have been excluded, it is possible that the number of restorations performed was much higher than reported. Therefore, it is possible that the extraction-to-restoration ratio is lower than reported and closer in line with the national goal of 10:1.

The wide variation in the type and number of services rendered in each district could be due to the variations in the infrastructure, number of patients being treated, and number of staff members assigned and the management of patients. Very few dentures were delivered, and this could be due to the lack of funds available to approve denture services.

Clinicians were treating an average of 19 patients per day, and they rendered mostly extractions. Most districts reported to have an average of 1.3 DAs per clinician, and this was slightly lower than the recommended norm of 1.5. Government needs to create and fill more DA posts to achieve a more favorable ratio between clinicians and DAs.

#### RECOMMENDATIONS

Managers should identify facilities where fewer restorations were being placed and discuss the reasons for this with the clinicians. They should then try and address these hurdles to increase the clinicians output.

Managers should consider the rotation of staff members from “quiet” to “busy” facilities so that the staff are exposed to different settings and to prevent staff from overload and burnout.

The Gauteng Department of Health should employ more clinicians who could be appointed at the busiest facilities to reduce the workload at these sites and increase service delivery. They should also employ community dentistry specialists for the Gauteng province who could assist in analyzing data, monitoring, and evaluating the type of services rendered, assist in planning preventive programs, and drive policy reforms. This would assist in identifying and addressing problems such as a lack of equipment and burnout among staff members.

The Gauteng Department should re-evaluate the current preventive programs in order to reduce the prevalence of dental caries and to inadvertently reduce the number of extractions. The oral hygienists employed in the public sector should also reevaluate the school brushing and fissure sealant programs to address the increasing prevalence of dental caries and other dental conditions, which eventually result in dental extractions.

#### LIMITATIONS

As all procedures rendered during the overtime period and services rendered by oral hygienists were excluded, the results were an underestimate of the actual services that were offered. Owing to time and financial constraints, data were collected from only 3 months per year, and hence these results need to be interpreted with

caution. As there was so much of variations between the districts and the facilities, comparisons between them must be interpreted with caution. However, the study provides useful information on the trends of dental services rendered over 3 years.

#### CONCLUSION

There was a significant increase in the number of patients from 2017 to 2019 with 2018 being the busiest year. Although a wide variation was observed in the number of extractions and restorations offered, extraction was the most common service rendered. The extraction-to-restoration ratio was higher than the national goal, and this needs to be discussed and addressed. The workload of clinicians was relatively high, and managers need to monitor and rotate clinicians to prevent burnout among staff members.

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#### CONFLICTS OF INTEREST

There are no conflicts of interest.

#### AUTHOR CONTRIBUTIONS

Prof. Bhayat wrote up the proposal, analyzed the data, and collected the data. Dr. Madiba completed the literature review and methods sections. Dr. Nkambule completed the conclusion, recommendations, and referencing.

#### ETHICAL CLEARANCE

Permission was granted by the Gauteng Department of Health to conduct the study and no names of patients or facilities were published. All procedures were performed as per the ethical guidelines laid down by the Declaration of Helsinki (2013).

#### PATIENT DECLARATION OF CONSENT

Not applicable.

#### DATA AVAILABILITY STATEMENT

Not applicable.

#### REFERENCES

1. Govender V, Chersich MF, Harris B, Alaba O, Ataguba JE, Nxumalo N, *et al.* Moving towards universal coverage in South Africa? Lessons from a voluntary government insurance scheme. *Global Health Action* 2013;6:19253.

2. Bhayat A, Cleaton-Jones P. Dental clinic attendance in Soweto, South Africa, before and after the introduction of free primary dental health services. *Community Dent Oral Epidemiol* 2003;31:105-10.
3. Harkinson BN, Cleaton-Jones PE. Analysis of attendance rates at Soweto dental clinics 1995–2002. *SADJ* 2004;59:147-9.
4. Department of Health. South African National Oral Health Strategy. Pretoria, South Africa: Department of Health; 2004. p. 1-31.
5. Smit DA, Osman YI. The availability of the basic oral health care package in the Western Cape. *SADJ* 2017;72:162-6.
6. Shaw V. Health information system reform in South Africa: Developing an essential data set. *Bull World Health Organ* 2005;83:632-6.
7. Gauteng Districts: Towns and Cities. Available from: <https://www.gauteng-info.co.za/provinces/article/.../gauteng-districts-towns-and-cities>. [Last accessed on 2019 July 24].
8. Bhayat A, Chikte U. Human resources for oral health care in South Africa: A 2018 update. *Int J Environ Res Public Health* 2019;16:1668.
9. Assari S, Hani N. Household income and children's unmet dental care need; Blacks' diminished return. *Dent J* 2018;6:17.
10. Akintobi TH, Hoffman LM, McAllister C, Goodin L, Hernandez ND, Rollins L, *et al.* Assessing the oral health needs of African American men in low-income, urban communities. *Am J Mens Health* 2018;12:326-37.
11. Chikte U, Pontes CC, Karangwa I, Kimmie-Dhansay F, Erasmus RT, Kengne AP, *et al.* Periodontal disease status among adults from South Africa—Prevalence and effect of smoking. *Int J Environ Res Public Health* 2019;16:3662.
12. Mohammed H, Varoni EM, Cochis A, Cordaro M, Gallenzi P, Patini R, *et al.* Oral dysbiosis in pancreatic cancer and liver cirrhosis: A review of the literature. *Biomedicines* 2018;6:E115.
13. Patini R, Gallenzi P, Spagnuolo G, Cordaro M, Cantiani M, Amalfitano A, *et al.* Correlation between metabolic syndrome, periodontitis and reactive oxygen species production. A pilot study. *Open Dent J* 2017;11:621-7.
14. Cho DH, Song IS, Choi J, Gwon JG. Risk of peripheral arterial disease in patients with periodontitis: A nationwide, population-based, matched cohort study. *Atherosclerosis* 2020;297:96-101.
15. Patini R, Mangino G, Martellacci L, Quaranta G, Masucci L, Gallenzi P. The effect of different antibiotic regimens on bacterial resistance: A systematic review. *Antibiotics (Basel)* 2020;9:E22.
16. Pippi R, Pietrantonio A, Patini R, Santoro M. Is telephone follow-up really effective in early diagnosis of inflammatory complications after tooth extraction? *Med Oral Patol Oral Cir Bucal* 2018;23:e707-15.
17. South African National Department of Health. Annual Performance Plan 2018/19–2020/21. Pretoria, South Africa: NDoH; 2018. [Internet]. [cited 2019 Oct 24]. Available from: <http://www.health.gov.za/index.php/2014-03-17-09-09-38/annual-performance-plans>. [Last accessed on 2019 July 20].

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