

**Caries status and treatment needs of 6- and 12-year-old
Western Cape learners in the public sector.**



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KEY WORDS

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ABSTRACT

Introduction:

There is a need for good oral health data in the Western Cape as effective health care requires good information. The most recent survey was carried out in 2002 (van Wyk and van Wyk, 2004) and therefore there is no current information on the oral disease burden, nor the oral health treatment needs of children in the Western Cape.

The Provincial Government of the Western Cape had requested data to be collected to evaluate the roll out of the fissure sealant programme in the Western Cape as part of the Primary Preventive Primary School Oral Health Programme. This data collected from 2011 included the caries status and treatment need of each primary and permanent tooth, in a sample of 6- and 12-year-old children, at selected provincial schools in this province. The programme was rolled out, but suddenly terminated in 2019 which limited the ability to conduct a complete analysis.

By determining the caries status and the treatment needs of the children who would use the dental clinics in the public sector, one can have a better understanding of the burden of disease and thus provide the health sector with direction as to what intervention is needed and where resources should be focused.

Aim:

To compare the caries status and treatment needs of 6- and 12-year-old learners by age group and location in the Western Cape from 2012-2018.

Methodology:

This cross-sectional analytical study analysed an existing dataset. The collection of this data had been requested by the Provincial Government of the Western Cape to evaluate the fissure sealant roll-out programme in selected provincial schools in the Western Cape. The data had been collected by dentists and oral hygienists employed in the public sector from 194 schools throughout the province. The data was collected on an ongoing basis and included the most recent surveillance data of oral health, including caries status and treatment needs codes, recorded from 2011 to 2019. A cross-sectional analytical study of 6164 participants was conducted. The sample included 6- and 12-year-old children at selected provincial schools in the Western Cape, who received dental treatment in the public sector. As part of the fissure sealant programme a random selection of 20 6-year-old and 20 12-year-old children were drawn from the class list, unless there

were less than 20 in the age group in which case all the qualifying children were included. The demographic information as well as the status and treatment need of each tooth in the primary and permanent dentition were recorded. The summary caries status and treatment needs were compared for each age group, as well as by each health district over time.

Results:

The dmft for the Western Cape increased from 2012-2018 and showed a high level of untreated caries and no filled teeth. Caries experience for 6-year-olds was highest in the Overberg and West Coast districts with levels above 90%, while the Central Karoo reported the lowest caries experience with 78%. The DMFT for the Western Cape decreased slightly from 2012-2018 and showed a high prevalence of untreated decay and a low number of restorations. Caries experience for 12-year-olds was highest in the Overberg (80%) and Cape Winelands (78%) with the lowest levels found in the Central Karoo (47%).

Extractions were the greatest treatment need reported for both 6-year-olds (48%) and 12-year-olds (34%), while only 12% and 8% respectively needed no treatment. Approximately a third of children in both age groups required caries arresting or sealant treatment. The Unmet Treatment Need remained high at 97% in 12-year-olds.

Approximately 2% of all permanent first molars had a fissure sealant present. A total of 232 fissure sealants were found in place from 2012-2018.

Conclusion:

The termination of the programme in 2019 limited the ability to conduct a complete analysis. The caries severity and caries experience did not decrease as would be expected with a prevention programme in place. The high level of need for extractions and restorations are indicative that the prevention programme has not lowered these treatment needs as was expected. Very few fissure sealants were found in permanent first molars over the 7 year period, the reasons for which are not known.

DECLARATION

I, Karen Rene Simpson, hereby declare that the work contained in this thesis is my own original work and has not previously, in its entirety, or in part, been submitted at any university for a degree and that all sources I have used or quoted have been indicated and acknowledged as complete references.



Dr Karen Rene Simpson



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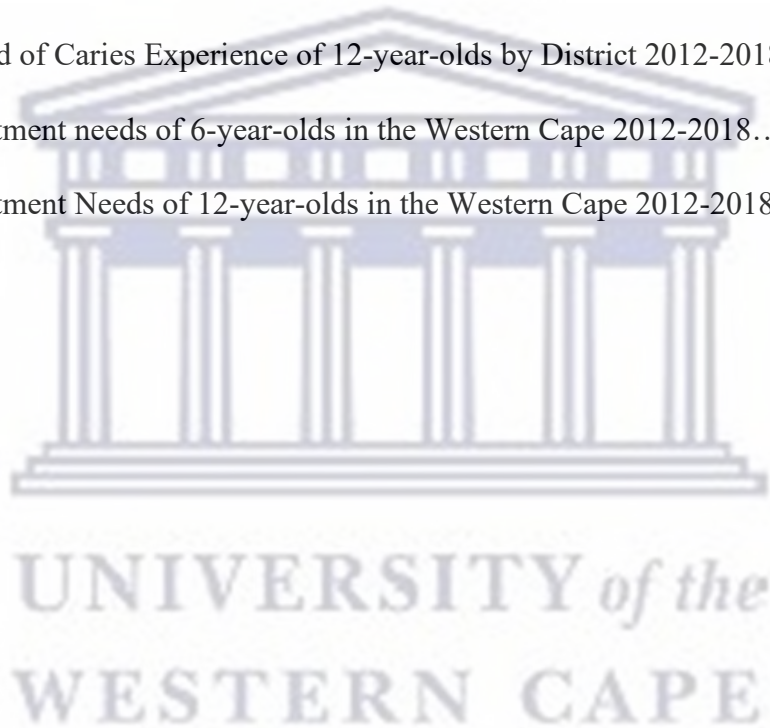
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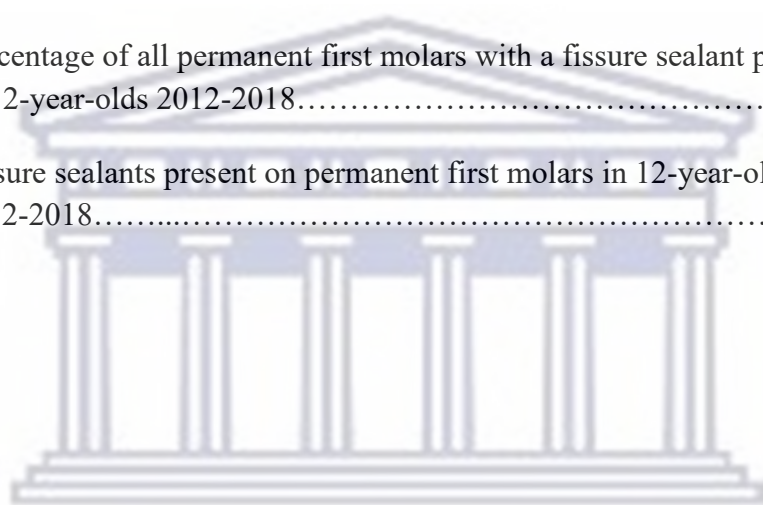
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CHAPTER 1

INTRODUCTION

Effective health care requires good information. The most recent information is needed in order to make good health planning decisions. In South Africa, National Oral Health Surveys were carried out in 1982, 1988/1989 and 1999/2002 (van Wyk and van Wyk, 2010). The most recent survey, carried out in 2002, therefore presents caries status data which is now over 20 years old.

There is no current information on the oral disease burden, nor the oral health treatment needs of children in the Western Cape. Therefore, the planning and delivery of oral health care is blind as there is no evidence on which to base an effective strategy. Updated information is also required to assess the success or failure of current oral health programmes and strategies (WHO, 2013).

There is therefore a need for good oral health data in the Western Cape. The Provincial Government of the Western Cape had requested data to be collected to evaluate the roll out of the fissure sealant programme in the Western Cape. This data collected from 2011, included the caries status and treatment need of each primary and permanent tooth, in a sample of 6- and 12-year-old children, at selected provincial schools in this province. An analysis of this data will enable the caries prevalence and the treatment needs of this population to be determined as well as to determine if there have been changes in either of these cohorts over time. This combined set of information will provide information for oral health treatment planning and delivery.

By determining the caries status and the treatment needs of the children who would use the dental clinics in the public sector, one can have a better understanding of the burden of disease and thus provide the health sector with direction as to what intervention is needed and where resources should be focused.

CHAPTER 2

LITERATURE REVIEW

2.1 Importance of health data collection

In order to provide efficient and effective oral health care, which will meet the populations' needs, quality data is essential (WA Department of Health, 2016). Basic oral health surveys provide a good basis to assess the oral health status and treatment needs of the population and determines the extent to which oral health services are addressing the needs of the population. Surveillance data is important to be able to plan and evaluate oral health programmes (WHO, 1997) (WHO, 2013).

WHO has suggested that in order to obtain effective surveillance of health issues, clinical oral health data surveys should be carried out every 5-6 years in the same setting or community (Petersen *et al.*, 2005).

2.2 International experience

Countries are encouraged to collect standardised, systematic data of oral diseases and conditions. This ensures that reliable data is collected. These surveys provide the means for comparison of data both within the country and internationally (WHO, 2013). Several developed countries including the United Kingdom, Denmark and Germany, conduct regular oral health surveys in both adults and children. This has provided information about the continuous improvement of oral health on an annual basis. The collection of data allows those countries to have the information needed to facilitate oral disease control, and to plan prevention strategies. It assists health authorities and policy makers to measure the impact and efficacy of health interventions (Petersen *et al.*, 2005). The availability of surveillance data will ensure that quality planning, monitoring and evaluation are possible (WA Department of Health, 2016). Regularly collected data in many countries have been able to show important trends in oral health. This includes the positive impact that prevention strategies have had in some countries, as well as the rapid increase in caries prevalence in other, poorer countries (WHO, 2013).

Researchers in Western Australia have reported inadequate routine collection of dental service data. This lack of comprehensive data has affected the ability to effectively evaluate the impact

that local and national policies, as well as the implemented programs have had. As such, there is now a requirement that regular population level epidemiological examination be carried out so that the oral health of that population can be monitored and evaluated (WA Department of Health, 2016).

2.3 WHO Basic Oral Health Survey

WHO encourages the use of the WHO Oral Health Surveys forms. Guidelines for the systematic collection of standardized data by calibrated and standardized examiners is provided. The recommended document records oral health status and treatment needs. This will subsequently allow for the analysis and monitoring of changes in disease patterns. These survey forms provide the means to determine the information necessary for the evaluation of the effectiveness of oral health services, but not of the specific factors affecting disease nor any specific treatments (WHO, 1997).

The standardized measurements of oral diseases and conditions can be used by National Oral Health survey planners to ensure that reliable data is collected. Surveys carried out using the WHO Oral Health Surveys fourth edition, have shown oral health data is important for the surveillance of oral health disease patterns (WHO, 2013).

2.4 Caries prevalence in South Africa and the Western Cape

National Children's Oral Health Surveys have been carried out in 1982, 1988/1989 and 1999/2002 in South Africa (van Wyk and van Wyk, 2010). The latest national children's oral health survey in 1999-2002, showed that nationally only 39,7% of South African children were caries free (van Wyk *et al.*, 2004).

In South Africa, caries prevalence for 6-year-olds was 60,3%, substantially lower than in the Western Cape which had a caries prevalence of 82,3% (van Wyk *et al.*, 2004). This is well below the goal of 50% caries free 6-year-olds, set by the Department of Health (Department of Health, 2014).

According to van Wyk *et al.* (2004), 75,2% of 6-year-olds in the Western Cape had untreated caries, well above the national mean of 55,1%. The percentage of 6-year-old children who needed care in the Western Cape was 86,3% compared to 59,1% needing care nationally. The mean

number of teeth needing treatment was 5,24, almost double the national mean of 3,00 (van Wyk *et al.*, 2004).

Twelve-year olds in the Western Cape were reported to have had a caries prevalence of 61,9%, while the national figure was 36,9%. The mean DMFT for 12-year-olds nationally was reported as 1,1, close to the goal of 1,0 set out by the Department of Health. The mean DMFT in the Western Cape though was almost 2 (1,97). The percentage of untreated caries in 12-year-olds was 51,6 %, well above the national mean of 30,3%. The percentage of 12-year-old children who needed care in the Western Cape was 80,5%, significantly higher than the national mean of 45,3%, with the mean number of teeth needing treatment being 5,3, almost twice that of the national mean of 2,6 (van Wyk *et al.*, 2004).

van Wyk *et al.*, (2004) reported that in South Africa, the decayed component accounted for the majority of the dmft and DMFT with the filling component contributing minimally. In 6-year-olds the decayed component was 2,2, the missing 0,5 and the filled component only 0,1. In 12-year-olds the decayed component was 0,8, the missing 0,2 and the filled component 0,1.

More recent surveillance data of the Western Cape reported by Smit *et al.*, (2017), stated that only 16% of 6-year-olds were caries free as at 2015. The dmft had increased from 5,5 to 6,2 from 2002-2015. In 12-year-olds, there had been an increase in caries experience from 62% to 67% from 2002-2015 and the DMFT had increased from 2 to 2,5.

2.5 Types of treatment needed

According to van Wyk, *et al.*, (2004), in South Africa, the most common oral health treatment need, based on the mean number of teeth needing care, was for fissure sealants and caries arresting care. This was followed by the need for restorations and extractions. Crowns, bridges and pulpal care need was negligible. Nationally, 6-year-olds required more restorations, preventive care and extractions, while 12-year-olds required more preventive care and restorations.

2.6 National oral health goals

Among the goals set out in the South African National Oral Health Strategy 2002-2005, were to increase the percentage of caries free children at age 6 to 50% and to reduce the mean DMFT at age 12 to 1,0. The data that has been reported on, clearly showed that in the Western Cape the

caries prevalence of 6- and 12-year-old children were amongst the highest in South Africa (Smit *et al.*, 2017).

2.7 Fissure sealants

Fissure sealants are well known to reduce caries on the occlusal surfaces and are effective in caries prevention with caries reduction rates ranging from 11%-51% (Lalloo and Turton, 2008) (Ahovuo-Saloranta *et al.*, 2013). When resin-based fissure sealants are placed in ideal conditions where adequate moisture control, tooth isolation and a clean enamel surface is possible, it is clear that fissure sealants are both safe and effective for caries prevention (Simonsen 2002). Lalloo and Turton (2008) reported that children aged 6-7 years were significantly less likely to experience dental caries when fissure sealants were placed on their first permanent molars in the first year of their schooling.

Results when fissure sealants are placed while in a field setting however varies. Singh (2011) reported good retention rates of fissure sealants placed in field settings, ranging from 86%-97% in Grade 1-4 learners after 6 months. This was in stark contrast to the findings of Naidoo and Potgieter (2017) who found very low retention rates of fissure sealants placed in field settings in Grade 1 learners where after 12 months only 7,8% were found intact and did not provide a significant reduction in caries rates. However, these sealants were placed without using suction or cleaning and drying the teeth.

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CHAPTER 3

AIM AND OBJECTIVES

3.1 Aim

To compare the caries status and treatment needs of 6- and 12-year-old learners by age group and location in the Western Cape from 2012-2018.

3.2 Objectives

- To determine caries status.
- To determine treatment needs.
- To compare these variables by age group and location.
- To compare the caries status and treatment needs of each cohort over time.
- To determine the success of the primary prevention programme including oral hygiene instruction, brushing programme and fissure sealant placement.



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CHAPTER 4

METHODOLOGY

This study analysed an existing dataset. The collection of this data had been requested by the Provincial Government of the Western Cape to evaluate the fissure sealant roll-out programme in selected provincial schools in the Western Cape. The data had been collected by dentists and oral hygienists employed in the public sector from 194 schools throughout the province. The data was collected on an ongoing basis and constituted the most recent surveillance data of oral health, including caries status and treatment needs codes, recorded from 2011 to 2019.

The data on the caries prevalence up to 2015 has been previously analysed and reported on (Smit *et al.*, 2017). This research project analysed the complete data set collected from 2012 to 2018, relating to the caries status and treatment needs.

A cross-sectional analytical study of 6164 participants was conducted. The sample included 6- and 12-year-old children at selected provincial schools in the Western Cape, who received dental treatment in the public sector.

As part of the fissure sealant programme a random selection of 20 6-year-old and 20 12-year-old children were drawn from the class list, unless there were less than 20 in the age group in which case all the qualifying children were included.

The examiners were initially standardized according to the WHO Oral Health Surveys, Basic Methods 4th Edition methodology guidelines (WHO, 1997), but were not calibrated as this would be logistically unfeasible. The data was collected on a WHO Oral Health Surveys data collection form to record caries status and treatment need. The children were examined at their school on a portable chair, using a portable light, WHO probe and a plane mirror.

The demographic information recorded on the data collection sheet included the school's name, patient number at that school, the examiner's name and number and the clinic name and number. The surveillance data included the name, age, gender and grade of each learner. The caries status of each tooth in the primary and permanent dentition as well as the presence of a sealant or varnish, restoration, crown or bridge was recorded. The caries status recorded whether the tooth was sound, decayed, filled and decayed, filled with no decay, missing due to caries, missing because of another reason, unerupted or excluded.

The treatment need recorded the treatment required on each primary and permanent tooth. This could include none, caries arresting or sealant care, 1 surface filling, 2 or more surface filling, crown or bridge abutment, bridge element, pulp care, extraction, need for other care and specify (other).

The data was captured in a custom database, exported to an Excel spreadsheet, and contained demographic information of the location, and codes relating to the examiner and the learner. The caries status and treatment need for each primary and permanent tooth was recorded.

The dmft and DMFT was calculated. Frequencies were determined for caries status and the treatment need, by tooth, by individual, by age group and by location.

The summary caries status and treatment needs of each health district was compared over time.

4.1 Study design

A cross-sectional analytical study.

4.2 Study site

Selected provincial schools in the Western Cape Province.

4.3 Study participants

The sample consisted of 6164 participants. This included 6- and 12-year-old children at selected provincial schools in the Western Cape, who received dental treatment in the public sector and who were part of the fissure sealant programme.

4.4 Inclusion and exclusion criteria

Inclusion:

Learners in Grade 0 and Grade 7 who were 6 years old and 12 years old respectively, who were present at school on the day of screening and treatment, were eligible for inclusion in the sample.

Exclusion:

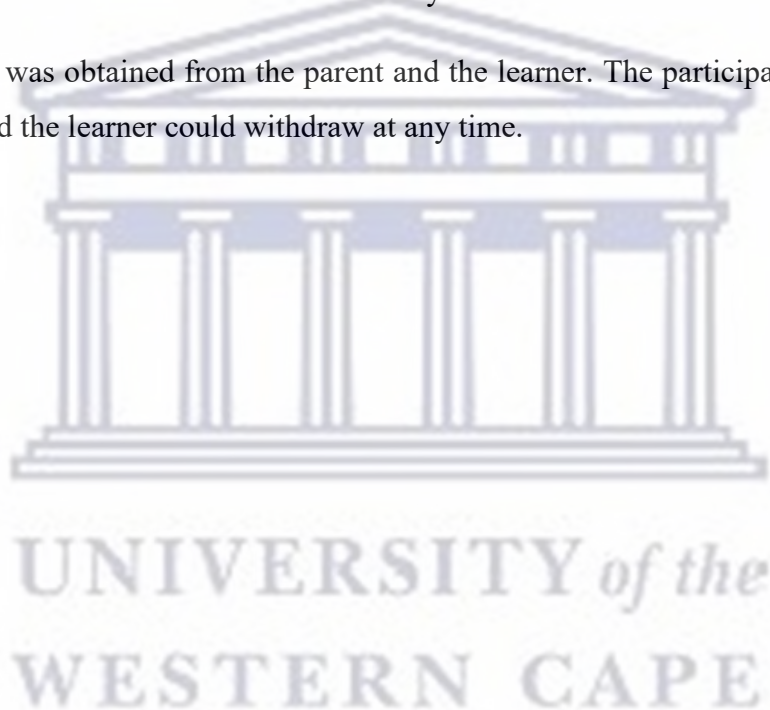
Learners not 6 years old and 12 years old were excluded from the sample.

4.5 Ethical Considerations

This study forms the second part of the analysis of the records from an existing database. This data capturing and analysis was in response to a request from the Provincial Government of the Western Cape to evaluate the roll out of the fissure sealant programme in the Western Cape. The data has been collected by dentists and oral hygienists in the public sector using a WHO Oral Health Surveys data collection form and using the WHO Oral Health Surveys, Basic Methods 4th Edition methodology guidelines (WHO, 1997).

The data for analysis was obtained in an electronic spreadsheet and contained the de-identified clinic name, examiner name and learner name, to ensure confidentiality of the clinician and the learner. The original data collection forms are safely secured.

Informed consent was obtained from the parent and the learner. The participation of the learner was voluntary, and the learner could withdraw at any time.



CHAPTER 5

RESULTS

5.1 DEMOGRAPHICS

A total of 6637 learners were examined from 2011 to 2019. In this time, 194 schools were included. However, due to the low number of schools visited in 2011 and 2019 (7 and 6 schools respectively for each age group) the analysis for this study was conducted on data collected from 2012 to 2018. This included the examination of 6164 learners. The number of schools surveyed per year varied, with the highest number of schools visited from 2014 to 2016 (Figure 1).

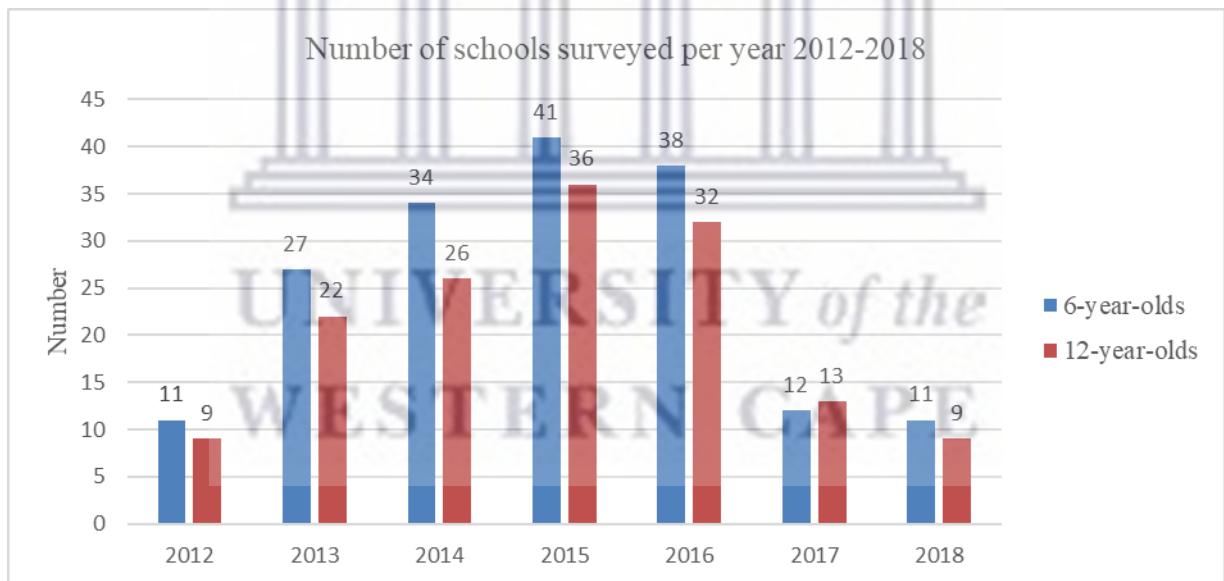


Figure 1: Number of schools surveyed per year by age group in the Western Cape 2012-2018

5.2 CARIES STATUS

5.2.1 6-Year-Olds dmft, Caries Severity and Trends

The mean dmft-score of 6-year-olds in the Western Cape was 6,4. The Cape Winelands and Overberg districts had the highest scores with 7,8 and the Central Karoo the lowest with 4,8 (Table 1). The caries severity of 6-year-olds as represented by the dmft, shows a high prevalence of untreated decayed teeth and no filled teeth (Figure 2).

Table 1: d, m, f and mean dmft of 6-year-olds in the Western Cape by District

DISTRICT	d	m	f	dmft
Cape Winelands	4,9	3,0	0,0	7,8
Central Karoo	3,1	1,6	0,0	4,8
Eden	4,6	1,9	0,0	6,5
Metropole	4,0	1,6	0,0	5,6
Overberg	3,8	4,0	0,0	7,8
West Coast	5,2	1,5	0,0	6,7
Western Cape	4,2	2,2	0,0	6,4

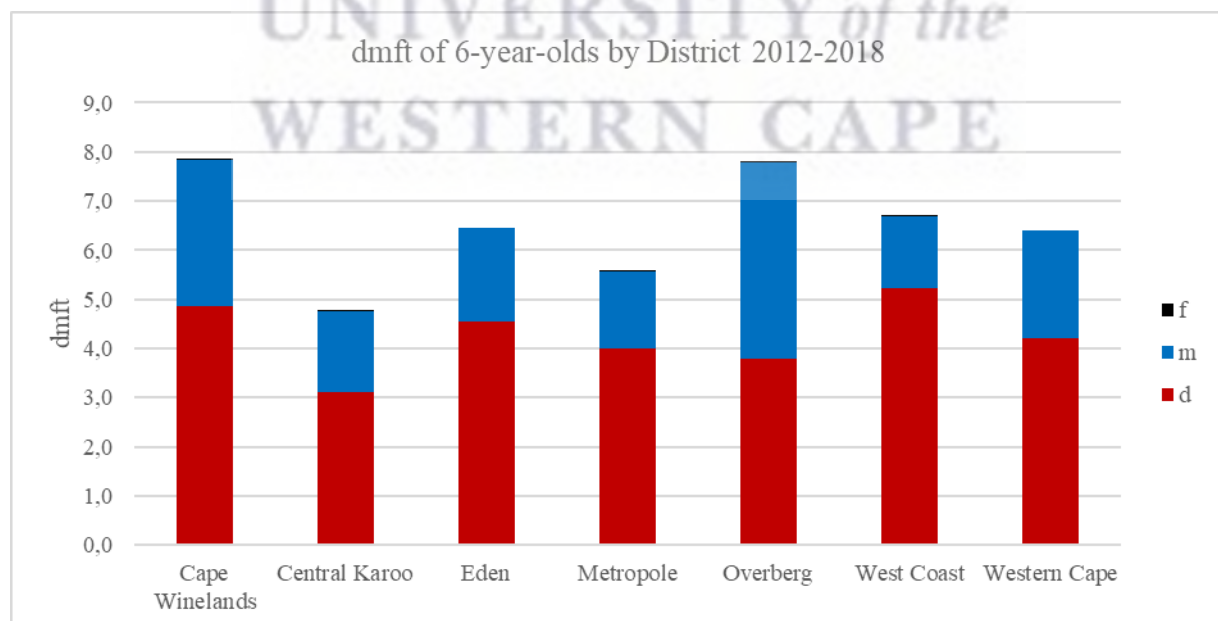


Figure 2: Mean dmft of 6-year-olds in the Western Cape by District 2012-2018

The trend of caries severity (mean dmft) for the Western Cape overall showed an increase from 6,3 in 2012 to 7,6 in 2018 (Figure 3).

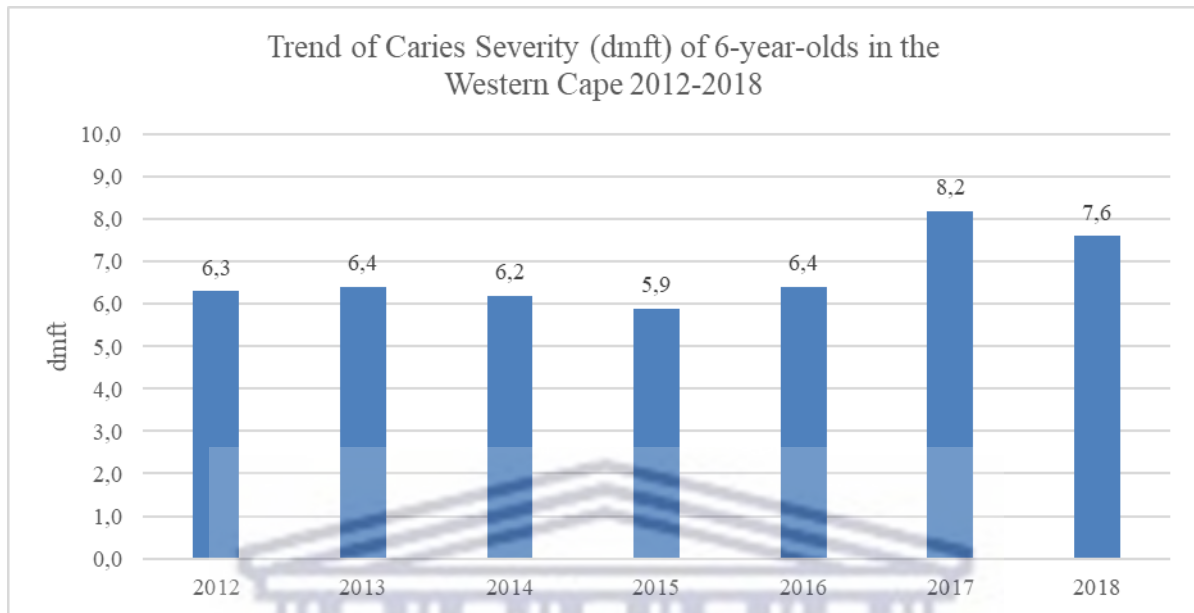


Figure 3: Trend of Caries Severity (dmft) of 6-year-olds in the Western Cape 2012-2018

The trend of the caries severity in the Cape Winelands showed an increase from 6,2 to 8,0 and in the West Coast district from 7,2 to 8,8. The Metropole showed a decrease from 7,7 to 2,5. (It is important to note that this dmft of 2,5 in 2018 is only based on 18 learners of 1 school examined in 2018, which could account for this substantial decrease) (Figure 4) (Table 2). Gaps in data collection (due to the clinics not carrying out the screening examinations) do not allow for a complete analysis of all districts.

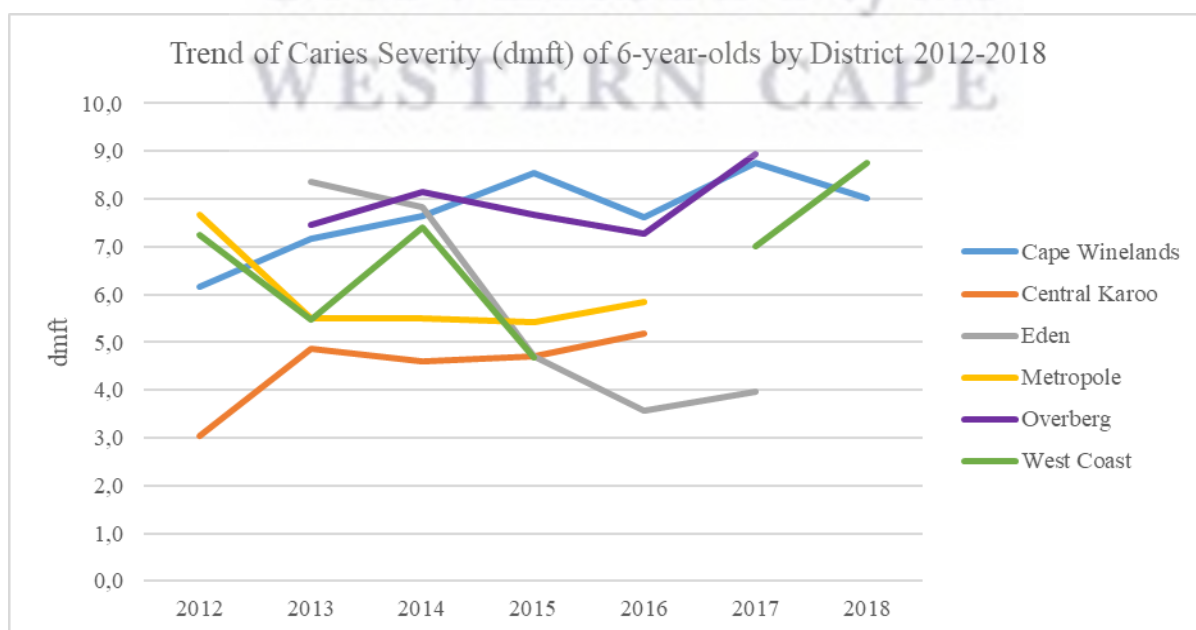


Figure 4: Trend of Caries Severity (dmft) of 6-year-olds in the Western Cape by District 2012-2018

Table 2: Trend of Caries Severity (dmft) of 6-year-olds in the Western Cape by District

DISTRICT	2012	2013	2014	2015	2016	2017	2018
Cape Winelands	6,2	7,2	7,6	8,5	7,6	8,7	8,0
Central Karoo	3,0	4,9	4,6	4,7	5,2		
Eden		8,3	7,8	4,7	3,6	4,0	
Metropole	7,7	5,5	5,5	5,4	5,9		2,5
Overberg		7,5	8,2	7,7	7,3	9,0	
West Coast	7,2	5,5	7,4	4,7		7,0	8,8
Western Cape	6,3	6,4	6,2	5,9	6,4	8,2	7,6

5.2.2 12-Year-Olds DMFT, Caries Severity and Trends

The mean DMFT-score of 12-year-olds in the Western Cape from 2012-2018 was 2,6 (Table 3). The Cape Winelands and the Overberg districts reported the highest scores with means above that of the Province at 3,4 and 3,1 respectively. The Central Karoo reported the lowest DMFT with 1,2. The caries severity of 12-year-olds as represented by the DMFT, shows a high prevalence of untreated decayed teeth, with a very low number of filled teeth (Table 3) (Figure 5).

Table 3: D, M, F and mean DMFT in the Western Cape by District

DISTRICT	D	M	F	DMFT
Cape Winelands	2,9	0,4	0,1	3,4
Central Karoo	1,0	0,2	0,0	1,2
Eden	1,3	0,7	0,0	2,0
Metropole	2,2	0,3	0,1	2,6
Overberg	2,3	0,7	0,0	3,1
West Coast	1,4	0,2	0,2	1,8
Western Cape	2,2	0,4	0,1	2,6

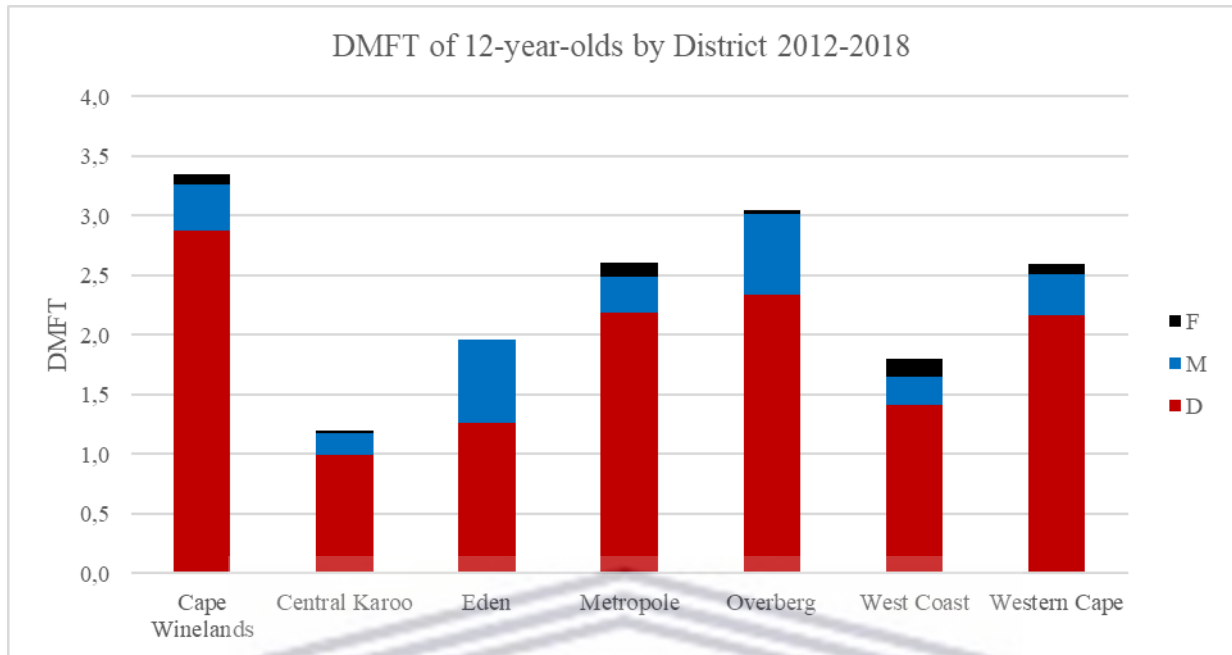


Figure 5: Mean DMFT of 12-year-olds in the Western Cape by District 2012-2018

The trend for caries severity (mean DMFT) of 12-year-olds in the Western Cape overall showed a decrease from 3,4 in 2012 to 2,9 in 2018 (Figure 6).

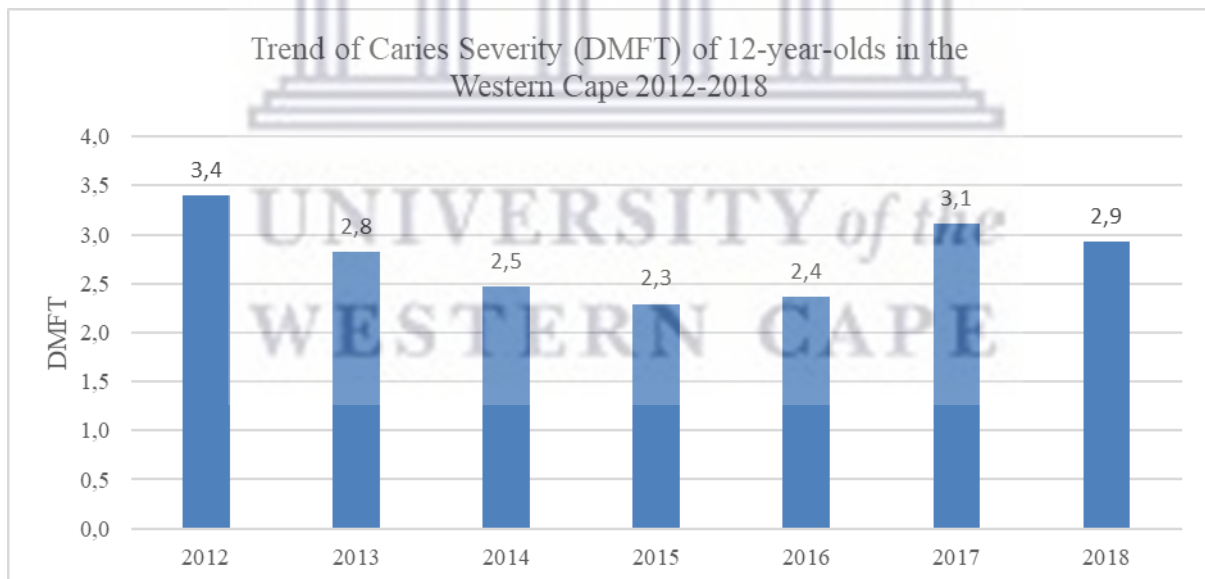


Figure 6: Trend of Caries Severity (DMFT) of 12-year-olds in the Western Cape 2012-2018

The trend of caries severity (DMFT) of 12-year-olds in the Cape Winelands ranged from 2,8 to 3,7 and ended higher with 3,3 at the end of the analysis period than at the start of the period, the Cape Metropole started at 5,3 and ended at 1,5 (with a mean DMFT of 2,8 over the period). All districts except the Cape Metropole have a mean DMFT in 2018 that is similar to the starting points in 2012. (It is important to note that in 2011 the mean DMFT for the Metropole was 1,6. The DMFT of 5,3 recorded in 2012 therefore is an outlier which could account for this increase). Data for all districts except the Cape Winelands is incomplete, resulting in gaps when data was not collected in those years (Figure 7) (Table 4).

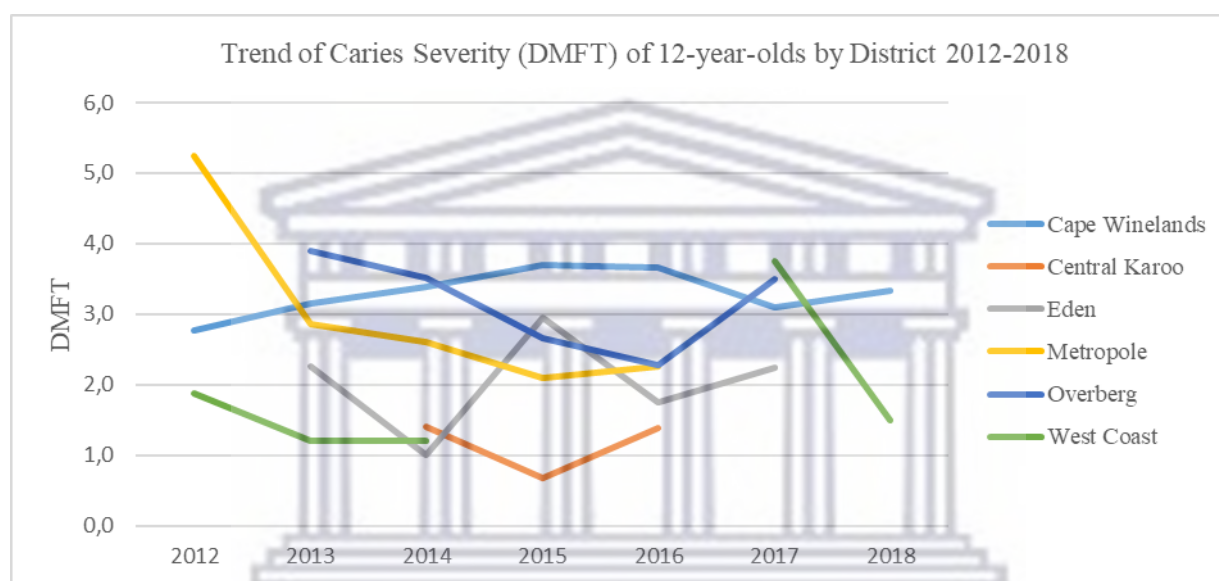


Figure 7: Trend of Caries Severity (DMFT) of 12-year-olds in the Western Cape by District 2012-2018

Table 4: Trend of Caries Severity (DMFT) of 12-year-olds in the Western Cape by District

DISTRICT	2012	2013	2014	2015	2016	2017	2018
Cape Winelands	2,8	3,2	3,4	3,7	3,7	3,1	3,3
Central Karoo			1,4	0,7	1,4		
Eden		2,3	1,0	3,0	1,8	2,2	
Metropole	5,3	2,9	2,6	2,1	2,3		1,5
Overberg		3,9	3,5	2,7	2,3	3,5	
West Coast	1,9	1,2	1,2			3,8	1,5
Western Cape	3,4	2,8	2,5	2,3	2,4	3,1	2,9

5.2.3 6-Year-Olds Caries Experience and Active Caries

The trend of caries experience (proportion of learners with a history of caries) of 6-year-olds in the Western Cape remained similar over the analysis period with 84% in 2012 to 88% in 2018 (Figure 8).

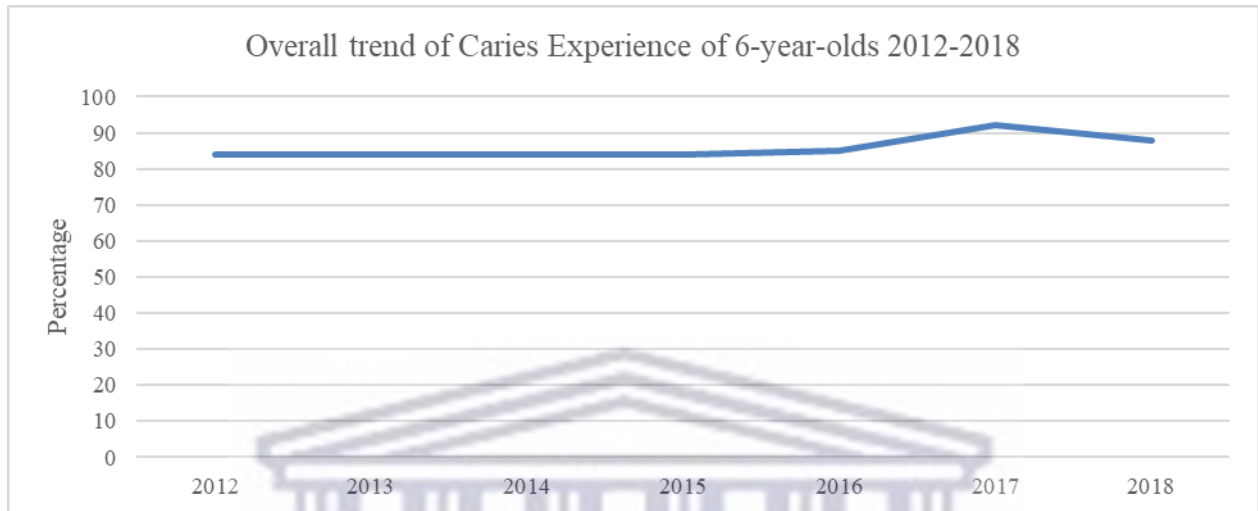


Figure 8: Overall trend of Caries Experience of 6-year-olds in the Western Cape 2012-2018

The mean caries experience of 6-year-olds was 84,9% for the Western Cape. The Overberg and West Coast districts both had a caries experience of over 90%, with the lowest level of 77,9% found in the Central Karoo district (Figure 9).

Active caries (the proportion of learners with an active caries lesion) was 74% in 6-year-olds in the Western Cape, with the West Coast reporting the highest levels at 89,2% and the Central Karoo the lowest level at 67,5% (Figure 9).

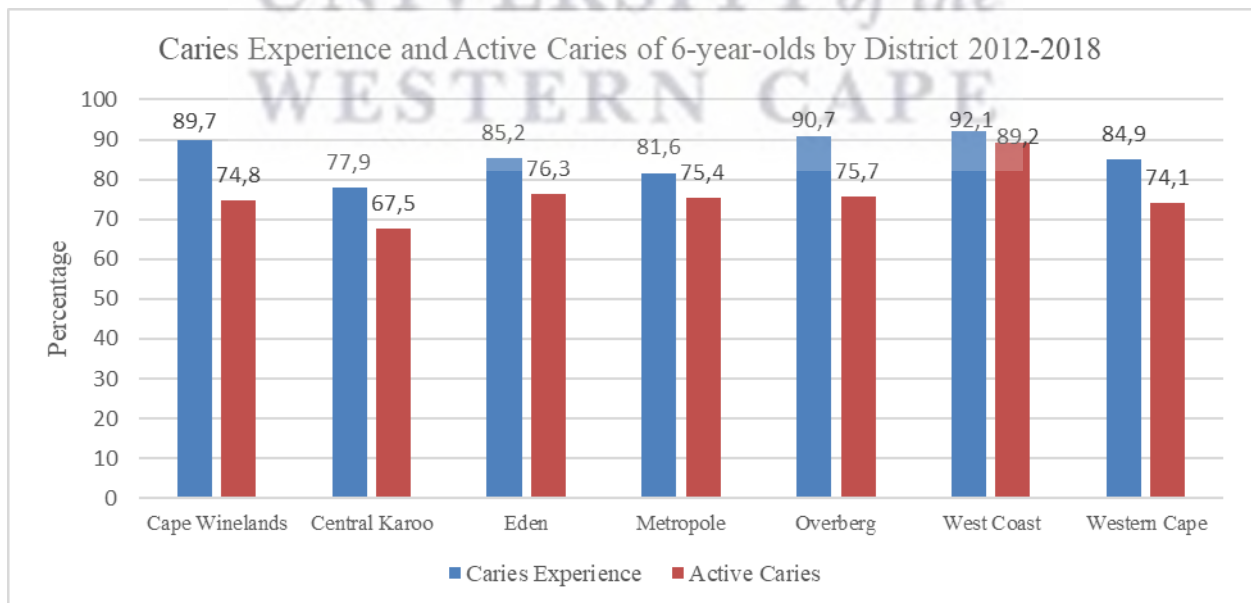


Figure 9: Caries Experience and Active Caries of 6-year-olds in the Western Cape by District 2012-2018

Between 2012 and 2018, the caries experience of 6-year-olds in the West Coast district showed an increase from 93% to 100%, and an increase of 14% was seen in the Cape Winelands district from 76% to 90%. Caries experience decreased from 98% to 65% in the Cape Metropole. Missing data (due to the clinics not carrying out the screening examinations) in almost all districts do not enable a complete analysis to be done (Figure 10) (Table 5). The Cape Winelands district was the only district with complete data for the time period and showed an increase from 76% to 90% (Table 5).

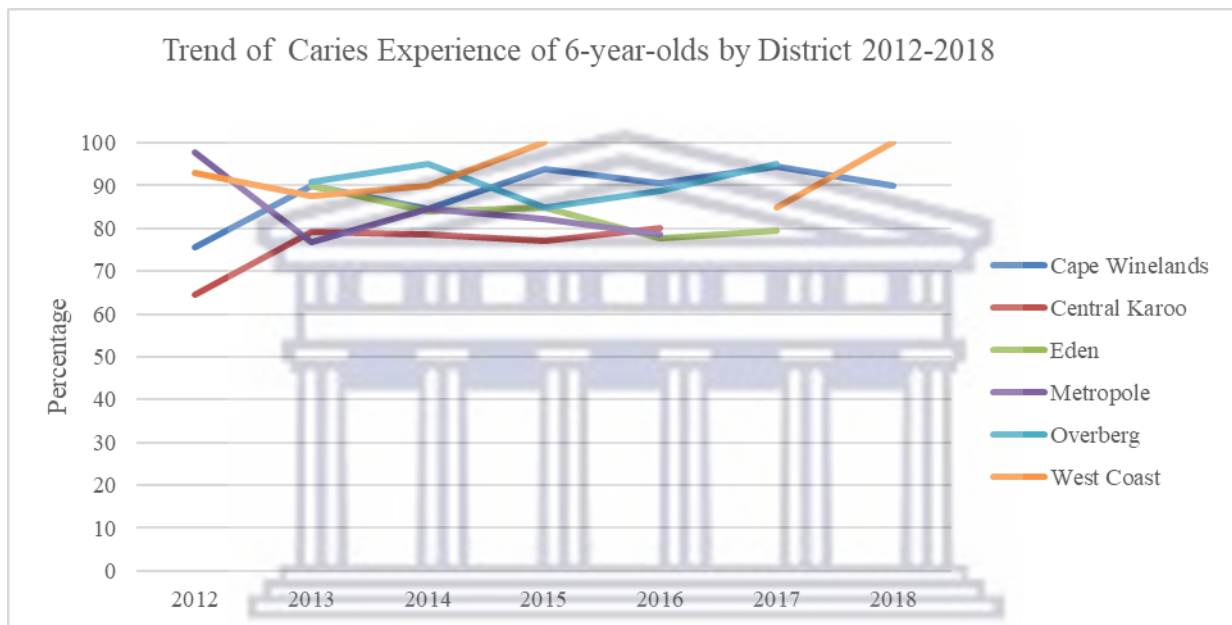


Figure 10: Trend of Caries Experience of 6-year-olds by District 2012-2018

Table 5: Trend of Caries Experience of 6-year-olds by District 2012-2018

DISTRICT	2012	2013	2014	2015	2016	2017	2018
Cape Winelands	76%	90%	84%	94%	90%	94%	90%
Central Karoo	65%	79%	79%	77%	80%		
Eden		90%	84%	85%	78%	79%	
Metropole	98%	77%	85%	82%	79%		65%
Overberg		91%	95%	85%	89%	95%	
West Coast	93%	88%	90%	100%		85%	100%
Western Cape	84%	84%	84%	84%	85%	92%	88%

5.2.4 12-Year-Olds Caries Experience and Active Caries

The trend of caries experience of 12-year-olds in the Western Cape remained similar from 77% in 2012 to 74% in 2018 (Figure 11).

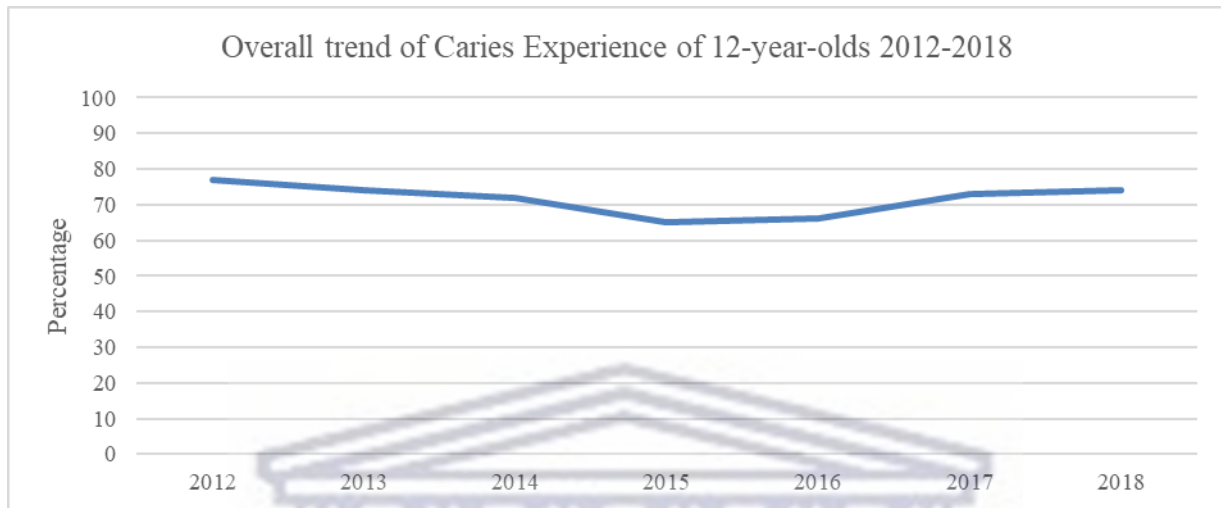


Figure 11: Overall trend of Caries Experience of 12-year-olds in the Western Cape 2012-2018

The mean caries experience of 12-year-olds was 70% for the Western Cape. The Overberg and Cape Winelands districts had higher caries experiences than the Western Cape overall at 80% and 78% respectively. The Central Karoo reported the lowest caries experience at 47% (Figure 12).

Active caries was recorded in 64% of 12-year-olds in the Western Cape. The Overberg and Cape Winelands reported the highest prevalence of 76% and 75% respectively and the Central Karoo reported the lowest prevalence of 42% (Figure 12).

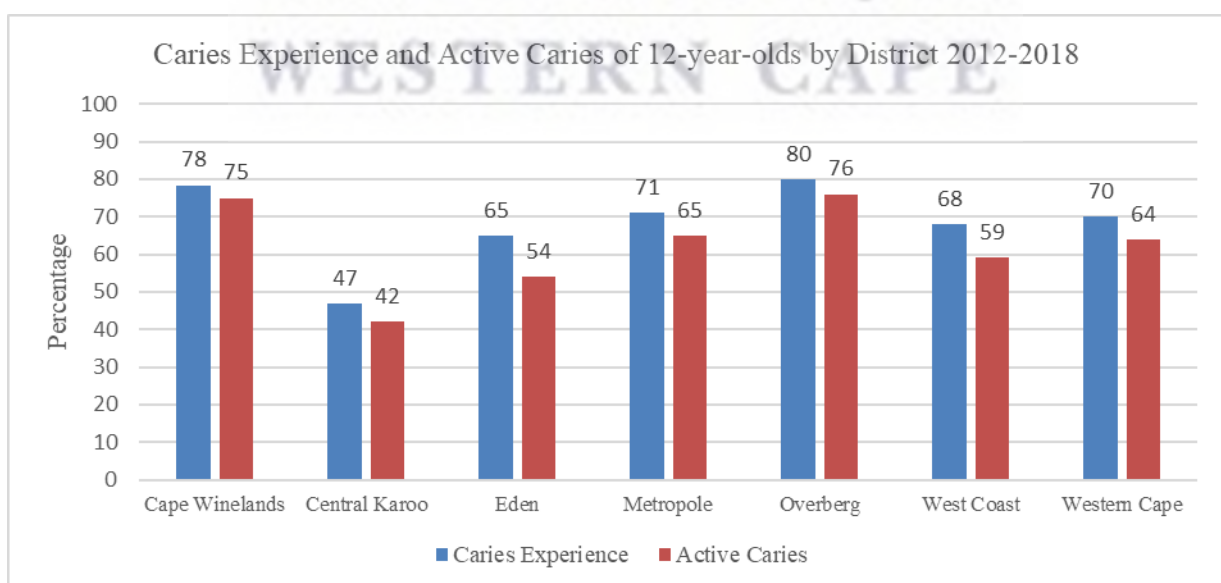


Figure 12: Caries Experience and Active Caries of 12-year-olds in the Western Cape by District 2012-2018

The trend of caries experience in the Cape Winelands, which has complete data for the period, showed an increase from 66% in 2012 to 78% in 2018. The Cape Metropole showed a decrease from 95% to 55% and the West Coast district showed a decrease from 70 to 65%. Gaps in data collection (due to the clinics not carrying out the screening examinations) do not allow for a complete analysis of all districts (Figure 13) (Table 6).

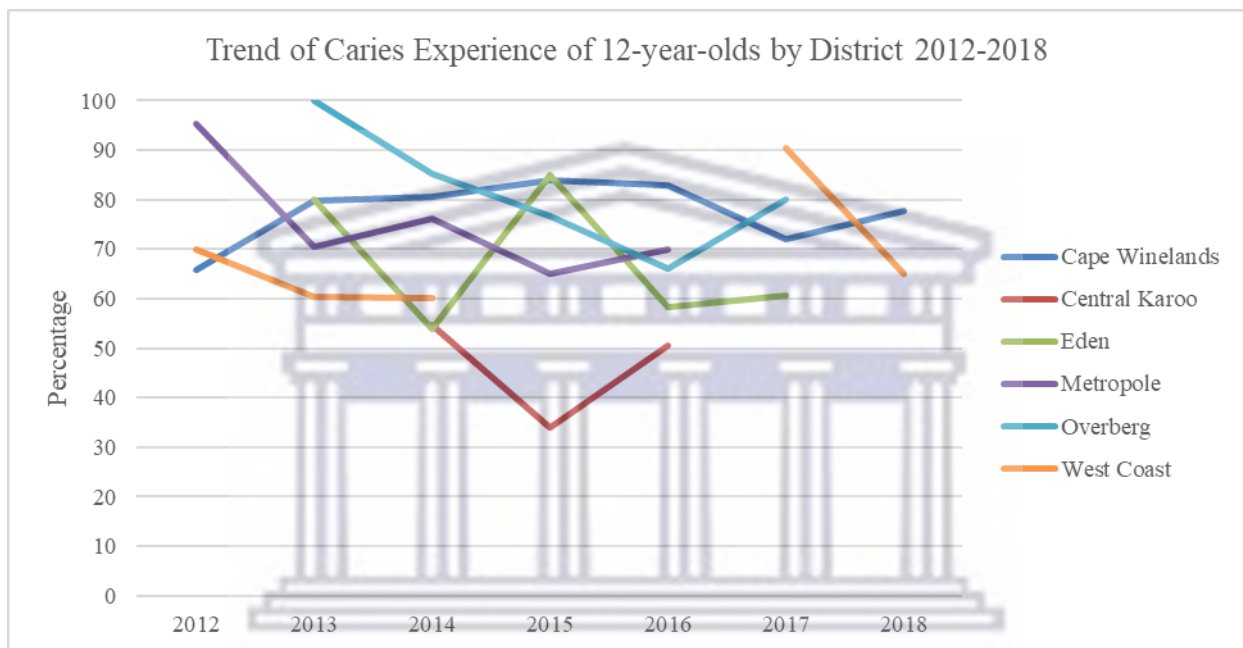


Figure 13: Trend of Caries Experience of 12-year-olds by District 2012-2018

Table 6: Trend of Caries Experience of 12-year-olds by District 2012-2018

DISTRICT	2012	2013	2014	2015	2016	2017	2018
Cape Winelands	66%	80%	80%	84%	83%	72%	78%
Central Karoo			55%	34%	50%		
Eden		80%	54%	85%	58%	61%	
Metropole	95%	70%	76%	65%	70%		55%
Overberg		100%	85%	77%	66%	80%	
West Coast	70%	60%	60%			90%	65%
Western Cape	77%	74%	72%	65%	66%	73%	74%

5.3 TREATMENT NEEDS

The treatment needs for this sample was analysed and reported by categorising the sample into the most severe treatment need required (WHO, 1997).

Therefore, the percentage of the sample reported as needing caries arresting or sealant treatment require only this treatment.

The sample reported as needing restorations, would include individuals who have been recorded as needing a one or two surface restoration, but may also need caries arresting or sealant treatment.

The sample reported as needing extractions, would include individuals who may need restorations and/or caries arresting or sealant treatment as well.

5.3.1 Treatment Needs of 6-year-olds

The greatest treatment need of 6-year-olds in the Western Cape from 2012-2018 was for extractions (48%), followed by the need for caries arresting or sealant treatment (27%) and lastly the need for restorations (14%) (Figure 14) (Table 7).

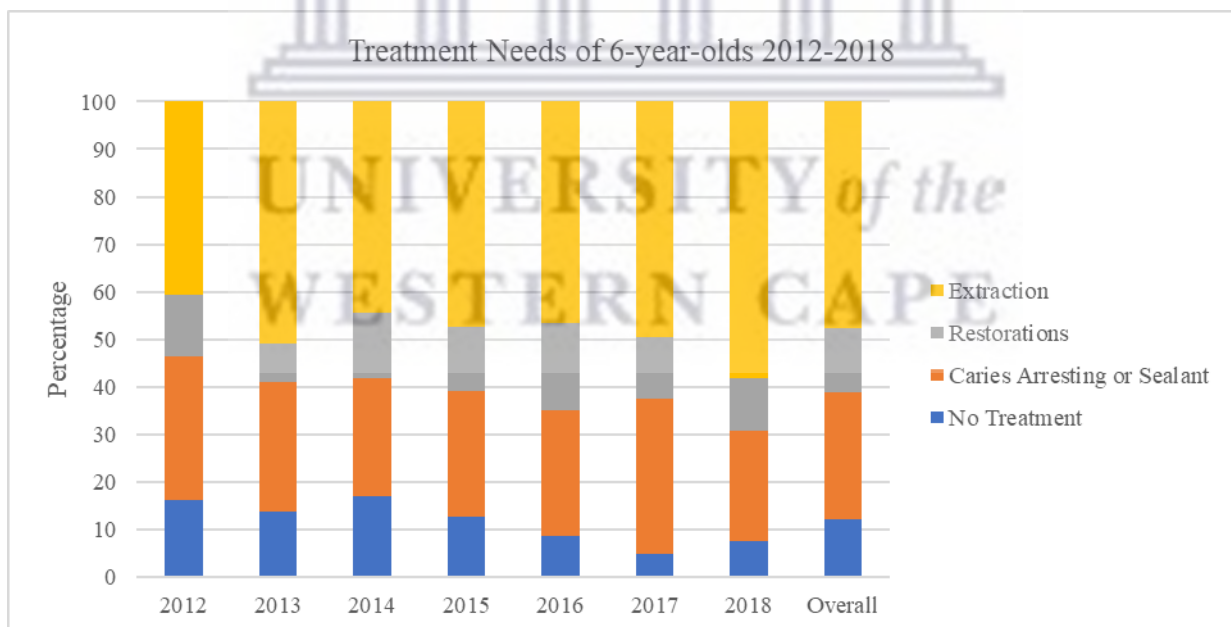


Figure 14: Treatment Needs of 6-year-olds in the Western Cape 2012-2018

The Western Cape overall reported only 12% of 6-year-olds needing no treatment from 2012-2018. This percentage decreased from 16% in 2012 to 7% in 2018. The need for caries arresting or sealant treatment decreased from 30% in 2012 to 23% in 2018. The Western Cape overall reported 27% of 6-year-olds needing caries arresting or sealant treatment over this time period. The need for restorations remained similar from 13% in 2012 to 11% in 2018. The need for extractions increased from 41% in 2012 to 58% in 2018 (Table 7) (Figure 15).

Table 7: Treatment Needs of 6-year-olds in the Western Cape 2012-2018

	2012	2013	2014	2015	2016	2017	2018	Overall
No Treatment	16%	14%	17%	13%	9%	5%	7%	12%
Caries Arresting or Sealant	30%	27%	25%	26%	26%	33%	23%	27%
Restorations	13%	8%	14%	13%	18%	13%	11%	14%
Extraction	41%	51%	44%	47%	47%	50%	58%	48%

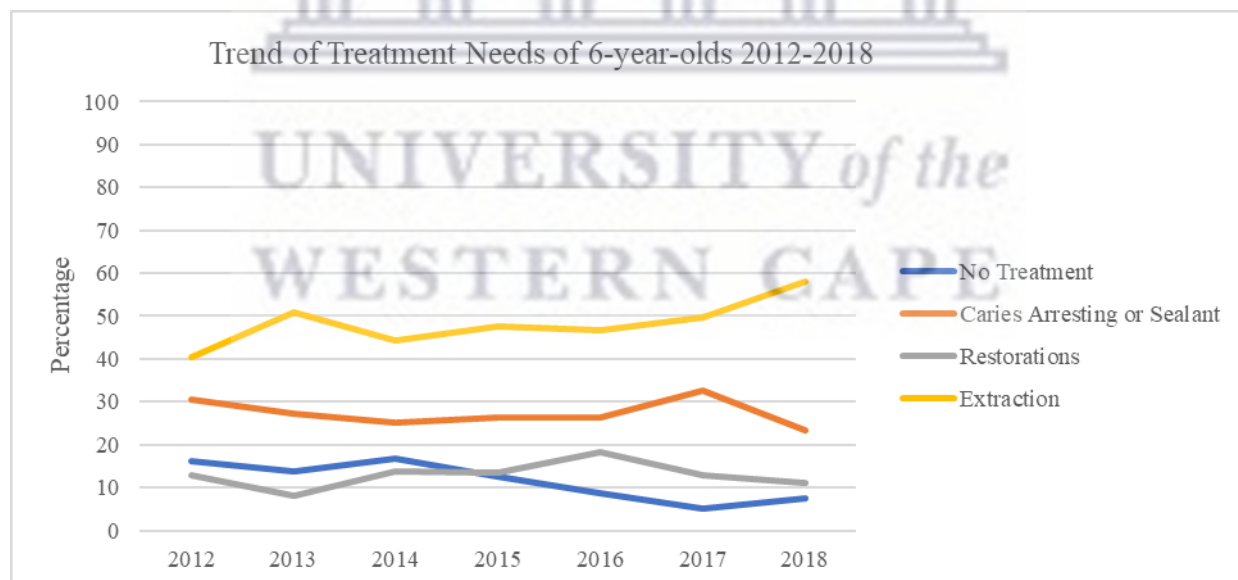


Figure 15: Trend of Treatment Needs of 6-year-old in the Western Cape 2012-2018

5.3.2 Treatment Needs of 12-year-olds

The greatest treatment needs of 12-year-olds in the Western Cape was for extractions (34%) followed by restorations (29%) and the need for caries arresting or sealant treatment (29%) (Figure 16) (Table 8).

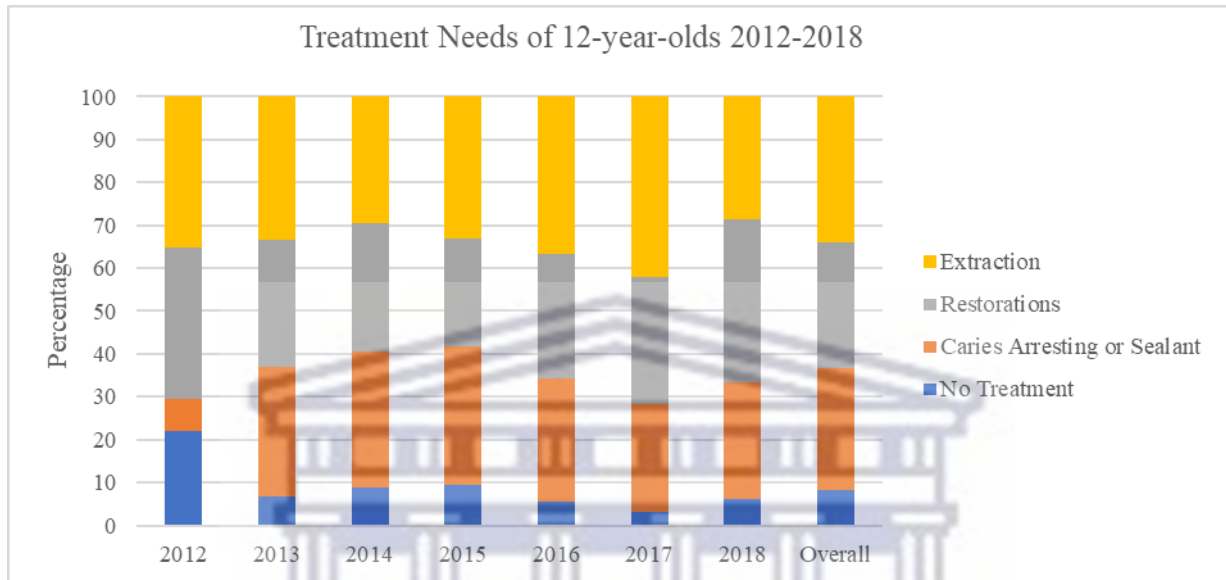


Figure 16: Treatment Needs of 12-year-olds in the Western Cape 2012-2018

Only 8% of 12-year-olds in the Western Cape needed no treatment from 2012 to 2018. This decreased from 22% in 2012 to 6% in 2018. The need for caries arresting or sealant treatment increased from 8% in 2012 to 27% in 2018. The need for restoration remained similar from 35% in 2012 to 38% in 2018. The need for extractions decreased from 35% in 2012 to 28% in 2018 (Table 8 and Figure 17).

Table 8: Treatment Needs of 12-year-olds in the Western Cape 2012-2018

	2012	2013	2014	2015	2016	2017	2018	Western Cape
No Treatment	22%	7%	9%	9%	5%	3%	6%	8%
Caries Arresting or Sealant	8%	30%	32%	32%	29%	25%	27%	29%
Restorations	35%	29%	30%	25%	29%	30%	38%	29%
Extraction	35%	34%	29%	33%	37%	42%	28%	34%

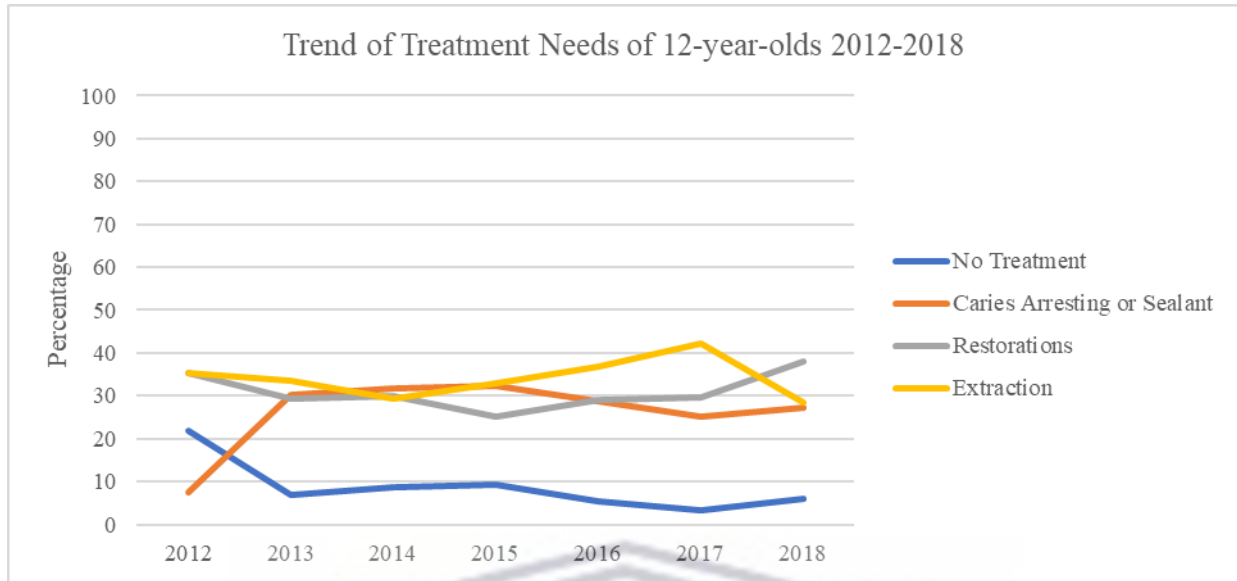


Figure 17: Trend of Treatment Needs of 12-year-olds in the Western Cape 2012-2018

5.3.3 Unmet Treatment Need

Unmet Treatment Need is calculated to determine the quantity of services provided for the treatment of caries. Unmet Treatment Need is calculated by dividing the D/d component of a particular group with the DMFT/dmft of the same group, and is expressed as a percentage (van Wyk and van Wyk, 2010). Unmet Treatment Need of 12-year-olds was recorded at 97% for the Western Cape. All the districts recorded above 90% with the Eden district recording the highest with 100% (Figure 18).

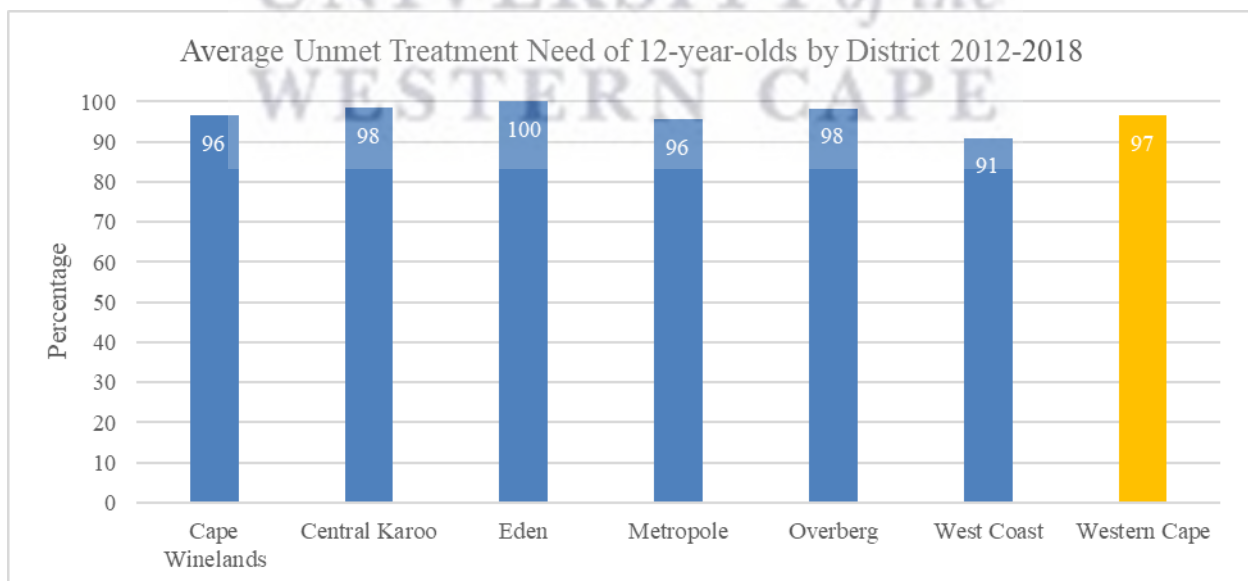


Figure 18: Average Unmet Treatment Need of 12-year-olds in the Western Cape by District 2012-2018

5.4 FISSURE SEALANTS

A total of 232 fissure sealants were recorded on permanent first molars from 2012-2018. This represents an average of 1,43% of first molars in 12-year-olds in the Western Cape with a fissure sealant in place. The highest average percentage of sealed first molars were found in the Cape Metropole district (2,25%). The Eden and West Coast districts reported 0% (Figure 19).

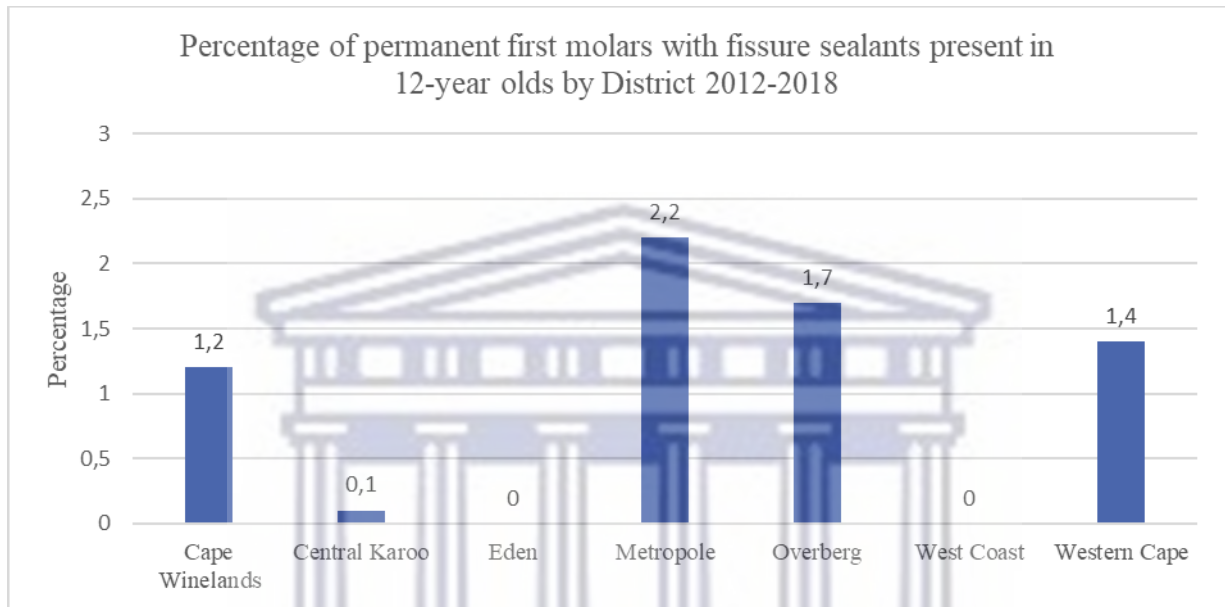


Figure 19: Percentage of permanent first molars with a fissure sealant present in 12-year-olds by District 2012-2018

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Most of the fissure sealants were found in the year 2017. This ranged from a low of 1,3% in 2013 to high of only 4,3% in 2017. The maximum number of fissure sealants found in one year was 64 in the year 2015 (Figures 20 and 21).

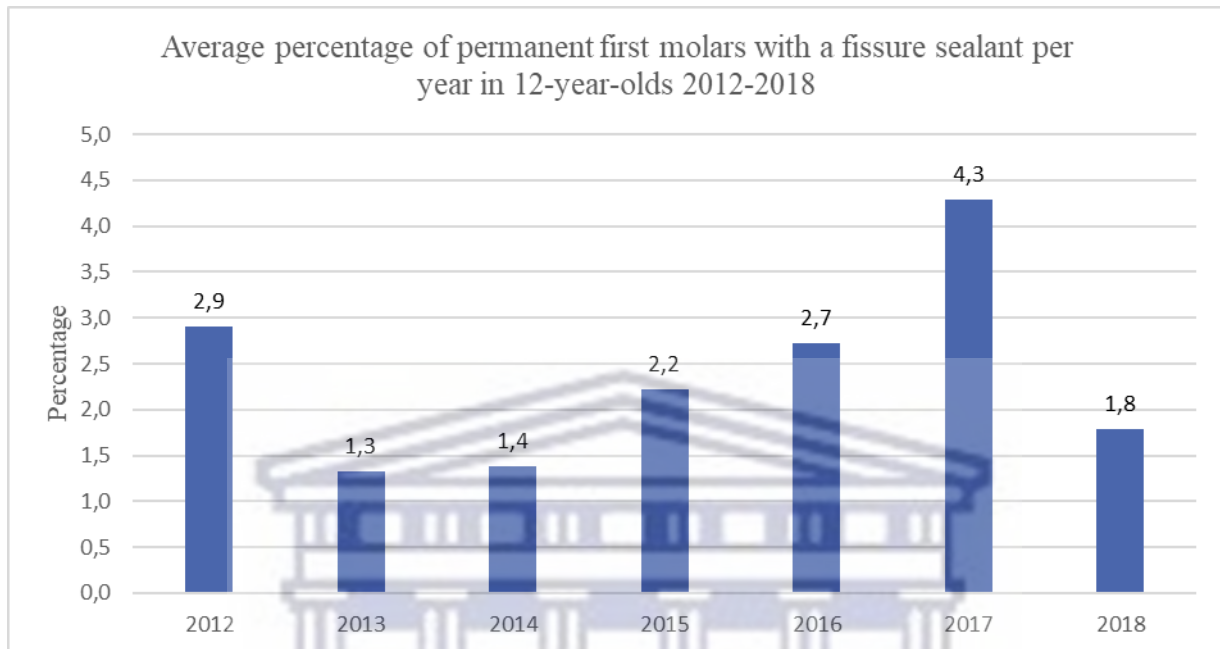


Figure 20: Average percentage of permanent first molars with a fissure sealant per year in 12-year-olds 2012-2018

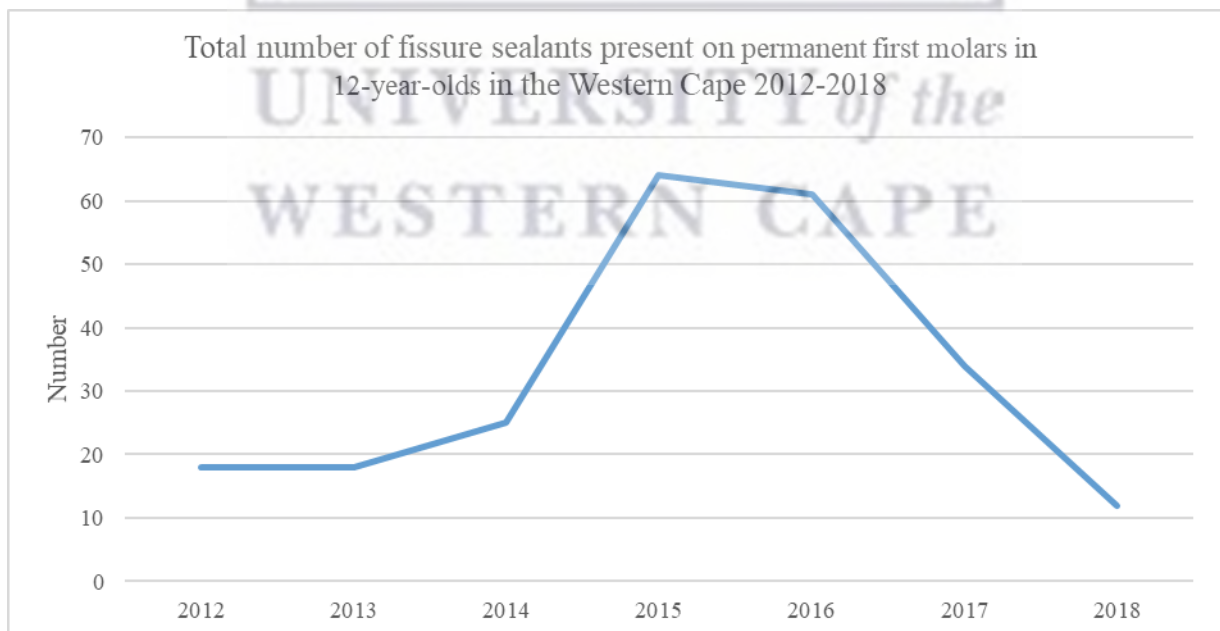


Figure 21: Total number of fissure sealants present on permanent first molars in 12-year-olds in the Western Cape 2012-2018

Only 2,4% of all lower molars were found to have fissure sealants over the study period. Only 1,8% and 2,2% of the upper molars were reported to have a fissure sealant in place (Figure 22).

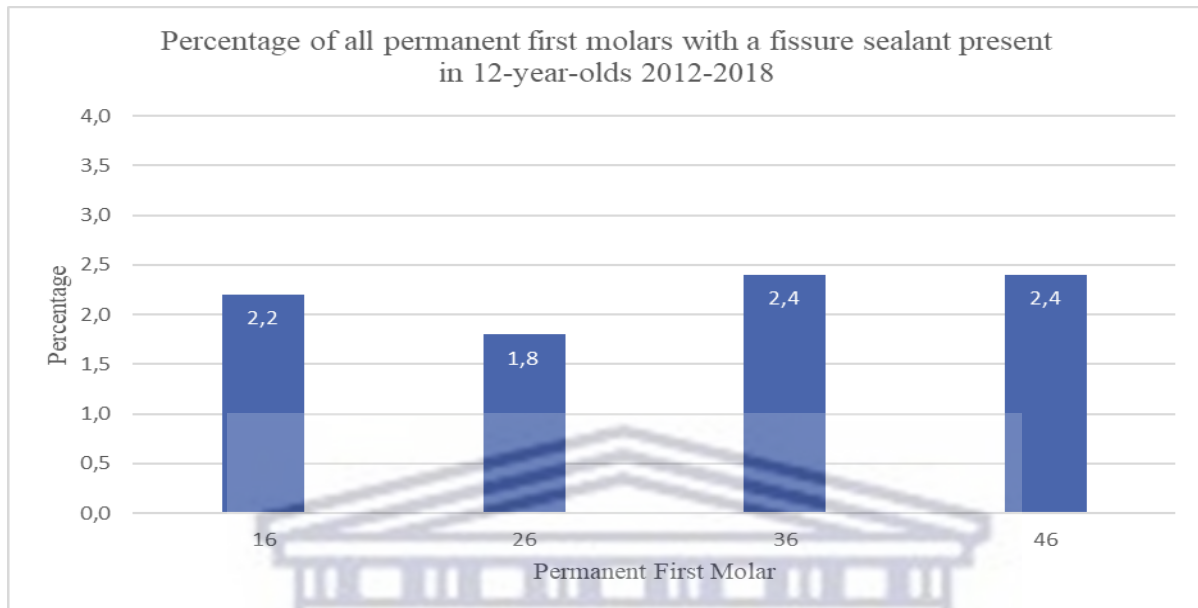


Figure 22: Percentage of all permanent first molars with a fissure sealant present in 12-year-olds 2012-2018

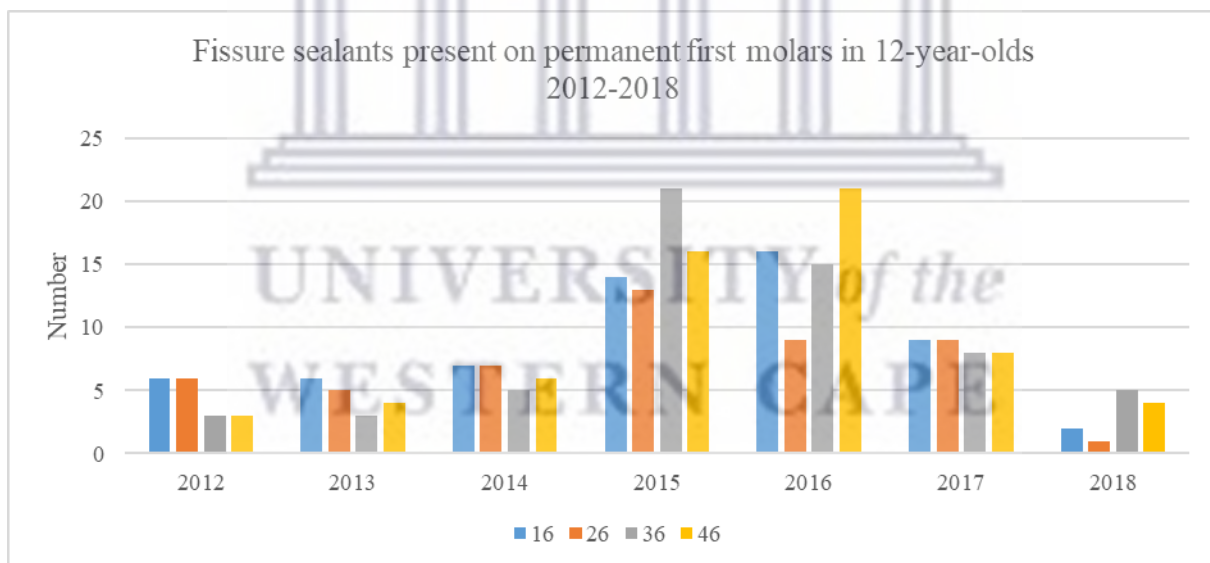


Figure 23: Fissure sealants present on permanent first molars in 12-year-olds 2012-2018

The prevalence of the number of fissure sealants found on permanent first molars was highest in the years 2015 and 2016, with much lower prevalence found in 2018. The higher number of schools surveyed in these years would account for these higher numbers (Figure 23). No schools included in 2012 were subsequently seen in 2018. This prevented an analysis on fissure sealant retention rates on permanent first molars in the 12-year-olds who would have had fissure sealants placed at the age of 6.

CHAPTER 6

DISCUSSION

6.1 INTRODUCTION

The Department of Health recognized that the burden of oral disease in the Western Cape was very high at almost twice that of the rest of South Africa. The need for oral health education, oral health promotion and the prevention of oral diseases was emphasized as areas requiring focus and intervention. The Primary Preventive Primary School Oral Health Programme was implemented in 2013 and aimed to provide 6- and 12-year-old school children with oral health screening, oral health education, starter kits for carrying out oral hygiene, brushing with a fluoride toothpaste and fissure sealants. These interventions were expected to significantly decrease the burden of oral disease experienced by the learners in these districts.

6.2 CARIES STATUS

6.2.1 Caries Severity and dmft

The mean dmft of 6-year-olds of 6,4 (Table 1) was more than twice the 2,8 reported in the National Children's Oral Health Survey, for the Western Cape (van Wyk *et al.*, 2004) and had increased from 6,3 in 2012 to 7,6 in 2018 (Figure 3). The untreated caries component was still the major component at 4,2. The missing component of 2,2 indicated that the only method of treatment received was extractions as the filling component was zero (Figure 2). Restorative treatment is rarely provided on primary teeth in the public sector (Smit and Osman, 2017) and this is evident with the zero filling component for the Western Cape overall in all districts.

The highest dmft scores were found in the Cape Winelands at 7,8 and the Overberg at 7,8 while the lowest was in the Central Karoo at 4,8. Areas within the Central Karoo district have naturally high fluoride concentration in the drinking water (Rickers, 2013). Fluoride in drinking water is well known to make a significant contribution to lower caries rates in these areas (Mullen, 2005), which could account for the relatively lower levels of caries seen the Central Karoo district.

The West Coast district reported a dmft of 6,7 with 5,2 due to the d component, the highest in the province. This district however reported the lowest level of 1,5 for missing teeth and 0 fillings. This indicates a high degree of untreated caries (Figure 2).

6.2.2 Caries Severity and DMFT

The mean DMFT of 12-year-olds in the Western Cape overall had decreased from 3,4 in 2012 to 2,9 in 2018 (Figure 6). A goal for a mean DMFT of 1,5 or less for 12-year-olds was set for South Africa for the year 2000. In the 2002 National Children's Oral Health Survey this was reported as 1,1 for South Africa (van Wyk and van Wyk, 2004). This study shows a more than double mean DMFT at 2,6. The decayed component of 2,2 contributed the largest proportion to this value while the missing and filled components contributing only 0,4 and 0,1 respectively (Table 3). This indicates the lack of delivery of the basic oral health package in the Province.

The Central Karoo is closest to this national goal with a DMFT of 1,2. The naturally high levels of fluoride in this district's water could contribute to this finding (Rickers, 2013) (Mullen, 2005).

The Cape Winelands and Overberg districts reported the highest DMFT with values of 3,4 and 3,1 respectively, which are above the global goal of 3 by 2000 as set by the WHO (WHO, 1983) and three times the goal of a mean DMFT of 1,5 or less by 2000, set by the Department of Health.

Incomplete data collection for most districts does not allow for complete statistical analysis of DMFT trends.

6.2.3 Caries Experience

The goal set by the National Department Of Health for children aged 6 years was that 50% or more be caries free (Department of health, 2014). The National Children's Oral Health Survey in 2002 reported 39,7% in this age group to be caries free (van Wyk *et al*, 2004). The caries experience of 6-year-olds in this study in the Western Cape from 2012-2018 was 84,9% and therefore far below the goal set, with only 15,1% caries free (Figure 8). The caries experience

of 6-year-olds in South Africa as reported in the National Children's Oral Health Survey was 60,3% (van Wyk *et al*, 2004). The Western Cape in that report was at 82,3% which is only slightly better than found in this study at 84,9% (Figure 8).

The caries experience of 12-year-olds overall for the Western Cape decreased from 77% in 2012 to 74% in 2018 (Figure 11). The Cape Metropole decreased from 95% to 55%, while the Cape Winelands increased from 66% to 78% (Table 6). However, these figures are still higher than those reported in the 2002 National Children's Oral Health Survey, where the caries experience in the Western Cape was 61,8% (van Wyk *et al*, 2004). Data is incomplete for all districts except the Cape Winelands which does not allow for a complete analysis.

6.2.4 Caries Reduction

The expected decline in caries, expressed as caries experience and caries severity, was not seen. The caries experience of both 6- and 12-year-olds remained at around 80% from 2012-2018 (Figures 8 and 11). Neither the dmft nor the DMFT showed a positive change (Figures 3 and 6).

The increase in dmft from 6,3 to 7,6 (Figure 3) shows that the programme had no impact on the caries severity of 6-year-olds. The slight decrease of the DMFT from 3,4 to 2,9 for the Western Cape overall, which is still well above the desired goal of 1,5 indicates that there was little to no improvement in caries severity.

The oral hygiene instruction and provision of toothbrushes at visits that formed part of the Primary Preventive Primary School Oral Health Programme, was not an effective caries prevention tool for 6-year-olds as a decline in the subsequent DMFT was not observed.

6.2.5 Oral Health Education Programmes Effect on Caries Status

School-based primary prevention oral health programmes, such as oral health education for children and toothbrushing with a fluoride toothpaste has the potential to be an effective strategy. In South Africa however, benefits such as oral hygiene awareness and practices derived from these programmes are reported to be short lived (Reddy and Singh, 2017) (Jürgensen and Petersen, 2013).

Oral health education programmes in schools may have limited impact on its own. They may prove to be more successful when provided, and reiterated, on a regular basis. This is particularly true in low socio-economic areas (Jürgensen and Petersen, 2013). Barrie and Carstens (1989) reported that dental health education programmes conducted at schools, whether the children received a talk, demonstration and/or active brushing, were not effective in improving oral hygiene. When toothbrushes were issued to pupils as part of the programme, as was done in this Primary Preventive Primary School Oral Health Programme, an initial but transient improvement was seen in oral hygiene levels.

6.2.6 Toothbrushing Programme Effect on Caries Status

The benefits of toothbrushing with a fluoride toothpaste are well reported. However, the main limitations and challenges encountered with toothbrushing programmes in South Africa includes educators reporting the programme to be time consuming within the time constraints of the school day, especially with large classes, high workload and a demanding curriculum in many South African schools. Challenges of storing the toothbrushes, cups and toothpaste, and the limitation of adequate water and basins further contributed to the brushing programme being conducted irregularly or not at all (Reddy and Singh, 2017) (Moleté *et al.*, 2020), which would lead to failure of the programme.

The caries severity in the Western Cape was expected to decrease with the implementation of the Primary Preventive Primary School Oral Health Programme, but this was not seen. In 6-year-olds the dmft increased from 6,3 to 7,6 from 2012 to 2018 (Figure 3). In 12-year-olds the DMFT decreased slightly from 3,4 to 2,9 from 2012 to 2018 (Figure 6). This is well below the goal set by the Department of Health (van Wyk and van Wyk, 2004).

6.2.7 Fissure Sealant Programme Effect on Caries Status

Fissure Sealants are known to be an effective caries prevention tool, but only when they are retained for a substantial period of time after placement (Lalloo and Turton, 2008) (Ahovuo-Saloranta *et al.*, 2013). Ideal conditions are needed to facilitate this, which includes proper isolation and moisture control. For this reason, the retention rates of fissure sealants placed in

field settings are variable. Naidoo and Potgieter (2018) reported only 7,8% of fissure sealants placed in field settings were found intact after 1 year while, Singh (2011) reported 55% of sealants intact after 1 year. This could account for the low number of 232 fissure sealants found in place in 12-year-olds in this sample. Circular no:H80/2013 set out an aim for this programme to achieve 20 000 teeth sealed in one year (Appendix 1). The 232 fissure sealants found in place while the programme ran for 7 years is well below this target.

6.3 TREATMENT NEEDS

6.3.1 Treatment needs in 6-year-olds

Of the 6-year-olds in the Western Cape overall, 93% needed treatment in 2018, which is much higher than the 59,1% reported in the National Children's Oral Health Survey. This was an increase from 2012 when 84% required treatment. The need for extractions increased from 41% in 2012 to 58% in 2018 (Table 7).

According to the National Children's Oral Health Survey the greatest treatment need for this age group was for restorative care and extractions (van Wyk and van Wyk, 2004). This differs with the treatment need found in the Western Cape for 6-year-olds which shows in 2018 a far greater need for extractions (Table 7). An assumption for this finding in 6-year-olds could be the oral health worker relying on exfoliation of primary teeth to facilitate the loss of these teeth without the need to subject the child to an extraction.

Preventive care (caries arresting or sealant) was the next highest treatment need (23%) in 2018 and a low need for restorations (11%) was reported (Table 7). The trend for treatment supplied by the public sector oral health workers shows no restorations were done (Figure 2). This may be influenced by the lack of the availability of the basic oral health care package at most Western Cape clinics (Smit and Osman, 2017).

The need for preventive (caries arresting or sealant) treatment decreased slightly from 30% in 2012 to 23% in 2018, with 27% in the Western Cape overall needing this intervention (Table 7). This is a finding of almost one third of 6-year-olds needing preventive care.

6.3.2 Treatment needs in 12-year-olds

The percentage of 12-year-olds in the Western Cape overall needing treatment increased from 78% in 2012 to 94% in 2018 (Table 8). This is significantly higher than the 45,3% reported in the National Children's Oral Health Survey needing treatment (van Wyk and van Wyk, 2004). The greatest need in the 12-year age group in 2018 was for restorations (38%), followed by extraction (28%) and lastly the need for preventive care (caries prevention and sealant care) (27%) (Table 8).

The need for preventive care increased from 8% to 27% and the need for extraction decreased from 35% to 28%. The need for extractions in 2018 at 28%, differs with the findings of the National Children's Oral Health Survey which reported a low need for extractions in this age group. The need for preventive care was the least recorded treatment need (27%), which differs with the National Children's Oral Health survey finding where it was the greatest treatment need. The higher need for restorations as opposed to extractions in 12-year-olds correlates with the findings in the National Children's Oral Health survey (van Wyk and van Wyk, 2004).

In 12-year-olds the need for preventive (caries arresting or sealant) treatment increased substantially from 8% in 2012 to 27% in 2018, with 29% in the Western Cape overall needing this preventive treatment. This finding is despite the presence of the Primary Preventive Primary School Oral Health Programme, of which the placement of fissure sealants was a part.

6.3.3 Unmet Treatment Need

The Unmet Treatment Needs for 12-year-olds of 97% for the Western Cape, ranging from 91%-100% across all the districts, indicates that most caries goes untreated. The rates found were significantly higher than the 82,1% for 12-year-olds reported in the National Children's Oral Survey (van Wyk and van Wyk, 2004).

6.4 FISSURE SEALANTS

The Circular setting out the inception of this prevention programme set a target for each operator to seal at least 200 teeth in one year, with the aim of achieving approximately 20 000 teeth sealed in one year (Addendum 1). The total number of teeth found to have fissure sealants in the 7-year period was 232. This low number could either be attributed to low fissure sealant application rates or low retention rates of the sealants that had been placed. The need for caries arresting or sealant in 12-year-olds increased substantially from 8% to 27% from 2012 to 2018. This has occurred despite the Primary Preventive Primary School Oral Health Programme having been in place for 7 years.

6.5 FACTORS AFFECTING TREATMENT NEEDS

The poor availability of the basic oral health care package (Smit and Osman 2017), limited human resources and challenging logistics could account for the low fissure sealant rates, the treatment need indicated for restorations and preventive care, the high prevalence of missing teeth due to extraction and the high levels of caries severity.

6.5.1 Lack of the basic oral health care package

The South African national oral health strategy indicated that the basic oral health care package should be available in 100% of South African dental clinics and should include the provision of oral health promotion and prevention measures, examination, bitewing radiographs, scale and polish, the placement of simple restorations (1-3 surface) and treatment for the emergency relief of pain and sepsis, including extractions (Department of Health, 2004). Most clinics in the Western Cape are however ill-equipped to carry out these basic treatments. Only 37% of clinics in Western Cape districts are able to provide preventive care in the form of fissure sealants and almost two thirds of clinics were offering only extractions (Smit and Osman 2017). The majority of treatment needed in this sample for 6-year-olds in the Western Cape was for extractions (48%), followed by preventive care (caries arresting or sealant) (27%) with a low need for restorations (14%). The greatest need in the 12-year age group was for extraction (34%), followed by the need for restorations (29%) and preventive care (caries arresting or sealant)

(29%). The lack of the Basic Oral Health Care Package could account for the high prevalence of treatment need for basic services and why the treatment needs for restorations compared to extractions is low.

The low treatment need for restorations reported by dentists in Western Cape public dental clinics could also be related to findings that patients have refused restorations and demanded extractions instead (Smit and Osman 2017).

Dentists have also reported that high patient numbers and far distances to travel, limit the variety of dental service care they are able to provide (Smit and Osman 2017). This inability to carry out essential prevention and restorative practices at public clinics could account for the high caries experience of 84,9% in 6-year-olds and 70% in 12-year-olds, the Unmet Treatment Need of 97% as well as the high prevalence of need for preventive care in the form of caries arresting or sealant treatment.

6.5.2 Last resort treatment

A reason for the higher extraction than restoration rates as indicated by the higher missing component than filling component in the dmft and DMFT (Figures 2 and 5), could be related to findings that patients in the Western Cape from lower socio-economic groups tend to only seek care once there is already pain and sepsis, and thus the only option for treatment would be extraction (Peerbhay and Barrie, 2012).

6.5.3 Dentist:Patient Ratio

The recommended dentist to population ratio is 1:15 000 (National policy for oral health 2004). The reported ratio in the Western Cape is 1:71 875 (Smit and Osman, 2017) which is almost five times the recommended ratio. This could be a contributing factor to the high rates of active caries and Unmet Treatment Need seen in this study. Despite the number of oral health personal having increased, the burden of disease has still increased. Reasons for this relate to cariogenic diet with increased sugar consumption, lack of clinical services and preventive interventions (Bhayat and Chikte, 2018).

6.5.4 Lack of school-based prevention programmes

Epidemiological data and national policies are available, however little is being implemented to reduce the high prevalence of childhood caries, as can be seen by the lack of adequate positive change in the caries prevalence in this study over the 2012 to 2018 time period. Oral disease preventive components of the basic oral health care package are not carried out (Smit and Osman, 2017), school-based oral health promotion is poorly implemented and not evaluated, there is a lack of accessibility and availability of public oral health care and there is a “questionable” appropriateness of implemented oral health prevention measures (Singh, 2011).

6.5.5 Lack of continuity in collection of data for analysis

The South African National Oral Health Strategy (2004) emphasises the need for ongoing collection and analysis of data, so that appropriate interventions can be implemented. The document highlights that once the oral health conditions of the community have been highlighted, the problems need to be prioritized according to prevalence, severity and social impact. In the Western Cape, the social impact of the high caries prevalence has both physical implications, such as pain and sepsis, social implications of time lost off school and work, as well as a decreased quality of life. This intervention programme aimed to decrease the prevalence of caries in school-going children and so improve the quality of life within those communities.

This programme has however not continued, the reasons for which could be related to the oral health workers failing to collect the data or not being instructed to continue the programme, lack of calibration of the oral health workers except for a lecture and information sessions at the inception of the programme, newly placed oral health workers that were not familiar with the programme not being informed about the programme nor calibrated, or the programme being stopped without formal communication to the relevant stakeholders.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

The termination of the programme in mid-2019 and the incomplete data collection in most districts, has limited the ability to conduct a complete analysis, and therefore to provide complete conclusions.

Despite the Department of Health in the Western Cape implementing this oral disease prevention strategy, a decrease in caries severity and caries experience was not found by location or over the seven-year period analysed. The caries severity of both 6- and 12-year-olds were still higher than those recorded for these age groups in the National Children's Oral Health Survey. The implementation of the Primary Preventive Primary School Oral Health Programme, which included various caries prevention methods, should have facilitated an improvement in the caries status, but it has failed to do so over the period that this programme has run.

The percentage of 6- and 12-year-olds requiring treatment was found to be exceptionally high, with numbers far exceeding the goals set by the Department of Health for each age group. Almost a quarter of 6- and 12-year-olds still require at least caries arresting or sealant treatment, while more would require this in addition to restorations and extractions. The most prevalent treatment need overall in the Western Cape of 6- and 12-year-olds was for extractions.

This is indicative of the lack of the basic oral health package available and offered in most public dental clinics. It is also a reflection on the failure of the Primary Preventive Primary School Oral Health Programme to prevent caries as it has not brought about a positive change to the treatment needs of the children included in this programme.

A school-based oral disease prevention strategy has its place to provide benefits, but it needs to be sustained and evaluated at regular intervals to determine the impact on the community. Fissure sealants are well known to be an effective caries prevention strategy when placed under ideal conditions. However very few fissure sealants were found in place over the study period.

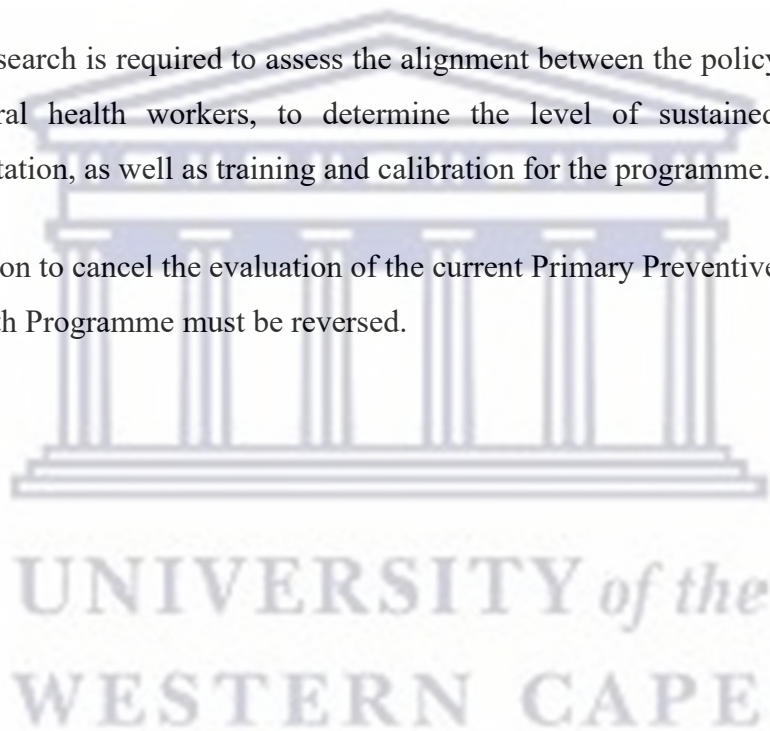
The sustainability of a tooth brushing with fluoride toothpaste programme is key to the success of the programme. With infrequent follow up at the schools and no record of how often this part of the programme was assessed and evaluated, it is evident that the high caries experience and caries severity experienced by both the 6- and 12-year-olds, did not benefit from this part of the Primary Preventive Primary School Oral Health Programme.

The high levels of caries severity, caries experience and treatment needs, along with the low prevalence of fissure sealants indicates that the Primary Preventive Primary School Oral Health Programme has not brought about adequate positive improvements in the oral health of the children in the Western Cape.



7.2 RECOMMENDATIONS

1. Programmes for oral health promotion should be regularly evaluated. This includes regular analysis of data received during the programme and subsequent adjustments to the programme as needed.
2. Programmes for oral health promotion should be maintained. This requires sustained motivation of oral health workers as well as adequate training of the oral health worker as necessary, in particular those new to the placement.
3. Further research is required to assess the alignment between the policy, and its roll out by the oral health workers, to determine the level of sustained instruction on implementation, as well as training and calibration for the programme.
4. The decision to cancel the evaluation of the current Primary Preventive Primary School Oral Health Programme must be reversed.



CHAPTER 8

REFERENCES

Ahovuo-Saloranta, A., Forss, H., Walsh, T., Hiiri, A., Nordblad, A., Mäkelä, M. and Worthington, H.V., 2013. Sealants for preventing dental decay in the permanent teeth. *Cochrane Database of Systematic Reviews*, (3).

Barrie, RB and Carstens. I.L, 1989 an evaluation of school dental health education programmes. *Journal of the Dental Association South Africa*, 44, 137-140.

Department of Health. South African National Oral Health Strategy 2014; Pretoria, 1-31.

Department of Health, Western Cape. South African National Oral Health Strategy. Available at: https://www.westerncape.gov.za/text/2003/national_policy_oral_health_sa.pdf (Accessed April 2021)

Jürgensen, N. and Petersen, P.E., 2013. Promoting oral health of children through schools—Results from a WHO global survey 2012. *Community Dent Health*, 30(4), pp.204-18.

Laloo, R. and Turton, M.S., 2008. Fissure sealants on permanent first molars—Consequences of a one-year delay. *Community Dent. Health*, 25, pp.191-192.

Molete, M., Stewart, A., Bosire, E. and Igumbor, J., 2020. The policy implementation gap of school oral health programmes in Tshwane, South Africa: A qualitative case study. *BMC health services research*, 20(1), pp.1-11. Available at: <https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-020-05122-8> (Accessed 28 May 2022)

Mullen, J., 2005. History of water fluoridation. *British Dental Journal*, 199(7), pp.1-4.

Naidoo, S. and Potgieter, C., 2017. How effective are resin-based sealants in preventing caries when placed under field conditions?. *South African Dental Journal*, 72(1), pp.22-27.

Peerbhay, F. and Barrie, R.B., 2012. The burden of early childhood caries in the Western Cape Public Service in relation to dental general anaesthesia: implications for prevention. *South African Dental Journal*, 67(1), pp.14-19.

Petersen, P.E., Bourgeois, D., Bratthall, D. and Ogawa, H., 2005. Oral health information systems-towards measuring progress in oral health promotion and disease prevention. *Bulletin of the World Health Organization*, 83, pp.686-693.

Reddy, M. and Singh, S., 2017. The promotion of oral health in health-promoting schools in KwaZulu-Natal Province, South Africa. *South African Journal of Child Health*, 11(1), pp.16-20.

Rickers, B.G, 2013. *Perceptions of Dental Fluorosis in the Central Karoo District of the Western Cape Province*. Masters Thesis. University of the Western Cape. Available at: https://etd.uwc.ac.za/bitstream/handle/11394/4831/Rickers_bg_msc_dent_2013.pdf (Accessed:28 May 2022)

Simonsen, R.J., 2002. Pit and fissure sealant: review of the literature. *Pediatric dentistry*, 24(5), pp.393-414.

Singh, S., 2011. Dental caries rates in South Africa: implications for oral health planning. *Southern African Journal of Epidemiology and Infection*, 26(4), pp.259-261.

Smit, D.A., Barrie, R.B. and Louw, A.J., 2017. The burden of dental caries in the Western Cape and a recommended turn-around strategy. *South African Dental Journal*, 72(8), pp.360-365.

van Wyk, C. and Van Wyk, P.J., 2010. Trends in dental caries prevalence, severity and unmet treatment need levels in South Africa between 1983 and 2002: scientific. *South African Dental Journal*, 65(7), pp.310-314.

van Wyk, P.J., Louw, A.J. and du Plessis, J.B., 2004. Caries status and treatment needs in South Africa: report of the 1999-2002 National Children's Oral Health Survey. *SADJ: journal of the South African Dental Association*, 59(6), pp.238-240.

van Wyk, P.J. and van Wyk, C., 2004. Oral health in South Africa. *International Dental Journal*, 54, pp.373-377.

WA Department of Health. State Oral Health Plan 2016–2020. Perth: Office of the Chief Dental Officer, Clinical Services and Research, Department of Health, 2016.

World Health Organization. Oral Health Surveys: Basic Methods. 4th Edition. Geneva: World Health Organization: 1997.

World Health Organization. Oral Health Surveys: Basic Methods. 5th Edition. Geneva: World Health Organization: 2013.

World Health Organization, Oral Health Goals 1983; Available from:
<http://apps.who.int/iris/bitstream/10665/169477/1/25808.pdf>



CHAPTER 9

APPENDICES

Appendix 1: Circular H80 / 2013



copy

CHIEF DIRECTORATE:
GENERAL SPECIALIST & EMERGENCY SERVICES

REFERENCE: 19/8/5/R

ENQUIRIES: Dr. A.G. Dalvie

DATE: 1 MAY 2013

CIRCULAR NO.: H 80 / 2013

TO: DEPUTY DIRECTOR GENERALS
CHIEF DIRECTORS AND DIRECTORS
HEADS OF INSTITUTIONS
DISTRICT MANAGERS
MANAGERS OF COMMUNITY HEALTH CENTRES AND CLINICS

PRIMARY PREVENTIVE PRIMARY SCHOOL ORAL HEALTH PROGRAMME

The burden of oral disease and specifically that of dental caries is very high in the Western Cape. A survey conducted in 2003 had shown that the caries incidence in the Western Cape is twice as high in the five to six year old as well as the fourteen to fifteen year old when compared to the National mean. Considering this status, it is clear that oral health services in the Western Cape need to put much emphasis on oral health education, oral health promotion and prevention of oral diseases.

ORAL HEALTH PROGRAMMES

The National Department of Health: Directorate: Oral Health Services has entered into a partnership with Colgate-Palmolive, the Department of Basic Education and the South African Dental Association in an effort to reach as many grade R and grade 1 learners as possible with oral health screening and oral health education. Colgate-Palmolive is providing starter kits that contain sample toothpaste, toothbrushes and education material in the form of leaflets, brochures and a DVD. Oral health operators can apply on a specific form (copy included as an attachment with this circular) to obtain these kits to initiate preventive programmes at primary schools. The National Department has set out a strategic plan whereby all districts in all provinces should provide at least one element of the school oral health preventative programme depending on available resources. A data sheet form (copy attached with circular) has been issued to all provinces whereby the Provincial Oral Health Co-ordinators have to collate this data to give the total numbers of learners reached with the education programme, the brushing programme and the fissure sealant programme. In the case of the latter programme, the number of learners covered as well as the number of teeth sealed is recorded.

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In the Western Cape, a small committee was constituted to develop a structured preventive oral health programme. The committee revised and produced various documents (copies attached with this circular) such as revised dental consent forms and letters, a protocol on infection control, an SOP (standard operational procedures) on the fissure sealant programme and a survey form to establish baseline data on caries experience in the various districts and serve as a monitoring tool over future years to see what impact the preventive programmes will have on the burden of oral disease.

SURVEY FORMS

These forms will collect the DMFT (decayed, missing, filled teeth) score for 6 year old and 12 year old learners. The DMFT is specific for these two ages' i.o.w. only learners that are already 6 years old (not 5 or 7 year old) and those that are 12 years old (not 11 or 13 year old) will form part of the sample. Each operator i.e. dentist, dental therapist and oral hygienist will be expected to complete forms for 20 six year old and 20 twelve year old, once a year, preferably at the beginning of the year. With a total of 96 operators in the Western Cape, this would give a big enough sample of 1920 learners from each age group.

PRIMARY PREVENTIVE PROGRAMME FORM

These forms will collect data on all three primary preventive programmes namely, oral health education, brushing with fluoride toothpaste programme and the fissure sealant programme. The idea here is that each operator, that is, dentist, dental therapist and oral hygienist adopt or target a specific school per month or two months or a quarter depending on the number of learners at the school. For the least, each operator should complete at least one school per quarter which will give four schools per annum. This target should form part of the SPMS (staff performance management system) evaluation of the operator.

As regards the fissure sealant programme, all 1st and 2nd permanent molar teeth should be sealed irrespective of age i.o.w. not only on 6 and 12 year old which applies to the survey only. The operator should target Grade R and Grade 1 for the 1st molars and Grade 6 and Grade 7 for the 2nd molars.

On the data form is a block on the right side of the page to record the number of schools reached as well as the names of the schools. Schools must be counted once only. Since the forms are submitted on a monthly basis, schools where a programme is carried over to the following month should not be counted again although the name of the school should appear again in the appropriate block. The reason for noting the name of the school is for auditing purposes. The National Department of Health visits a specific district per province on an annual basis. For auditing purposes, there will be a check on which schools were completed.

The primary preventive data forms must be completed per operator on a monthly basis. Data will be transferred onto an excel sheet for monitoring purposes as well as submission of totals to the National Department of Health on a yearly basis. This information will also be made available to the districts on a yearly basis. Here again, this could be used for SPMS purposes. A target could be set for each operator to seal at least 200 teeth in one year. Again, with an oral health staff component of 96 operators, the province could achieve 20 000 teeth sealed in one year. This should definitely have an impact on the burden of oral disease in the future.

Every oral health operator (dentist, dental therapist, oral hygienist) is requested to set aside at least half a day, morning or afternoon, per week for implementation of this primary preventive programme.

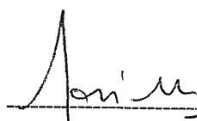
The co-operation of all oral health staff, facility managers and primary health care managers in the districts to bring about successful implementation and operation of the above programmes would be most sincerely appreciated.



PROF. Y. OSMAN
DEAN: ORAL HEALTH CENTRE
UNIVERSITY OF THE WESTERN CAPE

02/05/2013

DATE



DR. S. KARIEM
CHIEF DIRECTOR
GENERAL SPECIALIST & EMERGENCY SERVICES

07/05/2013

DATE



DR. B. ENGELBRECHT
DEPUTY DIRECTOR GENERAL
GENERAL SPECIALIST & EMERGENCY SERVICES

2013-05-13

DATE

Appendix 2: Standard operating procedures (SOP) for The Fissure Sealant Programme

STANDARD OPERATIONAL PROCEDURES (SOP)

For

The Fissure Sealant Programme

1) Introduction:

Oral conditions are important public health concerns because of their high prevalence, their severity, and public demand for services.

Dental caries is still the predominant problem in the Western Cape and is higher than the national figure for both primary and permanent dentition. A large proportion (estimated at 37%) of the adult population is edentulous (without teeth).

A strategy based on curative treatment would require a massive unrealistic and unaffordable resource allocation.

Selective Pit and Fissure Sealant Programme has been adopted as one of the evidence-based key primary prevention strategies that are very cost-effective. The teeth at highest risk for carious lesions are the first and second molars, and 90% of all dental caries in school children occurs in the pits and fissures of the occlusal surfaces of molars.

This Programme will target the first permanent molars (6-7 year-old – grade R and grade one learners) and second permanent molars (11-12 year-old - grade 6 and 7 learners).

The foundation phase (Grades 1 to 3) of the selected school will be placed on a Brushing Programme (Addendum A).

2) AIM

To improve the oral health status of selected primary school learners.

3) Planning

- The schools targeted are those on the School Nutrition Programme.
- Preferably close to clinic facility.
- Inform circuit manager, Principal, Governing Body ,successful school of selection

- Prepare and present prevention package to school staff (Addendum B)
- Presentation (PowerPoint) to include:
 - The reason for programme (National Oral Health Strategy)
 - Baseline data to be collected
 - Oral Health Education (OHE) Talk
 - School Dental Consent Importance

4) Fissure Sealant Procedure:

Attached

Fissure Sealant of choice – Clinpro or Delton Plus

5) Fissure Sealant Evaluation Criteria Diagram

Attached

6) Target Group

- Grade R and Grade One – for 1st Molar Teeth
- Grade Sixes and Sevens – for 2nd Molar Teeth

Year 1: Treat Grade R/1 and Grade 6/7 Learners

Year 2: Treat new Grade R/1 and new Grade 6/7 Learners

Year 3: Treat new Grade R/1 and new Grade 6/7 Learners

Year 4: Etc

(Sealants placed in Grade 1 and 7 and recalled – via note to parents - if 6.s and 7's are unerupted)

7) Base-line Data

- Baseline dmft
- 6 and 12 year olds only
- Oral Health Survey form to be completed
- Random sample of 20 learners from each age group

8) Infection Control:

Attached

9) Transport

- Availability of transport designated for the oral health programme is of crucial importance.
- Reliable Transport
 - Programme day per clinic – Dedicated session per week
 - Dedicated Driver – Must have PDP to transport learners
 - Oral Health Staff also requires regular transport to schools

10) Monitoring / Evaluation

Attached Forms:

- Monitoring – Monthly Primary Prevention Form
- Evaluation – Survey Form – sample of twenty learners for each of six year old and twelve year old – do once a year – long term evaluation → 5 years

11) Indicators

Number of learners that received OHE
Number of learners on new brushing programme
Number of learners that received fissure sealants

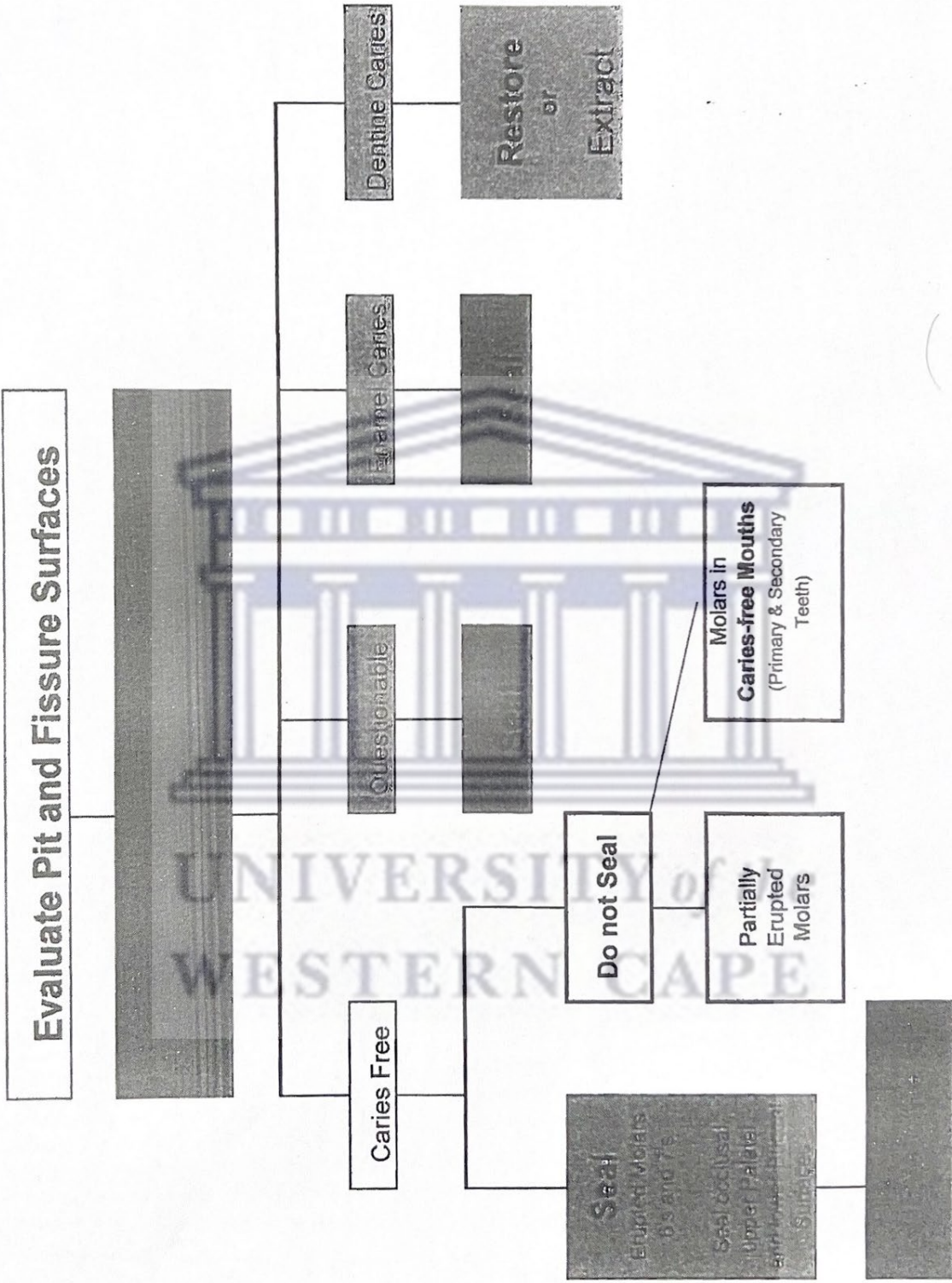
Number of schools completed with OHE
Number of schools completed with brushing programme
Number of schools completed with fissure sealants

12) **Addendum**

- A - **Brushing Programme (Oral Hygienists)**
- B - **Presentation (Oral Hygienists)**
- C - **Consent forms 1) Screening
2) Treatment**
- D - **Letter to the Principal**
- E - **Infection Control**
- F - **Baseline Data Forms (Survey Form)**
- G - **Monitoring Forms (Monthly Data Submission)**



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Appendix 3: Data Capture Sheet

PROVINCIAL GOVERNMENT : WESTERN CAPE
ORAL HEALTH SURVEY FORM
 [For 6 year old & 12 year old learners]

School Name	Pt. No.
Town / Suburb of school	

NAME:

Examiner No.

CLINIC:

Clinic Code

Age

Gender (1 = Female, 2 = Male)

Grade

Name		Date of Examination							
			Y	Y	M	M	D	D	

CARIES STATUS AND TREATMENT NEEDS

	18	17	16	15	14	13	12	11		61	62	63	64	65	26	27	28
Status																	
Treatment																	
Status																	
Treatment																	
	48	47	46	45	44	43	42	41		31	32	33	34	35	36	37	38
				85	84	83	82	81		71	72	73	74	75			

STATUS		
Permanent tooth		Primary tooth
0	Sound	A
1	Decayed	B
2	Filled & decayed	C
3	Filled, no decay	D
4	Missing due to caries	E
5	Missing any other reason	
6	Sealant, varnish	F
7	Bridge abutment or special crown	
8	Unerupted tooth	
9	Excluded tooth	

TREATMENT	
0	None
1	Caries arrest. or sealant care
2	1 Surface filling
3	2 or more surface filling
4	Crown or bridge abutment
5	Bridge element
6	Pulp care
7	Extraction
8	Need for other care
9	Specify

Appendix 4: Research Ethics Approval Letter



OFFICE OF THE DIRECTOR: RESEARCH RESEARCH AND INNOVATION DIVISION

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26 May 2020

Dr K Simpson
Faculty of Dentistry

Ethics Reference Number: BM19/1/9

Project Title: Caries status and treatment needs of 6 and 12 year old Western Cape learners in the public sector.

Approval Period: 15 February 2019 – 15 February 2020

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

The permission to conduct the study must be submitted to BMREC for record keeping.

Please remember to submit a progress report in good time for annual renewal.

The Committee must be informed of any serious adverse event and/or termination of the study.

A handwritten signature in black ink, appearing to read 'Josias'.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

NHREC REGISTRATIONNUMBER -130416- 050



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