

# Throughputs of two cohorts of dental students at Sefako Makgatho Health Sciences University: A comparison

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## ABSTRACT

### Introduction

The numbers of student dentists enrolled at dental schools across the country do not give an indication of the students' progress to degree.

### Aims and objectives

To describe and compare the throughputs of dentistry course for two cohorts of students at Sefako Makgatho Health Science University.

The progress to degree of the 2005 and 2010 cohorts of first year dental students was tracked and compared.

### Design

A comparative cross-sectional study.

### Methods

Academic records of the 2005 and 2010 cohorts of first year dental students were followed up over a five-year period. Data related to the demographic characteristics, numbers enrolled, numbers who dropped out, and the numbers who graduated were acquired and then captured in Microsoft Excel software.

### Results

Female students constituted the majority of enrollees in both cohorts (53.8% vs. 51.3%). The proportions of students who started the course, completed the degree and graduated within the regulation time among the 2005 and 2010 cohorts were similar (42.1% vs. 41.2%).

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A lone student among the 2010 cohort dropped out of the course. The majority of students (57.9% vs. 55.9%) in both cohorts took longer to qualify.

### Conclusions

The throughputs of dentistry course for the two cohorts hovered around 40%.

## INTRODUCTION AND BACKGROUND

There is a shortage of oral health personnel in South Africa. Oral health personnel, including dental assistants, oral hygienists, dental therapists, and dentists, have been estimated to constitute 0.2 per 1000 population.<sup>1</sup>

A meagre dental practitioner to population ratio of 1.09 per 10,000 has been estimated.<sup>2</sup> There is currently a debate about how to alleviate this shortage. An argument has been made that we should be training fewer dentists and more oral hygienists and dental therapists.<sup>3</sup> This line of reasoning is supported by evidence emerging from epidemiological studies of the burden of disease.

Evidence indicates that dental caries is the most prevalent oral disease<sup>4</sup> - the latest national survey found that more than 80% of dental caries in children was untreated.<sup>5</sup> Previously unobserved oral health priorities, which include conditions such as periodontal disease, oral manifestations of HIV/AIDS, dental trauma, oral cancer and craniofacial anomalies, are now under consideration, adding to the burden.<sup>6,7</sup>

An analysis of the throughput of the various courses offered at dental schools in the country could enrich the debate on the number and mix of oral health personnel required to provide necessary services. The results of such an investigation will be useful to policy-makers in developing human resources plan for oral health and to the dental schools' management in identifying impediments to graduation in order to offer the necessary academic and mentoring support to enable success.

The median throughput of the dental therapy courses for the period between 2004 and 2014 at Sefako Makgatho Health Sciences University has recently been established to be 45 percent with an interquartile range of 37 to 58.5 percent.<sup>8</sup> This finding is rather disappointing. The current study seeks to describe the throughputs for two cohorts of students in the dentistry course at Sefako Makgatho Health Science University during the period between 2005 and 2014.

The results of a recent review of Health Professions Council of South Africa (HPCSA) records indicate that the number of dentists increased at around 2% per annum during the period 2002 to 2015.<sup>9</sup> The study revealed a welcome change in the demographic profile of dentists. It found a relatively sharp increase in the number of Coloured, Black and female registered dentists.<sup>9</sup>

The aggregate number of student dentists currently enrolled in the four dental schools in the country is 1 158.<sup>10</sup> This figure does not give an indication of the students' progress to degree. A most recent systematic review of the literature clusters the determinants of university drop-out and delayed graduation into four main categories i.e. students' characteristics, abilities and behaviour; parental background and family networks; characteristics of tertiary education system and institutions, and labour market conditions.<sup>11</sup>

The strong association of race, gender, matriculation score and poverty with dropout or graduation at South African universities is well documented.<sup>12,13,14</sup> The association, if any, of student motivation with dropout or graduation is an important issue for future research. The results of a national survey among early-phase student dentists are extremely concerning. The survey found that for a third of respondents, dentistry was not a first choice – amongst the White students, it was a first choice for 82% compared with 59% amongst Black Africans.<sup>15</sup>

## OBJECTIVES OF THE STUDY

To describe the demographic changes undergone by the 2005 and 2010 cohorts of first year dental students in successive years of study.

To track and compare the progress to degree of the 2005 and 2010 cohorts of first year dental students. To determine the median numbers of students who completed their degree and graduated within the regulation time.

## MATERIALS AND METHODS

### Study design

This was a retrospective, comparative cross-sectional study in which existing academic records were reviewed.

### Target population

The sampling frame consisted of academic records of a subpopulation of dental students who were enrolled at Sefako Makgatho Health Sciences University during the period 2005 to 2014 i.e. academic records of cohorts of first year dental students who were enrolled in 2005 and 2010 respectively were followed up over a five-year period.

### Study sample

Every available record was studied.

### Data collection

Data related to the demographic characteristics of the students, the numbers enrolled, numbers who dropped

out, and the numbers who graduated were acquired and then captured in Microsoft Excel software.

### Definition of variables and terms

Age and gender refer to student age and sex as recorded in the academic records.

Population group breakdown of students into African, Indian, Coloured and White will be applied according to the Population Registration Act of 1950.<sup>16</sup>

Progress to degree refers to enrolment and academic progress.

Regulation time is the period of time normally expected for completion of the degree (five years).

Throughput, quite simply, is how many students who started studying complete the course of study. This may also be measured by the number of students who do not drop out.<sup>17</sup> It is also referred to as the completion rate, or graduation rate.<sup>18</sup>

First-timer refers to a student who was enrolled in a year of study for the first time.

### Ethical considerations

Ethical approval for the study was granted by the Ethics Committee of Sefako Makgatho Health Sciences University (SMREC/D/1820/2017). Permission to conduct the study was granted by the Chief Executive Officer (CEO) of the Medunsa Oral Health Centre.

## STATISTICAL ANALYSIS/ HYPOTHESIS TESTING

Collected data were subjected to univariate and bivariate analysis in Statistical Package for the Social Sciences (SPSS) software. Frequencies, means and proportions were calculated. Chi-square tests were performed to test the statistical significance of the differences in proportions. Chi-square tests for trends were performed to investigate trends in enrolments and examination pass rates. The chosen significance level of the tests was a p-value less than 0.05.

## RESULTS

Academic records of the 2005 and 2010 cohorts of first year dental students were followed up over a five-year period and analysed.

The total number of enrollees followed up over the five years of study in the 2005 cohort was 10.4% more than that of the 2010 cohort. The first year class of the 2005 cohort was 28.9% larger than that of the 2010 cohort.

On the one hand, the fifth year class of the 2005 cohort was 26.9% smaller than the first year class. On the other hand, the fifth year class of the 2010 cohort was 27% larger than the first year class. Female students constituted the majority (54.5%) of the enrollees - they were the majority in all classes of the 2005 cohort.

**Table 1.** Gender distribution by year of study.

Cohort	Gender	Year of study					Total
		First n (%)	Second n (%)	Third n (%)	Fourth n (%)	Fifth n (%)	
2005	Male	24 (46.2)	22 (41.5)	23 (44.2)	18 (40)	15 (39.5)	102 (42.5)
	Female	28 (53.8)	31 (58.5)	29 (55.8)	27 (60)	23 (60.5)	138 (57.5)
	Total	52 (100)	53 (100)	52 (100)	45 (100)	38 (100)	240 (100)
2010	Male	18 (48.7)	22 (51.2)	20 (51.3)	23 (46.9)	22 (46.8)	105 (48.8)
	Female	19 (51.3)	21 (48.8)	19 (48.7)	26 (53.1)	25 (53.2)	110 (51.2)
	Total	37 (100)	43 (100)	39 (100)	49 (100)	47 (100)	215 (100)
Total	Male	42 (47.2)	44 (45.8)	43 (47.3)	41 (43.6)	37 (43.5)	207 (45.5)
	Female	47 (52.8)	52 (54.2)	48 (52.7)	53 (56.4)	48 (56.5)	248 (54.5)
	Total	89 (100)	96 (100)	91 (100)	94 (100)	85 (100)	455 (100)

**Table 2.** Racial composition by year of study.

Cohort	Race	Year of study					Total
		First n (%)	Second n (%)	Third n (%)	Fourth n (%)	Fifth n (%)	
2005	African	44 (84.6)	45 (84.9)	46 (88.5)	40 (88.9)	32 (84.2)	207 86.3)
	Indian	5 (9.6)	5 (9.4)	4 (7.7)	3 (6.7)	4 (10.5)	21 (8.8)
	White	3 (5.8)	3 (5.7)	2 (3.8)	2 (4.4)	2 (5.3)	12 (4.9)
	Total	52 (100)	53 (100)	52 (100)	45 (100)	38 (100)	240 (100)
2010	African	27 (73.0)	32 (74.4)	36 (92.3)	46 (93.9)	43 (91.5)	184 (85.6)
	Indian	4 (10.8)	5 (11.6)	1 (2.6)	1 (2.0)	2 (4.3)	13 (6.1)
	White	6 (16.2)	6 (14)	2 (5.1)	2 (4.1)	2 (4.2)	18 (8.3)
	Total	37 (100)	43 (100)	39 (100)	49 (100)	47 (100)	215 (100)
Total	African	71 (79.8)	77 (80.2)	82 (90.1)	86 (91.5)	75 (88.2)	391 (85.9)
	Indian	9 (10.1)	10 (10.4)	5 (5.5)	4 (4.25)	6 (7.1)	34 (7.5)
	White	9 (10.1)	9 (9.4)	4 (4.4)	4 (4.25)	4 (4.7)	30 (6.6)
	Total	89 (100)	96 (100)	91 (100)	94 (100)	85 (100)	455 (100)

**Table 3.** Numbers of first-timers by year of study.

Cohort	First-timer	Year of study					Total
		First n (%)	Second n (%)	Third n (%)	Fourth n (%)	Fifth n (%)	
2005	No	14 (26.9)	10 (18.9)	7 (13.5)	5 (11.1)	2 (5.3)	38 (15.8)
	Yes	38 (73.1)	43 (81.1)	45 (86.5)	40 (88.9)	36 (94.7)	202 (84.2)
	Total	52 (100)	53 (100)	52 (100)	45 (100)	38 (100)	240 (100)
2010	No	3 (8.1)	10 (23.3)	8 (20.5)	23 (46.9)	5 (10.6)	49 (22.8)
	Yes	34 (91.9)	33 (76.7)	31 (79.5)	26 (53.1)	42 (89.4)	166 (77.2)
	Total	37 (100)	43 (100)	39 (100)	49 (100)	47 (100)	215 (100)
Total	No	17 (19.1)	20 (20.8)	15 (16.5)	28 (29.8)	7 (8.2)	87 (19.1)
	Yes	72 (80.9)	76 (79.2)	76 (83.5)	66 (70.2)	78 (91.8)	368 (80.9)
	Total	89 (100)	96 (100)	91 (100)	94 (100)	85 (100)	455 (100)

**Table 4.** Trends in examination pass rates.

Cohort	Year of study	Examination Results		Total	Chi-squared test for trend
		Pass n (%)	Fail n (%)		
2005	First	43 (82.7)	9 (17.3)	52 (100)	p = 0.254
	Second	48 (90.6)	4 (9.4)*	53 (100)	
	Third	41 (78.8)	11 (21.2)	52 (100)	
	Fourth	36 (80)	9 (20)	45 (100)	
	Fifth	26 (68.4)	12 (31.6)	38 (100)	
	Total	194 (80.8)	45 (19.2) *	240 (100)	
2010	First	34 (91.9)	3 (8.1)	37 (100)	p = 0.254
	Second	31 (72.1)	11 (27.9)*	43 (100)	
	Third	26 (66.7)	12 (33.3)*	39 (100)	
	Fourth	42 (85.7)	6 (14.3)*	49 (100)	
	Fifth	47 (100)	0 (0)	47 (100)	
	Total	180 (83.7)	32 (16.3) ***	215 (100)	
Total	First	77 (86.5)	12 (13.5)	89 (100)	p = 0.254
	Second	79 (82.3)	15 (17.7)**	96 (100)	
	Third	67 (73.6)	23 (26.4)*	91 (100)	
	Fourth	78 (83.0)	15 (17)*	94 (100)	
	Fifth	73 (85.9)	12 (14.1)	85 (100)	
	Total	374 (82.2)	77 (17.8) ****	455 (100)	

\*Number of students that dropped out.

**Table 5.** Comparison of the throughput of all first-timers between cohorts.

Cohorts	Year of study					Number of graduates	Throughput (%)	Chi-squared test
	First	Second	Third	Fourth	Fifth			
2005	38	29	27	20	16	16	42.1	p = 0.937
2010	34	30 (1)	20	16	14	14	41.2	

() number of students that dropped out.

Throughput = Number of graduates divided by number of students enrolled in first year.

**Table 6.** Comparison of the throughput of first-timers with tertiary education between cohorts.

Cohorts	Year of study					Number of graduates	Throughput (%)	Chi-squared test
	First	Second	Third	Fourth	Fifth			
2005	22	19	18	13	9	9	40.9	p = 0.454
2010	23	21	14	12	12	12	52.2	

Throughput = Number of graduates divided by number of students enrolled in first year.

**Table 7.** Comparison of the throughput of first-timers without tertiary education between cohorts.

Cohorts	Year of study					Number of graduates	Throughput (%)	Chi-squared test
	First	Second	Third	Fourth	Fifth			
2005	16	10	9	7	7	7	43.8	p = 0.174
2010	11	9	6	4	2	2	18.2	

Throughput = Number of graduates divided by number of students enrolled in first year.

**Table 8.** Comparison of the throughput of first-timers with and without tertiary education among the 2005 cohort.

Tertiary education	Graduated		Total	Chi-squared test
	Yes n (%)	No n (%)		
Present	9 (40.91)	13 (59.09)	22 (100)	p = 0.862
Absent	7 (43.75)	9 (56.25)	16 (100)	
Total	16 (42.11)	22 (57.89)	38 (100)	

**Table 9.** Comparison of the throughput of first-timers with and without tertiary education among the 2010 cohort.

Tertiary education	Graduated		Total	Chi-squared test
	Yes n (%)	No n (%)		
Present	12 (52.17)	11 (47.83)	23 (100)	p = 0.063
Absent	2 (18.8)	9 (81.82)	11 (100)	
Total	14 (41.18)	20 (58.82)	34 (100)	

In contrast, they were in the minority in the second and third year classes of the 2010 cohort.

African students constituted a vast majority (85.9%) of the enrollees – they were an overwhelming majority in all classes of both cohorts. Indian students comprised the second largest racial group of enrollees at a mere 7.5%.

A marginal (3.4%) increase in the proportion of White students was observed between the 2005 and 2010 cohorts.

One out of five (19.1%) enrolee was a repeater - they comprised 15.8% and 22.8% of the 2005 and 2010 cohorts respectively.

One out of four (26.9%) enrolee in the first year class of the 2005 cohort was a repeater compared with less than ten percent (8.1%) in the first year class of the 2010 cohort. Almost half (46.9%) of the fourth year class in the 2010 cohort were repeaters.

A steady decline in the proportion of repeaters was observed among the 2005 cohort from the first to fifth years of study.

The mean examination pass rate of the 2010 cohort was slightly higher (83.7% vs 80.8%) than that of the 2005 cohort. The difference was however not statistically significant ( $p>0.05$ ).

A two-thirds examination pass rate was the lowest rate achieved by both cohorts - 68.4% was recorded in the fifth year class of the 2005 cohort compared with 66.7% in the third year class of the 2010 cohort.

Three students, who failed the examinations, dropped out of the course among the 2010 cohort compared with one student among the 2005 cohort.

There was insufficient evidence to reject the null hypothesis of no trend in the proportion of students who passed the examination in the population ( $p> 0.05$ ) for both cohorts.

The proportions of students who started the course in 2005 and 2010 and completed the degree in 2009 and 2014 and graduated in 2010 and 2015 within the regulation time was similar (42.1% vs 41.2%). A lone student among the 2010 cohort dropped out of the course. The majority of students (57.9% vs. 55.9%) of both cohorts took longer to qualify.

Eleven percent more first-timers with tertiary education among the 2010 cohort compared with the 2005 cohort completed the degree and graduated within the regulation time. The difference in proportions was however not statistically significant ( $p > 0.05$ ). 59.1% (13/22) of students in the 2005 cohorts took longer to qualify. Twenty-five percent more first-timers without tertiary education among the 2005 cohort compared with the 2010

cohort completed the degree and graduated within the regulation time. The difference in proportions was however not statistically significant ( $p > 0.05$ ). 82% (9/11) of students in the 2010 cohorts took longer to qualify.

Slightly (2.84%) more students without tertiary education graduated within the regulation time than those with tertiary qualification. There was insufficient evidence ( $p > 0.05$ ) to reject the null hypothesis that the proportions of students that graduated were equal in the two groups in the population.

A little less than three times (2.78 times) as many students with tertiary education graduated within the regulation time as were those without tertiary education. There was however insufficient evidence ( $p > 0.05$ ) to reject the null hypothesis that the proportions of students that graduated were equal in the two groups in the population.

## DISCUSSION

This study set out to track, over a five-year period, and compare the progress to degree of first year dental students who were enrolled in 2005 and 2010.

The number of students who completed their degree and graduated within the stipulated time was also determined.

### Demographic characteristics

The current study found that the size of the 2005 cohort was 28.9% larger than that of the 2010 cohort in the first year of study (Table 1). This unanticipated discrepancy coincided with the founding of the University of Limpopo (MEDUNSA Campus), a predecessor of Sefako Makgatho Health Sciences University. It may be due to institutional inexperience.

The results of this study indicate that female students constituted the majority (54.5%) of the enrolees of both cohorts (Table 1). The present findings seem to be consistent with other research which found that female students constitute the majority of dental students.<sup>15</sup> The most interesting finding was that the variation in numbers of enrolees between the first and fifth year classes of both cohorts was in different directions yet similar i.e. a 26.9% decline among the 2005 cohort in contrast to the 27.0% rise among the 2010 cohort (Table 1). This rather contradictory result was due to the significant difference (31.6%) in the examination pass rates between the fifth year classes of the 2005 and 2010 cohorts.

The results of this study show that African students constituted an overwhelming majority (85.9%) of the enrolees (Table 2). This foreseeable finding is inextricably linked with the founding mission of the predecessor institutions.

Medunsa, the Medical University of Southern Africa, was founded in 1976 to address both the under-representation of blacks in the health professions and the lack of good health care in the homelands. The university trains most of the black physicians, dentists, veterinarians, and allied health professionals in South Africa.<sup>19</sup>

rians, and allied health professionals in South Africa.<sup>19</sup> The results of this study show a significant reduction in the proportion of first year repeaters from a high of 26.9% in the 2005 cohort to a low of 8.1% in the 2010 cohort (Table 3). This encouraging finding suggests that the academic and mentoring support offered is effective.

In contrast, the current study found that repeaters constituted a strikingly large size (46.9%) of the fourth year class of the 2010 cohort. The observed significant increase in the number of repeaters in the fourth year class of 2013 could be attributed to fact that the large class size (59 students) of the previous year consisted of a relatively large number of weak students. Further research is required to establish the major factors that cause students to repeat a class.

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a relatively large number of weak students. Further research is required to establish the major factors that cause students to repeat a class.

### Examination pass rate

The results of this study did not show any trend in the examination pass rates (Table 4). It seems possible that these results are due to the highly variable pass rates - the pass rates ranged between 68.4% and 90.6% and between 66.7% and 100% for the 2005 and 2010 cohorts respectively.

It is however encouraging that the lowest examination pass rates were attained in different classes i.e. the fifth year class of the 2005 cohort and the third year class of the 2010 cohort respectively. These findings suggest that the lowest examination pass rates were random.

### Throughput

The current study found that the throughputs of the dentistry course at Sefako Makgatho Health Sciences University (SMU) hovered around 40% (Table 5).

Local studies of comparable cohorts were not found - the through-put of dentistry courses in the four dental schools in South Africa, namely the University of the Western Cape (UWC), University of the Witwatersrand (Wits), Sefako Makgatho Health Sciences University (SMU) and University of Pretoria (UP) has not previously been described.

The findings of the current study differ greatly from the Ministry of Education's target of 20% graduation rate for a 4-year or more undergraduate degree.<sup>20</sup> However, they are broadly consistent with other research.

The Council for Higher Education (CHE) found that the regulation time throughput, for four year degrees, of cohorts of first year students enrolled in the years 2007, 2008, and 2009 ranged between 29% and 42%.<sup>21</sup>

Furthermore, a regulation time throughput of 36.9% among first year students enrolled in 2009 has been found by researchers of the Stellenbosch University working paper.<sup>22</sup> The throughput of the dentistry course beyond regulation time is an important issue for future research.

The results of this study indicate that prior exposure of first-timers to tertiary education did not significantly ( $p>0.05$ ) improve throughput (Tables 6, 8 and 9). This finding was unexpected. However, with a small sample size, caution must be applied in interpreting these findings.

The results of this study indicate that a lone student among the 2010 cohort dropped out of the course (Table 5). The findings of the current study do not support the previous research – the dropout rate is much lower (2.9%) than previously reported. The Council for Higher Education (CHE) found that the dropout rate ranged between 30% and 33%.<sup>21</sup> The Stellenbosch University working paper reported a dropout rate of 28.4%.<sup>22</sup>

### Limitations of the study

Data on age of the students was not available.

The determinants of university dropout and delayed graduation could not be identified as data was not available.

### CONCLUSION

The throughputs of dentistry course for the two cohorts hovered around 40%.

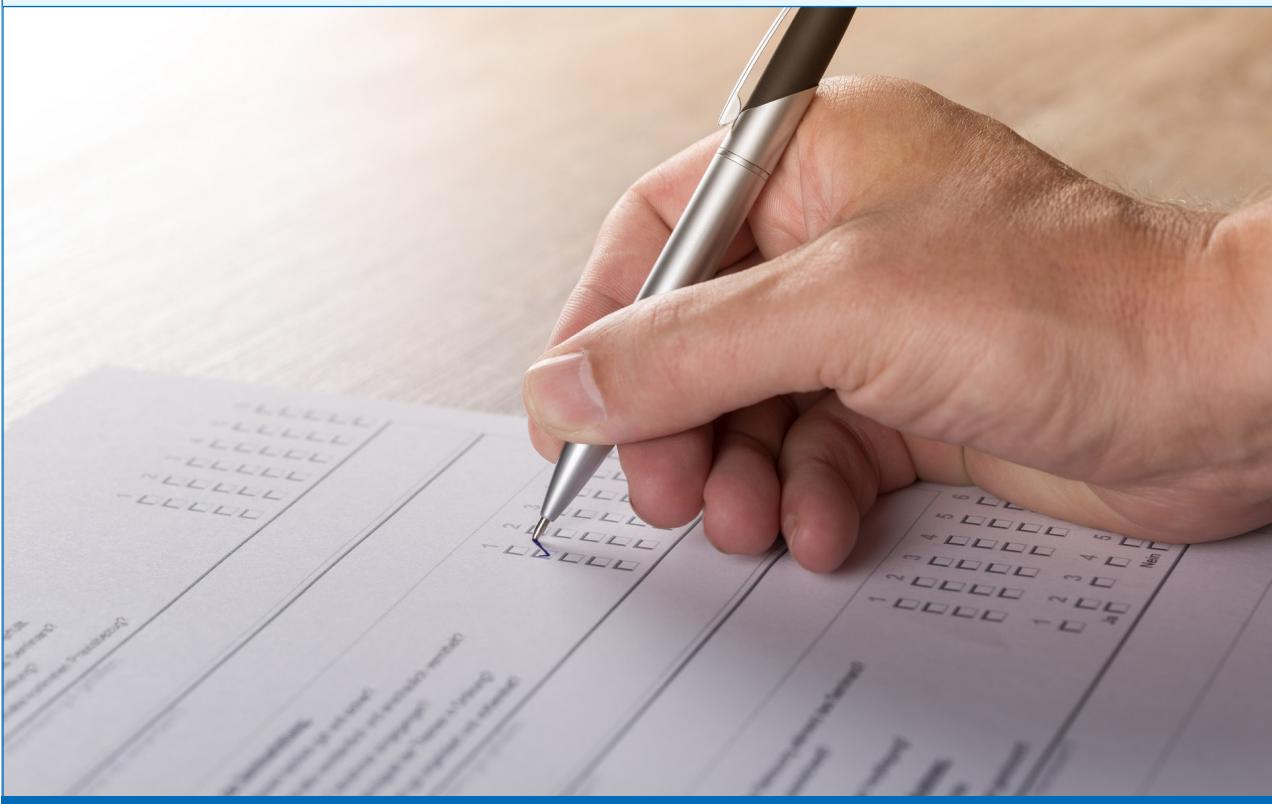
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## Do the CPD questionnaire on page 339

The Continuous Professional Development (CPD) section provides for twenty general questions and five ethics questions. The section provides members with a valuable source of CPD points whilst also achieving the objective of CPD, to assure continuing education. The importance of continuing professional development should not be underestimated, it is a career-long obligation for practicing professionals.



### Online CPD in 6 Easy Steps

- 1 Go to the SADA website [www.sada.co.za](http://www.sada.co.za).
- 2 Log into the 'member only' section with your unique SADA username and password.
- 3 Select the CPD navigation tab.
- 4 Select the questionnaire that you wish to complete.
- 5 Enter your multiple choice answers. Please note that you have two attempts to obtain at least 70%.
- 6 View and print your CPD certificate.