

# **The Effect of the COVID-19 Pandemic on Suicide Trends in Pretoria, South Africa**

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## **Abstract**

Suicide is one of the worldwide leading causes of unnatural death. Pretoria is a capital city of South Africa and is the fourth most populated city in South Africa. Between 16 and 22 suicide cases are recorded daily in South Africa.

Case files from the Pretoria Medico-Legal Laboratory were reviewed between 1 January 2015 to 31 December 2021, which spanned the COVID-19 pandemic. All cases of *possible and probable* suicides were included. Oneway ANOVA and Pearson Chi<sup>2</sup> tests were conducted to determine statistical significance in the observed trends.

A total of 1 820 *possible and probable* suicide cases were identified. The year following the outbreak of the COVID-19 pandemic accounted for the largest number of suicides. White males were the most heavily represented population, followed by black males. Hanging was the most common method for males, whereas poisoning via ingestion and/or overdose was more commonly used by females.

Suicides in Pretoria have increased since previous studies from 9.74% and 10.2% to 13.32%. Methods used have changed among various population groups over the past two decades. This paper examined changes in suicide trends in Pretoria compared to previous studies and highlighted correlations between suicide trends and COVID-19 lockdown measures.

**Keywords:** forensic pathology; suicide; fatal; epidemiology; Pretoria; South Africa; profile; deaths; forensic population; unnatural death; public health prevention strategy.

## **Background**

Suicide is defined as death caused by self-injury with the intention to die, and is one of the leading causes of unnatural death throughout the world.<sup>1-2</sup> The World Health Organisation (WHO) declared suicide as a global health crisis in 1994 and remains an ongoing epidemic.<sup>3-7</sup> According to the 2019 statistics of the WHO, more than 700,000 people die annually due to suicide.<sup>1,8</sup>

Suicide rates tend to be especially high in low- and middle-income countries, such as South Africa.<sup>1,8</sup> In South Africa, there are between 16 to 22 suicide cases per day.<sup>9-10</sup> Three South African studies between 2001 to 2016, reported a large increase in suicides rates from 8% to 17%.<sup>3,11-12</sup> Males accounted for majority of the suicide victims.<sup>3,13-14</sup> The age group of 15 to 44 years comprised of 50% to 73% of suicide victims.<sup>11,13-14</sup> The most frequent methods tend to be hanging, firearm usage, poisoning, self-gassing, jumping from a height, and self-immolation.<sup>3,11-13</sup>

There are three capital cities in South Africa: Pretoria, Cape Town, and Bloemfontein. Pretoria hosts the executive branch of government and is further classified as the administrative capital of South Africa. The population of Pretoria is estimated at 2.88 million (in 2024) – making Pretoria the fourth most populated city in South Africa.<sup>15</sup> Similar to other metropolitan municipalities, Pretoria is not exempt from urbanization, and there is an ongoing need for secure shelters and affordable housing.<sup>16</sup> There are a total of 227 informal settlements across all seven municipal regions of Pretoria, with an estimated 345 710 households living in these informal settlements.<sup>16</sup>

Three prior studies have examined suicides in the Pretoria region.<sup>5,17-18</sup> The *Scribante et al* study indicated a suicide rate of 9.74% between 1997 and 2000, which increased to 10.2% in the *Engelbrecht et al* study between 2007 and 2010.<sup>5,17</sup> Thus, the suicide rate increased by 0.66% over a decade in Pretoria.<sup>5,17</sup> Approximately 79% of these suicide victims were male.<sup>5,17-18</sup> In the *Scribante et al* and *Engelbrecht et al* studies, the male to female ratio was 3:1, which increased to 5.2:1 in a study by *Onoya et al*.<sup>5,17-18</sup> The age group of 21 to 40 years accounted for the largest number of suicide victims.<sup>5,17</sup> Firearm usage was reported as the most common method in the *Scribante et al* study.<sup>17</sup> Whereas the *Engelbrecht et al* and *Onoya et al* studies reported hanging as the most common method, followed by poisonings and firearm usage, self-immolation, electrocution, and vehicle impacts.<sup>5,18</sup>

In December 2019, COVID-19 broke out, and in March 2020, WHO declared this novel virus a pandemic.<sup>19</sup> The COVID-19 virus was established to be related to Severe Acute Respiratory Syndrome Coronavirus, thus being named SARS-CoV-2.<sup>19-21</sup> The COVID-19 pandemic created strain on healthcare systems around the world. South Africa was placed on a nationwide lockdown as of 26 March 2020, known as Alert Level 5.<sup>22-24</sup> This resulted in heavy restrictions, during which individuals were unable to leave their residences,

businesses were closed, and only essential workers such as hospital staff and policemen were allowed to attend work.<sup>22</sup> Alert Level 5 was later lowered to Alert Level 4, and eventually to Alert Level 3, which still imposed various restrictions on citizens' daily lives.<sup>25</sup> Only from Alert Level 2 were all restrictions eased, however social distancing and wearing face masks were still applicable.<sup>25</sup> Alert Level 2 was implemented on 18 August 2020, bringing 145 days of strict lockdown restrictions to an end in South Africa.<sup>24</sup> Many citizens were unable to work, leading to reduced incomes for numerous households and leaving families without their primary source of income.<sup>26-27</sup>

As everyday lives of South African citizens were affected by COVID-19 and the subsequent lockdown, changes in the suicide trends reported by previous studies were brought into question. The purpose of this study is to document the trends of Forensic Pathology cases, specifically suicides, in South Africa around the time that these COVID-19 restrictions were implemented.

Studies reviewing suicide trends during the COVID-19 pandemic in other countries showed that the suicide rates were in fact lowest during the periods with the most severe restrictions and that an increase in suicide was not observed in the first few months following the onset of the pandemic and subsequent social restrictions.<sup>28-31</sup> Some studies, in fact, showed a decrease in suicide rates during the COVID-19 quarantine periods compared with previous years.<sup>31-32</sup> However, it is worth noting that several of these studies did not review timelines beyond the year 2020.

When further narrowing down the research to include Pretoria, South Africa, even less research was available. This paper investigates suicide trends in Pretoria between the years of 2015 and 2021 and compared the results with the trends of previous studies in the region. This comparison explored significant changes in suicide trends in the years preceding the outbreak of COVID-19 and in the year following the pandemic and its associated lockdown. Therefore, the findings of this paper could narrow the information gap within the public health sector.

## **Materials and Methods**

Case files from the Pretoria Medico-Legal Laboratory (PMLL) were reviewed between 1 January 2015 to 31 December 2021. These case files were identified through a digital database created by the Department

of Forensic Medicine, at the University of Pretoria. If further information was needed, the authors referenced the original case files at the PMLL. Prior ethical approval was gained from the Faculty of Health Sciences Research Ethics Committee at the University of Pretoria. (Ref. no. 161/2022 and 258/2019)

The PMLL conducts an average of 2 500 autopsies per annum.<sup>17</sup> All unnatural deaths undergo a medico-legal autopsy, defined as deaths due to “*physical or chemical influence; an act or omission amounting to negligence; procedure- and anaesthetic-related; and sudden or unexpected or unexplained deaths*”.<sup>33</sup> Cases of suspected suicide are therefore considered unnatural deaths and are submitted to the PMLL. All such cases were autopsied to determine the cause of death, mechanism of death, and possible manner of death.

All cases of *possible and probable* suicides, as identified by the Forensic Pathologist responsible for the post-mortem investigation, were included in this study. A suicide is definite when the victim's intent is clear, and the presence of a suicide note could be an example of intent. Where intent has been made clear, cases of unnatural death are considered *possible and probable* suicides.<sup>34</sup> It is noted that in South Africa, the manner of death is ultimately declared by the Presiding Magistrate's Court. The cases included in this study represent cases identified as suicides by the Forensic Pathologist at the time of reporting.

All cases were kept anonymous and no personal information was collected. The demographic data of each case was analysed with regards to the date of death, method of suicide used, age, sex, and race of the victims. The race of the victims was collected in accordance with the case file, as identified according to the Identity Document of the deceased or according to the family members, or in the case of an unknown victim, it was documented according to the attending Forensic Pathologist's discretion.<sup>35</sup>

The total number of unnatural deaths were recorded, indicating any changes in the frequency of admissions over the study period. All *possible and probable* suicide cases were isolated and calculated as a percentage of the total admitted unnatural deaths. The number of *possible and probable* suicide cases for 2020 were further analysed in relation to the months of onset of each COVID-19 Alert Level. Statistical significance for this relationship was calculated using Oneway ANOVA tests.

*The possible and probable* suicide cases were broken down into demographic information, and the data was calculated as ratios, enabling the identification of trends. Statistical significance was calculated using Pearson's Chi<sup>2</sup> tests. All analysis was carried out using Stata 18.0 (StataCorp LLC, Texas USA) with an alpha of 0.05 set for significance. The statistical analysis was conducted with the assistance of a statistician from the University of Pretoria's Department of Immunology.

## **Limitations**

Due to the inclusion criteria being based on the Forensic Pathologist's identification of *possible and probable* suicides, a case may later have been reclassified by the Presiding Magistrate's Court. This study's results are therefore based on preliminary *possible and probable* suicides, which may not fully reflect the suicide rate in Pretoria.

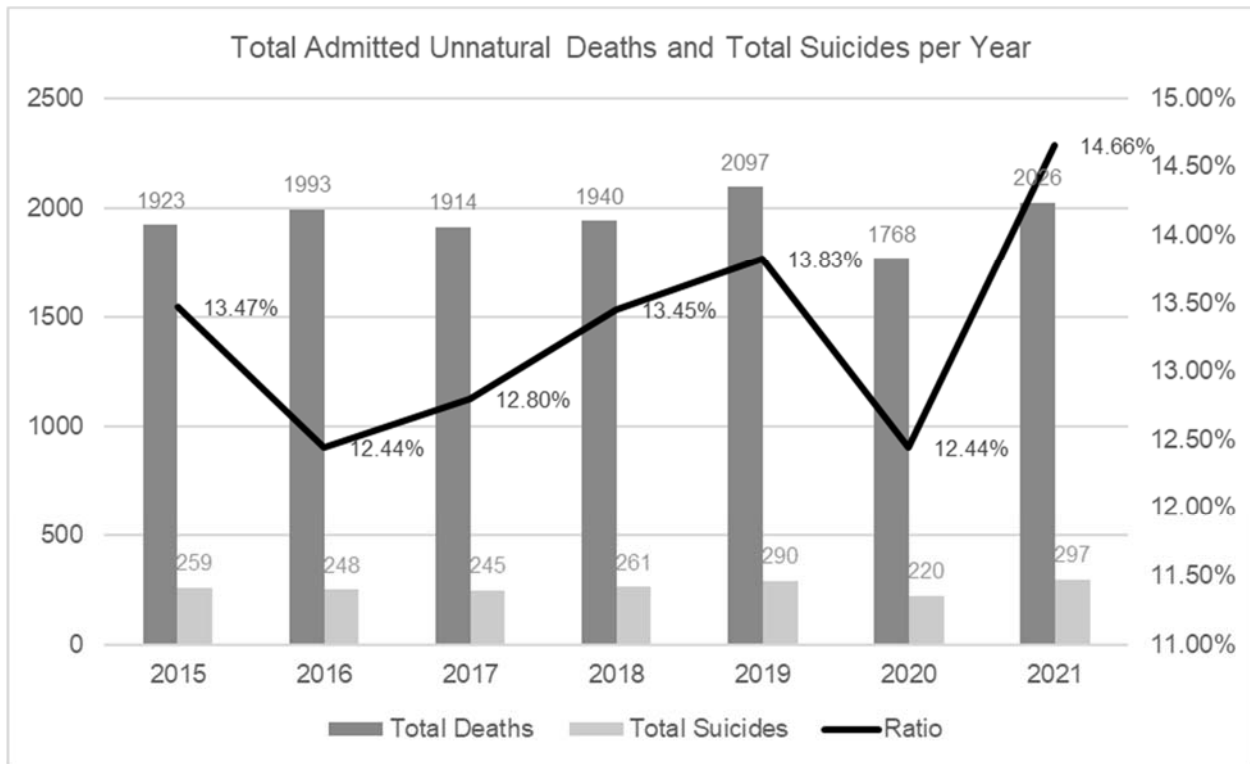
Bias may often influence the classification of unnatural deaths as suicides. Suicide rates may therefore not always be accurate, since it cannot be precisely compared between groups or societies within a specific time.<sup>36</sup> Suicides may also be misclassified by Forensic Pathologist's due to the occurrence of unusual self-inflicted injuries which may simulate a homicide or other criminal offence.<sup>37</sup>

As the data for this study was obtained through digital databases, the possibility of human error in recording the data ought to be considered. The authors referred to the original, hand-written case files for confirmation when applicable, ensuring the accuracy and reliability of the data.

A further limitation to this study, is that the increase in the suicides across the years cannot be determined as significant or stochastic. To remove stochasticity, our results would need to be compared to expected suicide rates.<sup>38</sup> In other words, to eliminate randomness, our findings would have to be compared to the anticipated suicide rates. Thus, further statistical calculations would be required, which is outside the scope of this study.

## Results

Over the seven-year study period, 13 661 cases were admitted to the PMLL. Of these total cases, 1 820 cases were classified as *possible and probable* suicides, accounting for 13.32% of the total case load as shown in detail in Figure 1.



**Figure 1:** Total number of admitted unnatural deaths, total number of suicides and the ratio of the suicides per total admitted unnatural deaths per each year.

Table 1 shows the breakdown by sex and race in the different age groups. Both male to female ratios and different races were identified as being statistically significant.

The age range of the victims was 9 to 94 years, with a median age of 37 years. The largest number of victims fell in the age category of 30 to 39 years with 454 individuals (25.1%), followed by the age category of 20 to 29 years with 401 individuals (22.1%).

Age Grouping (years)							
0-19	20-29	30-39	40-49	50-59	60-69	≥70	Test

n	131 (7.2%)	401 (22.1%)	454 (25.1%)	336 (18.5%)	238 (13.1%)	155 (8.6%)	97 (5.4%)	
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Sex								
Female	56 (42.7%)	100 (24.9%)	71 (15.6%)	85 (25.4%)	57 (23.9%)	32 (20.6%)	20 (20.6%)	<0.001
Male	75 (57.3%)	301 (75.1%)	383 (84.4%)	250 (74.6%)	181 (76.1%)	123 (79.4%)	77 (79.4%)	

Race								
Asian	6 (4.6%)	9 (2.2%)	8 (1.8%)	12 (3.6%)	8 (3.4%)	3 (1.9%)	3 (3.1%)	<0.001
Black	89 (67.9%)	267 (66.6%)	272 (59.9%)	126 (37.6%)	45 (18.9%)	24 (15.5%)	7 (7.2%)	
Mixed-Race	8 (6.1%)	21 (5.2%)	21 (4.6%)	8 (2.4%)	4 (1.7%)	2 (1.3%)	0 (0.0%)	
White	28 (21.4%)	104 (25.9%)	153 (33.7%)	189 (56.4%)	181 (76.1%)	126 (81.3%)	87 (89.7%)	

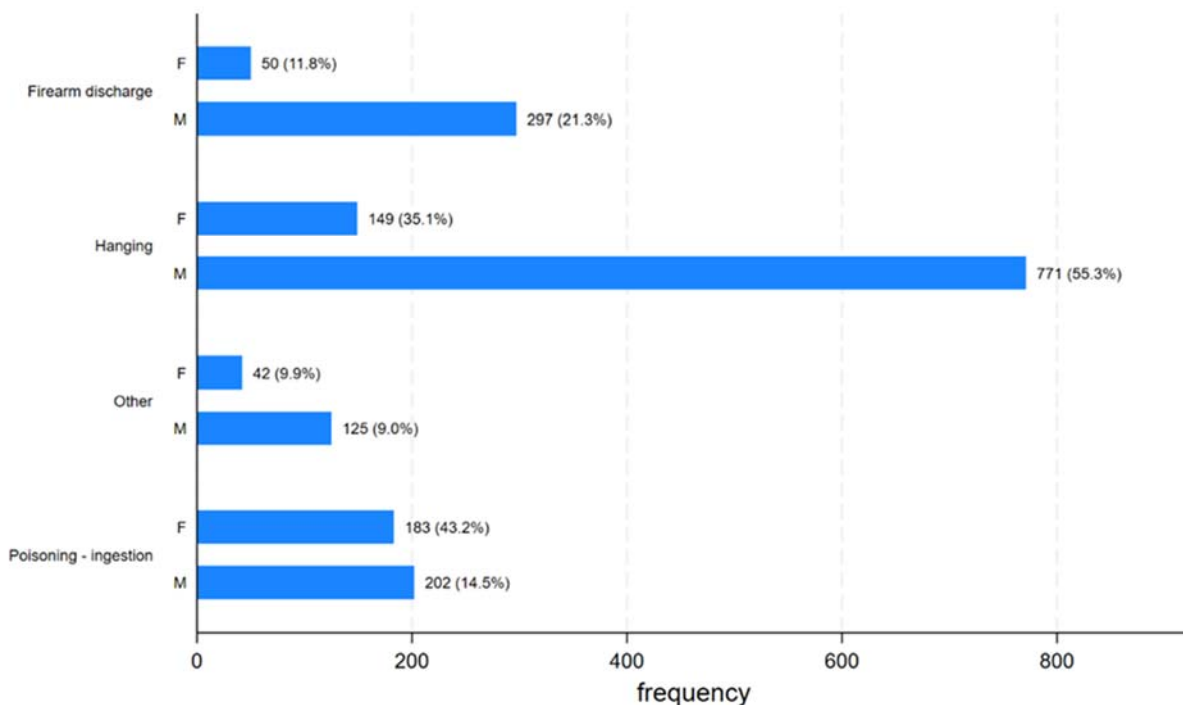
**Table 1:** The total number of suicides and the sex and race distribution of the suicides in accordance with the age grouping of the victims. (n=1 812, 8 victims of unknown age).

Methods of suicide are shown in table 2 with hanging identified as the major cause of suicides (920, 50.55%). Followed by poisoning via ingestion/overdose and firearm discharge.

Method of Suicide	Frequency	Percent	Cumulative
Hanging	920	50,55	50,55
Poisoning via ingestion/overdose	385	21,15	71,7
Firearm discharge	348	19,12	90,82
Other	167	9,18	100
<b>Total</b>	<b>1 820</b>	<b>100</b>	

**Table 2:** The frequency of the most prevalent methods of suicides (Other: Poisoning - gassing, use of a sharp object, burn or fire-related, explosive blast, railway fatality, fall from a height, pedestrian-vehicle-accident, and electrocution).

There is a statistically significant difference (Pearson's  $\chi^2 = 168$ ,  $p < 0.001$ ) between the method of suicide when considering males and females. The majority of females  $n=183$  (43.2%) succumbed to poisoning via ingestion/overdose followed by hanging. The majority of males  $n=771$  (55.3%) were indicated to have committed suicide by hanging. The frequencies are shown in Figure 2.



**Figure 2:** Frequency of females and males with the different methods of suicides. (Other: Poisoning - gassing, use of a sharp object, burn or fire-related, explosive blast, railway fatality, fall from a height, pedestrian-vehicle-accident, and electrocution.)

By further separating the results per race and per sex, distinctive trends in the methods of suicide can also be identified in table 3. Of the 678 black male victims and the 634 white male victims, hanging was the most common method ( $n=444$ , 24.4% and  $n=278$ , 15.3% respectively). The second most common method for black males was poisoning via ingestion or overdose ( $n=127$ , 7.0%), followed by firearm usage ( $n=58$ , 3.2%). The reverse was seen for white male victims in which the second most common method was firearm usage ( $n=219$ , 12.0%), followed by poisoning via ingestion or overdose ( $n=68$ , 3.7%). Of the 155 black female victims, the most common method was poisoning via ingestion or overdose ( $n=86$ , 4.7%), followed by hanging ( $n=48$ , 2.6%). Of the 237 white female victims, hanging and poisoning via ingestion/overdose

accounted for the same number of victims (n=85, 4.7% each). Firearm usage was the least common method for both black and white females (n=6, 0.3% and n=43, 2.4% respectively).

Race							
White		Black		Mixed-Race		Asian	
F	M	F	M	F	M	F	M

Firearm Discharge								
Frequency	43 (2.40%)	219 (12.00%)	6 (0.30%)	58 (3.20%)	0 (0.00%)	8 (0.40%)	1 (0.10%)	12 (0.70%)

Hanging								
Frequency	85 (4.70%)	278 (15.30%)	48 (2.60%)	444 (24.40%)	9 (0.50%)	26 (1.40%)	7 (0.40%)	23 (1.30%)

Poisoning via ingestion/overdose								
Frequency	85 (4.70%)	68 (3.70%)	86 (4.70%)	127 (7.00%)	11 (0.60%)	5 (0.30%)	1 (0.10%)	2 (0.10%)

Other								
Frequency	24 (1.30%)	69 (3.80%)	15 (0.80%)	49 (2.70%)	2 (0.10%)	4 (0.20%)	1 (0.10%)	3 (0.20%)

**Table 3:** The frequency of female and male suicide and the most prevalent methods of suicide.

Table 4 looks at suicide trends before, during and after the COVID-19 Pandemic: The years before the COVID-19 lockdown restrictions (2015-2019), the year that the restrictions were put into place (2020), and the year following these restrictions (2021). The period before COVID-19 had an average number of suicides per admitted deaths to the PMLL of 13.20%. The period during COVID-19 had both the lowest number of total death cases admitted to the PMLL as well as the lowest number of suicides, but ultimately the same ratio as seen in 2016, at 12.44%. The year following the COVID-19 pandemic accounted for the largest number of admitted deaths as well as total suicide cases, with a ratio of 14.66%.

Year							
2015	2016	2017	2018	2019	2020	2021	Total

Total deaths cases at PMLL	1923 (14.08%)	1993 (14.59%)	1914 (14.01%)	1940 (14.2%)	2097 (15.35%)	1768 (12.94%)	2026 (14.83%)	13661
Total suicide cases	259 (14.23%)	248 (13.63%)	245 (13.46%)	261 (14.34%)	290 (15.93%)	220 (12.09%)	297 (16.32%)	1820
Ratio	13.47	12.44	12.8	13.45	13.83	12.44	14.66	13.32

Sex								
Male	202 (11.1%)	200 (10.99%)	188 (10.33%)	204 (11.21%)	219 (12.03%)	158 (8.68%)	224 (12.31%)	1395
Female	56 (3.08%)	48 (2.64%)	57 (3.13%)	57 (3.13%)	71 (3.9%)	62 (3.41%)	73 (4.01%)	424
Unknown	1 (0.05%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1
Total	259	248	245	261	290	220	297	1820

Method								
Firearm Discharge	45 (2.47%)	54 (2.97%)	56 (3.08%)	51 (2.8%)	51 (2.8%)	41 (2.25%)	50 (2.75%)	348
Hanging	136 (7.47%)	117 (6.43%)	118 (6.48%)	134 (7.36%)	157 (8.63%)	112 (6.15%)	146 (8.02%)	920
Poisoning via ingestion/ overdose	48 (2.64%)	47 (2.58%)	47 (2.58%)	57 (3.13%)	58 (3.19%)	51 (2.8%)	77 (4.23%)	385
Other	30 (1.65%)	30 (1.65%)	24 (1.32%)	19 (1.04%)	24 (1.32%)	16 (0.88%)	24 (1.32%)	167
Total	259	248	245	261	290	220	297	1820

Race								
Asian	7 (0.38%)	12 (0.66%)	7 (0.38%)	8 (0.44%)	7 (0.38%)	5 (0.27%)	4 (0.22%)	50
Black	115 (6.32%)	99 (5.44%)	113 (6.21%)	123 (6.76%)	141 (7.75%)	102 (5.6%)	140 (7.69%)	833

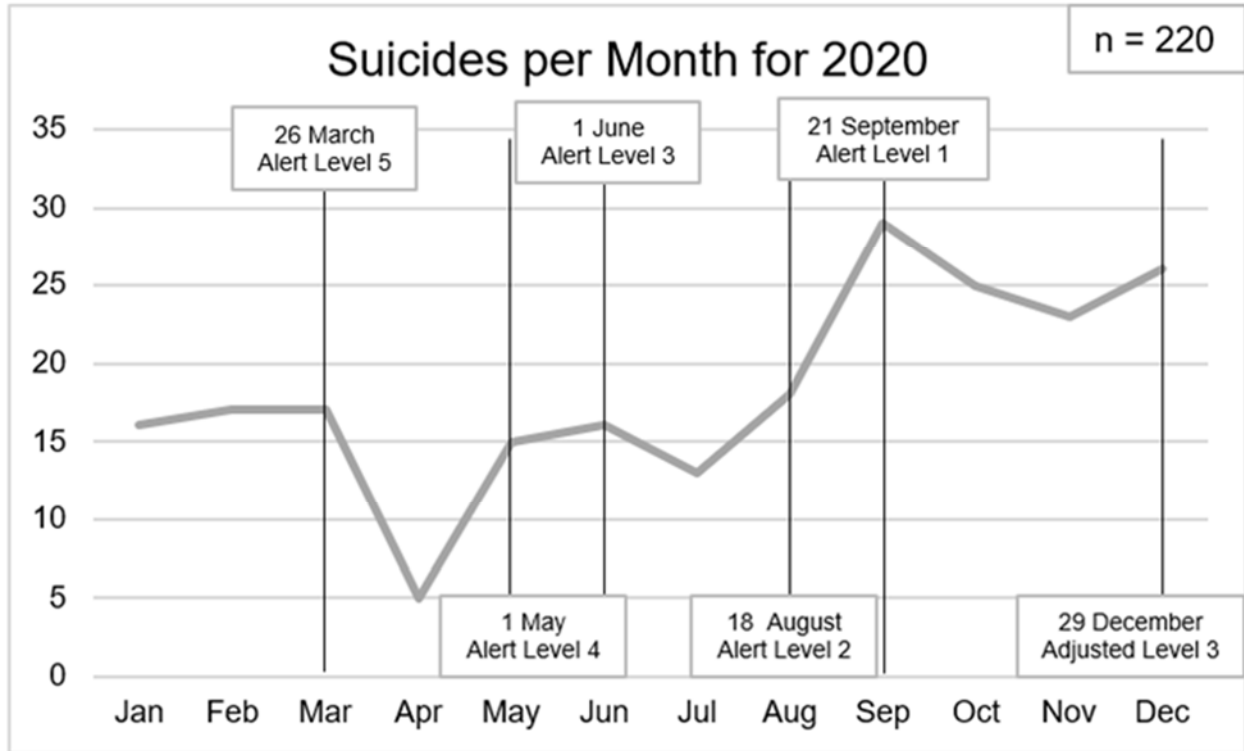
Mixed-Race	15 (0.82%)	9 (0.49%)	7 (0.38%)	9 (0.49%)	10 (0.55%)	5 (0.27%)	10 (0.55%)	65
White	121 (6.65%)	128 (7.03%)	118 (6.48%)	121 (6.65%)	132 (7.25%)	108 (5.93%)	143 (7.86%)	871
Unknown	1 (0.05%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1
Total	259	248	245	261	290	220	297	1820

Age Group								
0-19	9 (0.49%)	10 (0.55%)	16 (0.88%)	22 (1.21%)	26 (1.43%)	14 (0.77%)	34 (1.87%)	131
20-29	64 (3.52%)	57 (3.13%)	59 (3.24%)	60 (3.3%)	54 (2.97%)	53 (2.91%)	54 (2.97%)	401
30-39	71 (3.9%)	53 (2.91%)	62 (3.41%)	60 (3.3%)	81 (4.45%)	59 (3.24%)	68 (3.74%)	454
40-49	45 (2.47%)	56 (3.08%)	44 (2.42%)	50 (2.75%)	52 (2.86%)	33 (1.81%)	56 (3.08%)	336
50-59	32 (1.76%)	32 (1.76%)	34 (1.87%)	41 (2.25%)	41 (2.25%)	23 (1.26%)	35 (1.92%)	238
60-70	22 (1.21%)	29 (1.59%)	15 (0.82%)	19 (1.04%)	25 (1.37%)	23 (1.26%)	35 (1.92%)	168
>70	9 (0.49%)	10 (0.55%)	15 (0.82%)	9 (0.49%)	11 (0.6%)	15 (0.82%)	15 (0.82%)	84
Unknown age	7 (0.38%)	1 (0.05%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	8
Total	259	248	245	261	290	220	297	1820

**Table 4:** The number of suicides per year and by each demographic category. The years are divided into the groups: before the COVID-19 lockdown restrictions were put into place (2015-2019 in blue), the year that the restrictions were put into place (2020 in orange), and the year following these restrictions (2021 in green).

The usage of firearms decreased during and after the pandemic compared to before the pandemic, whereas the usage of self-poisoning increased after the pandemic as compared to before and during. The number of suicides in individuals below 20-years old steadily increased before COVID-19, decreased during lockdown restrictions, and returned to the steady increase in the year following the lockdown restrictions.

Figure 3 demonstrates a breakdown of the number of suicides that occurred in each month for 2020. Included in this figure are the start date of the different Alert Levels.



**Figure 3:** The number of suicides per month in 2020, overlapped by the COVID-19 Alert Level.<sup>23,31</sup>

Table 5 further breaks down the suicide victims for 2020 into race and gender categories for statistical analysis. A Oneway ANOVA analysis was significant ( $F= 107.7, p<0.001$ ) with the most suicides occurring during Alert Level 1, followed by Alert Level 3. Of the 238 suicides in Alert Level 1, hanging was the most predominant method ( $n=126, 52.9\%$ ), followed by poisoning via ingestion/overdose ( $n=50, 21.0\%$ ), and firearm usage ( $n=46, 19.3\%$ ). The same trend, although with fewer numbers, was seen during Alert Level 3, with hanging the most predominant method ( $n=66, 48.5\%$ ), followed by poisoning via ingestion/overdose ( $n=40, 29.4\%$ ), and firearm usage ( $n=18, 13.2\%$ ).

Race									
	White		Black		Asian		Mixed-race		
Total	F	M	F	M	F	M	F	M	

Alert Level 0									
n	49 (9.5%)	9 (1.7%)	18 (3.5%)	7 (1.4%)	11 (2.1%)	0 (0.0%)	0 (0.0%)	3 (0.6%)	1 (0.2%)

Alert Level 1									
n	238 (46.0%)	31 (6.0%)	79 (15.3%)	18 (3.5%)	97 (18.8%)	2 (0.4%)	5 (1.0%)	4 (0.8%)	2 (0.4%)

Alert Level 2									
n	57 (11.0%)	11 (2.1%)	13 (2.5%)	9 (1.7%)	23 (4.4%)	0 (0.0%)	1 (0.2%)	0 (0.0%)	0 (0.0%)

Alert Level 3									
n	136 (26.3%)	17 (3.3%)	50 (9.7%)	15 (2.9%)	49 (9.5%)	0 (0.0%)	1 (0.2%)	0 (0.0%)	4 (0.8%)

Alert Level 4									
n	31 (6.0%)	4 (0.8%)	15 (2.9%)	3 (0.6%)	8 (1.5%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.2%)

Alert Level 5									
n	6 (1.2%)	1 (0.2%)	3 (0.6%)	1 (0.2%)	1 (0.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)

**Table 5:** The lockdown level suicides count by race and gender for 2020.

## Discussion

The total case load of suicides per admitted deaths for this study period was 13.32%. This represented a 3.12% increase from the *Engelbrecht et al* study a decade prior.<sup>5</sup> This difference is much larger than the difference between the two previous studies of only 0.5%, thus amounting to a 6.2-fold increase in suicides per admitted deaths over two decades in Pretoria.<sup>5,17</sup>

Males accounted for the largest number of victims with a male to female ratio of 3.3:1, which is consistent with previous studies.<sup>3,5,13-14,17</sup>

According to the 2016 South African National Census, the overall population of Pretoria consisted of 79.1% of black individuals, 17.4% of white individuals, 1.9% of mixed-race individuals, and 1.6% of Asian individuals.<sup>39</sup> There was a slightly higher number of suicide cases for white victims compared to black victims. However, due to the population distribution of Pretoria, suicide was a more evident manner of death in white individuals. Additionally, there was a noticeable increase in the number of suicides in the combined group of Asian and mixed-race individuals, from 3.5% to 6.32%.<sup>5</sup>

The age range of 20 to 39 years accounted for 46.98% of the suicides. This remains the most predominant age range seen in suicide cases.<sup>3,5,7,11,13,18,40-42</sup> The youngest suicide was that of a 9-year-old – which was the youngest age of the three studies relating to the Pretoria region.<sup>5,17-18</sup> The mean age of this study, 40.07 years, has steadily increased from the mean age of 38.31 years reported by *Engelbrecht et al* and 36.6 years reported by *Scribante et al*.<sup>5,17</sup> This increase may be attributed to a higher number of suicide cases among individuals aged over 60 years as identified in the current study.

Hanging remains the most common method of suicide.<sup>5,7,11-13,18,41,43</sup> Self-poisoning was the second most common method followed by firearm usage.<sup>5,18</sup>

As per previous studies, males opted for more violent methods such as firearm usage, whereas females opted for less violent methods such as poisoning via ingestion or overdose.<sup>3,5,14,18,37,40,43</sup> White males were more likely to choose hanging, whereas previous studies indicated that white males preferred the use of firearms.<sup>5</sup> Also observed in this study was that black females preferred to use poisoning through ingestion or overdose, whereas the previous finding was that black females preferred to commit suicide by hanging.<sup>5</sup>

As a result of COVID-19, South Africa went into lockdown as of the end of March 2020.<sup>24</sup> The strict control over travel, work, alcohol, and cigarette purchases, as well as the daily routines of South Africans, may have contributed to the decrease in suicides in 2020, especially in April.<sup>24</sup> This month had the lowest number of suicides, coinciding with the highest alert level implementation.<sup>24</sup> This correlates to the results noted in studies related to other countries, where there was an initial decrease in the suicide rate during the most

severe quarantine periods.<sup>28-31</sup> As these alert levels decreased, becoming less strict over travel and work, the number of suicides increased.

Studies on the effects of past epidemics or pandemics on suicide trends in various countries also suggested that changes in suicide rates may not increase immediately after the outbreak but may decrease initially.<sup>31,44-45</sup> A study by *Pirkis et al* looked at real-time suicide data from 21 countries, primarily high- and upper-middle-income countries.<sup>31</sup> It found that, overall, suicide cases did not seem to increase during the first few months after the start of COVID-19 and the associated lockdown restrictions.<sup>31</sup> These countries typically put in place additional mental health and financial support structures to mitigate the early adverse effects of the COVID-19 pandemic.<sup>31</sup> These additional support structures may not be sustainable, and their depletion may result in higher suicide rates in the subsequent months or years. The ongoing economic crisis due to the extended lockdown period may also have led to higher suicide rates.<sup>46</sup> It is worth noting that, while South Africa had limited government support structures in place during the pandemic, personal support structures may also have contributed to the “delayed” effect of the lockdown restrictions on suicide trends.

Following the decreased suicide rates observed in the early months of the pandemic and the strict lockdown restrictions, the total suicides reached the highest point in the year following the pandemic restrictions. The aftereffects of COVID-19 may have been a contributing factor to this statistic as it significantly impacted the daily lives of many individuals in various aspects, including socio-economically, physically, and mentally. Within the African countries, South Africa was one of the five countries that had the highest number of COVID-19 reported deaths between February 2020 and March 2021.<sup>47</sup> Lockdown had an enormous effect on poor and rural households as the loss of their household income caused a deeper dive into poverty.<sup>27,47</sup> Many individuals lost their employment and businesses were shut down due to an unstable economy.<sup>48-49</sup> The pandemic severely impacted industries, primarily the tourism industry, upon which South Africa is heavily dependent.<sup>50-51</sup> Thus, it is plausible that these effects may have contributed to the increase in suicide rates in 2021, the year following the strictest COVID-19 lockdown restrictions.

## **Conclusion**

The results of this study indicate that suicides are a growing concern in Pretoria, South Africa. Several changes in suicide trends were identified compared to previous studies conducted in Pretoria. The total number of suicides per admitted cases at the PMLL has increased, compared to the previous two studies. Furthermore, multiple changes have occurred with regards to the suicide method used – specifically in the white male and black female population. The increase in suicide cases identified in the year following the outbreak of COVID-19 was shown to be statistically significant compared to the suicide rates of previous years in the study. This study showed that the suicide trends in Pretoria, South Africa correlated with the different levels of lockdown restrictions, before, during and after COVID-19.

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## **Declaration of Interests**

The authors declare that they have no known competing interests.

## **Keywords**

Forensic pathology; Suicide; Fatal; Epidemiology; Pretoria; South Africa; Profile; Deaths; Forensic population; Unnatural death; Public health prevention strategy.

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