

## Suicides in the Island of Mauritius over a decade (2000 to 2010)

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**Abstract:** Understanding the suicide profile in Mauritius is important for enhancing suicide prevention strategies. The aim of this research was to study recent trends in suicides over a decade from 2000 to 2010 to investigate the relationship of suicides with respect to gender, age-group, mode of suicide and living standards as represented by gross domestic product per capita adjusted for purchasing power parity. A retrospective analysis was conducted on all suicide cases recorded by the police for the period 2000 to 2010. For each recorded case of suicide, the following factors were studied: year of occurrence, gender, age, mode of suicide, place of residence and occupation. Results showed that suicide rates varied from 6.2 to 8.9 during the 10-year period and that the rates appeared to be decreasing with improvement in living standards. Suicide rates were higher in males and in the 20 to 29 age group. It was observed that there had been a shift in the mode of suicides over the decade with an increase in suicide deaths by hanging whilst suicides by poisoning were on a declining trend. Although possible underreporting of suicides is a limitation, findings from the study could better inform suicide prevention strategies.

**Keywords-**deaths, hanging, poisoning, suicides

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### I. INTRODUCTION

Death caused by suicide is an acknowledged public health problem with social and economic repercussions due to the untimely and preventable deaths of individuals. Rates of suicide are increasing in several parts of the world with World Health Organization (WHO) estimates of about 1.53 million suicide deaths in the year 2020 [1]. Causes of suicides are multifactorial with mental health disorders, psychological distress, personal, familial, social and cultural stresses, precarious financial and employment status, political, religious and cultural factors interacting to result in circumstances favouring suicidal intent. Suicide attempts can be impulsive or premeditated resulting in suicide death or suicide-related injury. There may be 20 suicide attempts for each suicide death according to the WHO [2]. Means of suicides vary throughout the world and include hanging, drug overdose or ingestion of harmful substances, use of firearms, carbon monoxide poisoning, asphyxia, jumping from heights, exsanguination and drowning. Restricting access to means of suicide has been shown to lower suicide deaths [3].

Mauritius is a small island in the Indian Ocean, with a population of 1,255,020 in December 2012. Its population structure consists of 71.8% of people aged 15 to 64 with under-15s representing 20.6% and elderly people of 65 and above representing 7.6% of the population [4]. According to the World Bank, Mauritius is classified as an upper middle income country [5] in Sub-Saharan Africa with a gross domestic product (GDP) per capita adjusted for purchasing power parity (PPP) in 2013 estimated at 15487.54 U.S. dollars [6]. In 2004, the Dangerous Chemicals Control Act was passed to regulate dangerous chemical substances [7]. The Firearms Act 2006 controls the acquisition of firearms in Mauritius [8]. In 2011, 1.3% of deaths in Mauritius were due to suicides [9].

As suicide deaths are still a significant and preventable cause of mortality, an understanding of the epidemiology of suicides can inform and enhance effectiveness suicide prevention activities. The aim of this research was therefore to study recent trends in suicides in Mauritius from 2000 to 2010 with respect to gender, age-group and crucially mode of suicide.

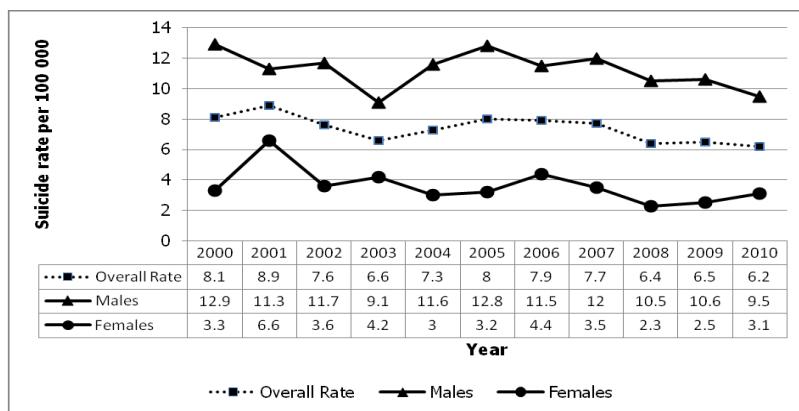
### II. METHODOLOGY

A retrospective analysis was conducted of all suicide cases, recorded by the police, in the Island of Mauritius for the period 2000 to 2010. All cases of unnatural deaths are reported to the police and such data are recorded at the Crime Records Office at the police headquarters. Data on suicides are recorded on a suicide database. This study was carried out in two phases, firstly in 2006 where all suicide cases occurring in the period between 2000 to 2005 were studied and secondly in 2011 which investigated suicides taking place in the period 2006 to 2010. Ethics clearance was granted prior to each study by the University of Mauritius Research Ethics Committee in February 2006 and in January 2011. Permission was granted by the Commissioner of Police to access data from the suicide database in 2006 and in 2011. For each recorded case of suicide, the following

factors were studied: year of occurrence, gender, age, mode of suicide, place of residence and occupation. Crude suicide rates were calculated for males, females and for the population as follows: the number of cases in each group was divided by the mid year estimates of the group and calculated per 100 000 of population. Overall suicide rates over the decade in each age group of 10 year interval was calculated by dividing the total number of suicide cases over the decade in each age group by the total 10-year population of the particular age group and calculating this per 100 000 of population. Population census figures were obtained from the Central Statistics Office of Mauritius. Data was recorded in Microsoft Office Excel 2007 and this was used to construct charts. The statistical software Stata (StataCorp, version 11) was used to obtain regression models to analyse the relationship of suicide rates vs. living standards represented by GDP per capita adjusted for PPP. Modes of suicide was classified into hanging, poisoning, immolation and “other” modes which included jumping from a height, use of firearms, slashing of throat and wrists, suffocation by gas, drowning, electrocution and starving to death.

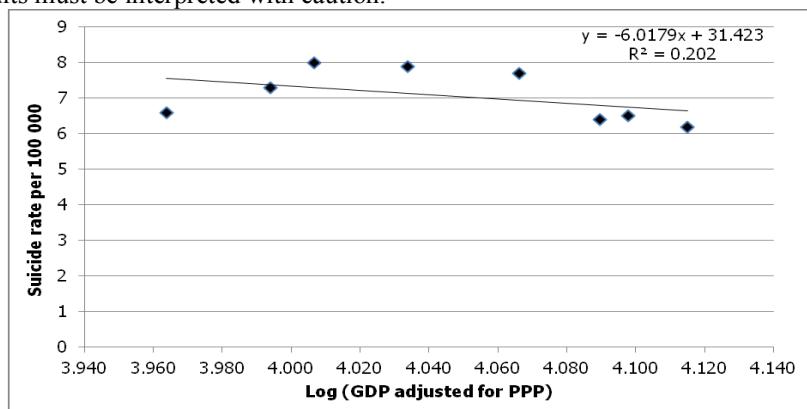
### III. RESULTS

The absolute number of deaths in the 10 year period was 1005 and included 757 males and 248 females. Overall rates of suicides varied from 6.2 to 8.9 during the 10-year period (Fig. 1). The general suicide trend showed a slowly declining suicide rate over the decade. Regarding gender differences in suicide rates, male suicide rates remain substantially higher than female rates over the whole decade (Fig. 1). This was further confirmed by statistical tests. According to the two-sample t test used to investigate the gender differences, a value of  $p=0.00$  was obtained at 5% significance level. As  $p<0.05$ , the gender difference was confirmed statistically.



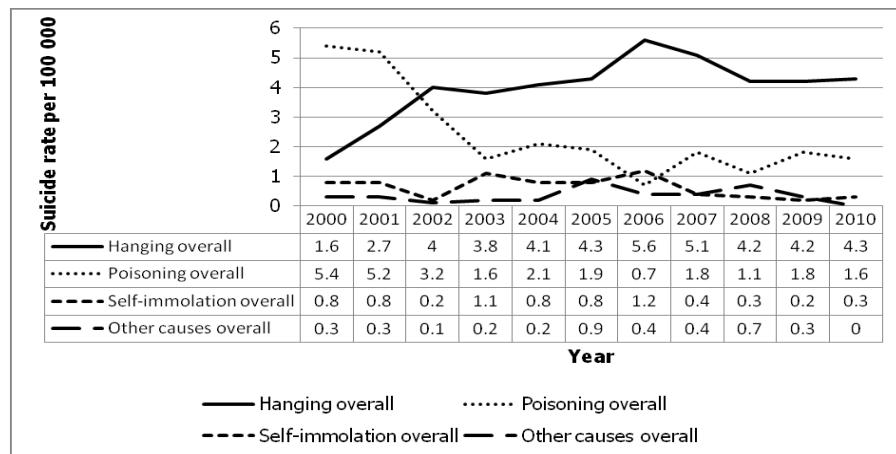
**Figure 1:** Suicide rates in Mauritius 2000-2010

The relationship of suicides with living standards was compared to see if suicides were decreasing with rising living standards in Mauritius as indicated by a rising GDP per capita adjusted for PPP from 9198.73 in 2003 to 13033.24 in 2010. From the regression model describing the relationship of suicide rates vs. GDP per capita adjusted for PPP over the decade (Fig. 2), it can be seen that there was a mild negative linear correlation between the two variables relationship (Pearson's coefficient of correlation( $r$ ) = -0.449). From the  $R^2$  value of the model (Fig. 2), it was seen that 20% of the suicide rate could be explained by changes in GDP per capita adjusted for PPP. However due to the small sample size, further statistical test at alpha=5% shows a p value of 0.13. Hence these results must be interpreted with caution.



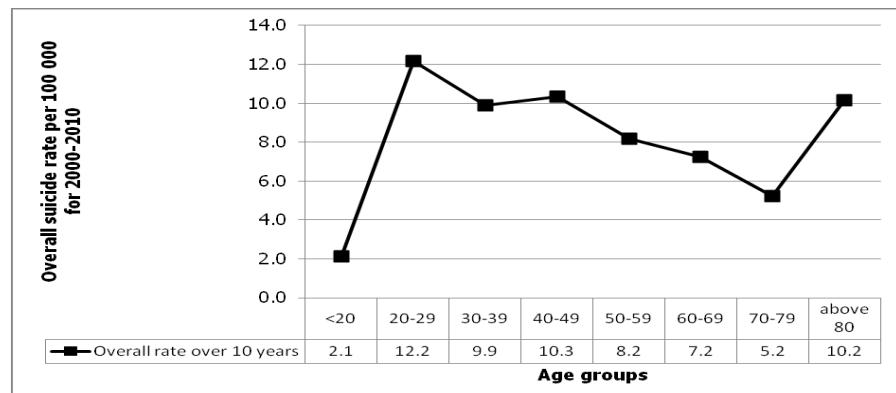
**Figure 2:** Suicide rate vs. Log (GDP adjusted for PPP).

Regarding modes of suicides, hanging was the most commonly used means of committing suicide followed by poisoning. It was observed that suicides by hanging were following an increasing trend whilst suicides by poisoning were on a declining trend over the years as shown by Fig. 3. A two-sample t test was performed to investigate whether the decline in suicide rates due to poisoning was statistically significant. According to the t test at 5 % significance level, a value of p of 0.0296 was obtained ( $p < 0.05$ ) and we conclude that overall suicide rate by poisoning for the years 2005 to 2010 was significantly lower to overall suicide rate by poisoning for years 2000 to 2004. This finding may be explained by the introduction of the Dangerous Chemical Control Act in 2004.



**Figure 3:** Trends in different modes of suicides in Mauritius 2000-2010.

Age groups most affected by suicides over the decade were the 20-29 (suicide rate=12.2), 40-49 (suicide rate=10.3) and the above 80 group (suicide rate=10.2) as illustrated in Fig. 4.



**Figure 4:** Overall suicide rates over 10 years in different age groups

Regarding the place of residence of persons committing suicides, it was found for the period 2005-2010 that 57% of the victims inhabited a rural area whilst 37% lived in an urban residence. The place of residence of 6% of victims was unknown. It was not possible to obtain data for the period 2000-2005. Again regarding occupation of the victims, in most cases such data was not obtained.

#### IV. DISCUSSION

The quality and thus reliability of data on suicides is an important issue since cause of death, in some cases of unnatural deaths for instance cases of drowning or falls from a height, may be ambiguous and thus data on suicides may be underreported. This concern has been highlighted previously [1]. Results obtained from our study may also differ slightly from data available from WHO country reports [10] which give suicide incidence rates per gender and age groups but do not include the means of suicide. One explanation may be that WHO country reports use data from different sources and those small differences in number in a small population like Mauritius may alter rates of suicide to some extent. The results of our study used data obtained at source from the police department and police data is usually of reliable quality as a thorough investigation has usually been carried out and good records are kept.

One of the most important finding of this study was that overall rates of suicides varied from 6.2 to 8.9 during the 10-year period and suicide rates were observed to be declining. This is in contrast with previous studies which have reported that Mauritius had a high rate of suicides [1].

Our study also suggested that suicide rates appeared to be decreasing with improvement in living standards although this finding needs to be confirmed over a longer period of time. This trend is similar to those observed in high income European countries, Canada, Australia and New Zealand where suicide rates are decreasing with improvements in GDP per capita adjusted for PPP and contrast with other countries in Latin America and the Caribbean region where economic growth has been accompanied by a rise of suicide rates indicating that income inequality and adequacy of mental health infrastructures also modulate effects of increasing GDP per capita in countries [11]. The finding in our study may be explained by the fact that Mauritius has aimed for equitable income distribution and has made provision for a free public health care system.

In our study, male suicide rates were significantly higher than female rates. This finding is consistent with worldwide trends showing that male suicides predominate in almost all countries [12]. One explanation put forward by some authors is that males tend to use violent means of suicide more often than females and they have highlighted the need for gender-specific approaches to suicide prevention [13].

Modes of suicides have also seen a change in recent years. Suicides due to hanging have been observed to be increasing whereas suicides due to poisoning are on the decrease in Mauritius. Trends in hanging are also showing increase popularity worldwide especially in young males [14]. It is of concern that restricting access to means of suicide by hanging is of limited value as ligatures and ligature points used in hanging are widely available. Although it may be possible, to some extent, to restrict means of access to hanging in controlled environments like prisons, this approach is not practical in a community environment. Hence the popularity of hanging as a mode of suicide in Mauritius may pose a challenge to suicide prevention efforts locally. In contrast, legislation controlling access to dangerous chemicals in Mauritius may have contributed to the decrease in trends of suicide deaths by poisoning. It is worth mentioning that the use of firearms as a mode of suicide in Mauritius is limited due to legislation restricting gun ownership.

The highest rate of suicide was found amongst young adults (20-29) in Mauritius. Recent studies [15] show that the highest suicide rates worldwide are in the elderly followed by high suicide rates in the young in South East Asia and high suicide rates in the middle aged in Europe. However absolute figures show the highest number of suicides in the 15-29 age group which is a vulnerable age group subjected to a wide number of stressors. Hence suicide prevention strategies must take into account the specificities of each age group.

## V. CONCLUSION

This study has described trends in suicide rates in the island of Mauritius for the decade 2000 to 2010. Important findings were that suicide rates varied from 6.2 to 8.9 during the 10-year period and that the rates appeared to be decreasing with improvement in living standards over the decade. Suicide rates were higher in males in keeping with worldwide trends and the 20 to 29 age group was more vulnerable to suicides. There had been a shift in the mode of suicides over the decade with a decrease in poisoning cases and with an increase in hanging as the preferred mode of suicide. Such results could help to optimise gender and age specific suicide prevention strategies and crucially, could enhance efforts to discourage the use of hanging as a mode of suicide with the aim of reducing overall suicide cases in Mauritius.

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