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Developing Life Tables for Mauritian Population Using Lee-Carter Mortality Forecasts

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Abstract--*Appropriate life tables, also known as mortality tables are highly important for pricing and reserving in insurance and pension industries. For the past few decades, remarkable improvements in life expectancies have been perceived which have further driven significant declines in mortality. From an actuarial perspective, the unremitting decrease in mortality rates has an impending effect on social security systems as well as on life insurance policies and pension plans. The main objective of this research is to develop unabridged life tables for the Mauritian population using the projected death rates from the Lee-Carter model. The empirical mortality dataset of Mauritian population from 1984 to 2016 are considered. The index level of mortality for each gender, shape and the sensitivity coefficients for the ages from 0 to 85 are obtained using Lee-Carter model. The Singular Value Decomposition (SVD) is used to forecast the general mortality index for the time period from 2017 to 2036.*

Keywords-- *Lee-Carter model, actuarial perspective, Singular Value Decomposition (SVD).*

I. INTRODUCTION

Mauritius is one of the developing countries that has experienced drastic enhancement in the health and living condition of its population since its independence in 1968.Based on a study conducted by Statistics Department of Mauritius in 2017, the assessed resident population as at 31 December 2016 was 1,221,213, signifying an upturn of 0.045% relative to that of 2015 which was recorded as 1,220,663. This rise in the Mauritian population can be attributed to the rapid industrial development and economic growth in the preceding eras. Martial (2016) revealed that Mauritius is transitioning from a country of high fertility and high mortality rates in the 1950s and mid-1960s to one with the lowest population growth rates in the emerging world at present. Owing to the eradication of epidemics such as malaria and advent of improved health care together with high level of education on family planning by the government after independence in 1968, that the population growth attained stability and positive changes could be observed in the life expectancy at birth of the inhabitants. For instance, the life expectancy at birth for both males and females increased exceedingly to 71 years and 78 years respectively as at 2015.

As mortality tables contribute highly to the pricing of insurance policies and pension schemes, Mauritius does not have its own mortality table. Insurance companies and other financial institutions make use of the South-African mortality tables in order to value and price the insurance contracts by assuming certain mortality load, because the life expectancy of Mauritius (74.6 years) is greater than that of South-Africa (62.4 years) based on the census conducted by the WHO (2016). This eventually may lead to either over-estimating or under-estimating the

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prices of insurance policies or pension schemes. For instance if mortality is improved, the premiums for life insurance policies will be higher as compared to the prices if mortality enhancements are not taken into account. Consequently, insurance companies might face insolvency in the future, owing to the application of inappropriate mortality tables (Martial and Boolaky, 2016).

Virginia (2015) accentuated that the demographic transition model is a dominant notion in population research and human geography. In addition, Dudley (2015) highlighted that this theory constitutes of societies that experience modernization progress from a pre-modern regime of high fertility and high mortality to a post-modern one in which both are low. Convoying this theory is a graph portraying deviation in birth rates, death rates, population and natural upsurge over time. Additionally, it reflects four stages of the change in patterns in the population due to the society's level of technology development (Macionis, 2014). This can be depicted in the figure below.

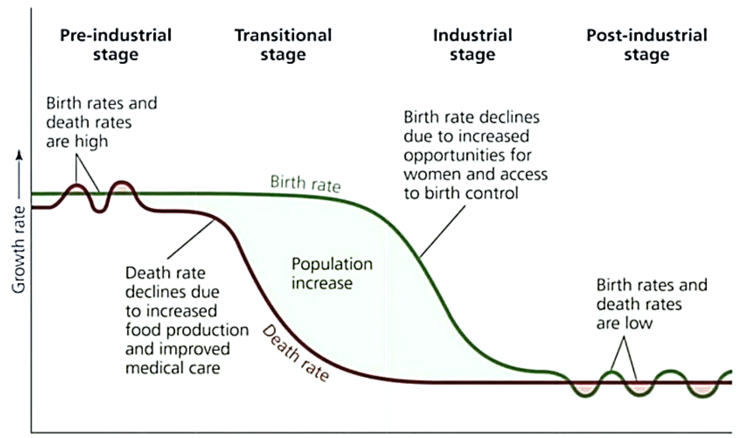

Figure 1: Demographic Transition Theory (Source: Journal of Geography, 2015)

Arnold (2010) highlighted that demographers and actuaries have been struggling in determining an appropriate mortality curve till the time Gompertz came forward with a law of mortality in 1825 whereby it was deduced that the force of mortality between ages 20 and 60 years followed an exponential distribution. However, Makeham (1860)has improved the law by adding a constant which explained the risk of death from all causes which do not rely on age. Researchers conducted studies based on the law to forecast mortality rates but found many forecasting errors (Brouhns et al., 2002; Czado et al., 2005; Koissi and Shapiro, 2006). Followedthe Gompertz-Makeham law of mortality, Lee and Carter (1992)developed a stochastic model to predict mortality rates effectively, wherebyLee & Miller (2001) developed two variants on the original Lee-Carter method whereby k_t was estimated by matching life expectancy. Additionally, Renshaw-Haberman (2006) extended the Lee-Carter by adding a cohort effect. Similarly, Cairns et al (2006) settled a different outline of the Lee-Carter by adjusting the logarithmic function. The latter looked at the logarithm of the ratio of the mortality rate to the survival rate (using the logistic function) (Booth et al, 2008). However, no matter how many extensions of Lee-Carter model were developed, the original one has been widely accepted by the actuarial community since this mortality forecasting technique does not integrate information about medical, behavioral or social influences on mortality variation(Wasana, 2014).

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Coupled to these, Brouhns, Denuit and Vermunt (2002) substituted the SVD technique by a log-bilinear Poisson regression in the Lee-Carter approach. It was deduced that the Poisson method also allows insurance companies to project future cash flows as well as calculate longevity risk. In addition to this, Rossa (2011) developed life tables for the year 2020 for Poland using stochastic forecasts of age-specific death rates from the Lee-Carter stochastic model with the aid of death data from 1990 to 2007. According to Rob (2013), prospective life tables depend on forecasting age-specific mortality. Miklos (2014) highlighted that actuaries generally face issues during calculation of annuities or insurance premiums, for which the exact values are highly dependent on future variations in mortality tables. Similarly, pension providers and actuaries in Mauritius either over-estimate or under-estimate the prices of annuities or insurance products, because Mauritius does not have its own unabridged life table.Furthermore, Russolillo (2014) also applied the Lee-Carter model to construct life tables for the Italian population for the years 2020 and 2025, using mortality data from 1950 to 2000. It was found that the Singular Value Decomposition (SVD) method was used to estimate the parameters of the Lee-Carter model. Finally, with the aid of the Autoregressive Integrated Moving Average (ARIMA), the forecasted mortality index was generated which contributes highly to the projection of life tables. The latter also added that the projected mortality tables proved to be significant to estimate the costs of insurance companies as well as to calculate optimal premiums. Owing to the continuous improvement in mortality rates worldwide, Shair et al. (2018) conducted a study whereby the latter applied the Lee-Carter as well as the Poisson Log-bilinear Regression models in the aim of developing projected life tables for Malaysian males and females up to the year 2030. It was found that the Lee-Carter model provided more accurate mortality forecasts as compared to Poisson Log-bilinear model. In this study, Lee-Carter model will be used to the mortality data of the Mauritian population to project future death rates for the next two decades. By using the forecasted values of mortality rate, a mortality table for the Mauritian population will be constructed to an extent whereby the latter can enhance the pricing techniques of insurance companies in Mauritius.

II. METHODOLOGY

Lee-Carter Model

To forecast mortality rates for Mauritius, Lee-Carter model is used and given as below:

$$m_{x,t} = e^{a_x + b_x + k_t + \varepsilon_{x,t}}$$

where $m_{x,t}$ is the central mortality rate at age *x* and year *t*

a_x is average (over time) log-mortality at age *x*

b_x measures the response at age *x* to change in the overall level of mortality over time

k_t represents the overall level of mortality in year *t*

$\varepsilon_{x,t}$ is the residual

The parameter $\boldsymbol{a_x}$ designates the average age-specific pattern of mortality and $\boldsymbol{k_t}$ denotes a time-trend index of general mortality level (Marie, 2010). Drop in death rate at specific age x is captured by $\boldsymbol{b_x}$. For model

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identification, the succeeding limitations are compulsory: $\sum_t k_t = 0$ and $\sum_x b_x^2 = 1$. Therefore, the parameter vector $\boldsymbol{a_x}$ is computed as the average over time of the logarithm of the central death (Arnold, 2010).

Life Tables

According to Sulaiman and Rukayya (2017), a life table, also known as a mortality table is one of the oldest statistical techniques and is comprehensively used by medical statisticians and actuaries. It is also the structure for conveying the form of mortality in terms of probabilities. In addition to this, it is created from census and death registration data. A mortality table is a prominent method of showing the probabilities of a person of a certain population living or dying at an exact age. Moreover, it is an alternative effective way of expressing the death rates experienced by a population during a given period (Rukayya, 2017). However, the main issue of using death rates in constructing the table is that the age distribution of that population distresses the rates. Furthermore, life table can be classified as cohort, unabridged or abridged. A typical life table has the following columns as shown in the table below.

Table 1: Columns in a life table.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
x	$\boldsymbol{l_x}$	$\boldsymbol{d_x}$	$\boldsymbol{q_x}$	$\boldsymbol{L_x}$	$\boldsymbol{T_x}$	$\boldsymbol{e_x^0}$

Where the symbols given above are defined as follows:

(1) $\boldsymbol{x}$- the exact age or may refer to age interval

(2) $\boldsymbol{l_x}$-the number of lives at any age $\boldsymbol{x}$ out of a total number of births of $\boldsymbol{l_0}$, usually 100,000.

(3) $\boldsymbol{d_x}$-the number of deaths at age $\boldsymbol{x}$ out of survivors who died before age $\boldsymbol{x+1}$. $\boldsymbol{d_x = l_x - l_{x+1}}$

(4) $\boldsymbol{q_x}$-the probability of death of a life age $\boldsymbol{x}$ before reaching age $\boldsymbol{x+1}$. $\boldsymbol{q_x = \frac{d_x}{l_x}}$

(5) $\boldsymbol{L_x}$-the number of years of life lived between ages $\boldsymbol{x}$ and $\boldsymbol{x+1}$ of those currently aged $\boldsymbol{x}$. It will always be the same in each year under a stationary condition. When the death at an age $\boldsymbol{x}$ are assumed to be uniformly distributed, it becomes the mid-year population as given below.

$$\boldsymbol{L_x = l_x + 0.5(l_x - l_{x+1})}$$

$\boldsymbol{L_x = 0.5(l_x + l_{x+1})}$ for $x \geq 2$

It also assumes that a person dying between the age $\boldsymbol{x}$and $\boldsymbol{x+1}$, on an average, lives 0.5 years. It can be written as:

$$\boldsymbol{L_x = l_x - 0.5d_x}$$

(6) $\boldsymbol{T_x}$-the number of years lived by the cohort $\boldsymbol{l_x}$ after attaining the age $\boldsymbol{x}$. It is usually considered as the total future life table of the $\boldsymbol{l_x}$persons who reached age $\boldsymbol{x}$(Sulaiman and Rukayya, 2017)

$$\boldsymbol{T_x = \sum_{y=x}^{w} L_y}$$

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Where w is the highest age possible.

(7) e_x^0-the average number of additional years a person aged x is expected to live under the prevailing mortality condition (Rukayya, 2017).

$e_x^0 = \frac{T_x}{l_x} = e_x + 0.5$

Where e_x is the curtate expectation of life which infers the average number of complete years of life lived, by each age of l_x persons reaching that age. It is given by:

$$e_x = \frac{L_{x+1} + L_{x+2} + \cdots + L_w}{l_x}$$

III. RESULTS AND DISCUSSION

This section will focus on the use of the mortality death rates fitted to the Lee-Carter model to develop mortality tables for the years 1984 to 2016. Additionally, the forecasted death rates at a 95% confidence interval were used to construct mortality tables for the Mauritian population for the next 20 years. Since the original model of Lee Carter is being applied to the Mauritian mortality data, as proposed by Lee and Carter (1992), an ARIMA (0, 1, 0) is more appropriate in forecasting the mortality index k_t. The forecast package in R programme is used to project future values of k_t and the projection period is 20 years. The graph and table below show the projected values of k_t with the blue line representing the mean of the forecasted k_t values. The forecast is grounded on ARIMA extrapolation.

Table 2: Forecasted values of kt for the years 2017 to 2036.

Age (x)	**Forecasted kt values**		
	Male	**Female**	**Total**
2017	-1.2127	-1.5390	-1.3043
2018	-2.4255	-3.0780	-2.6087
2019	-3.6382	-4.6170	-3.9130
2020	-4.8510	-6.1560	-5.2173
2021	-6.0637	-7.6949	-6.5216
2022	-7.2764	-9.2339	-7.8260
2023	-8.4892	-10.7729	-9.1303
2024	-9.7019	-12.3119	-10.4346
2025	-10.9147	-13.8509	-11.7390
2026	-12.1274	-15.3899	-13.0433
2027	-13.3401	-16.9289	-14.3476
2028	-14.5529	-18.4679	-15.6519
2029	-15.7656	-20.0069	-16.9563
2030	-16.9784	-21.5458	-18.2606
2031	-18.1911	-23.0848	-19.5649

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2032	-19.4039	-24.6238	-20.8693
2033	-20.6166	-26.1628	-22.1736
2034	-21.8293	-27.7018	-23.4779
2035	-23.0421	-29.2408	-24.7822
2036	-24.2548	-30.7798	-26.0866

From the projected values of $\boldsymbol{k_t}$as shown in Table 2, it can be deduced that there will be enormous improvement in the mortality rate of both male and female of Mauritius for the next 20 years. The grey shaded region in Figure 2 shows the forecasted trends for all the years ahead. However, the mean of the projected values for $\boldsymbol{k_t}$is taken into consideration, given by the blue line. Lower future mortality rate implies that for the next 20 years pension providers as well as insurance companies will have to charge higher for pension annuities and life insurance policies, since it is predicted that the life expectancy of the Mauritian population will continue to increase.

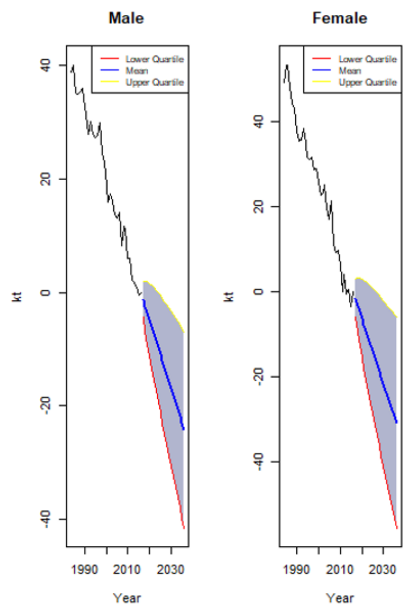

Figure 2: Projected values of kt for the next 20 years.

Using the estimated values of $\widehat{a}_x$, $\widehat{b}_x$ and $\widehat{k}_t$, the following equation is used to compute the mortality rate using the R programme software with the aid of lca and forecast functions.

$$\ln(m_{x,t}) = \widehat{a}_x + \widehat{b}_x\widehat{k}_t$$

The forecasted values for the years 2017 to 2036 for male, female and the total population are attached in the appendix. The following figures illustrate the projected death rates.

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Figure 3: Past and Forecasted mortality rates for the Mauritian population.

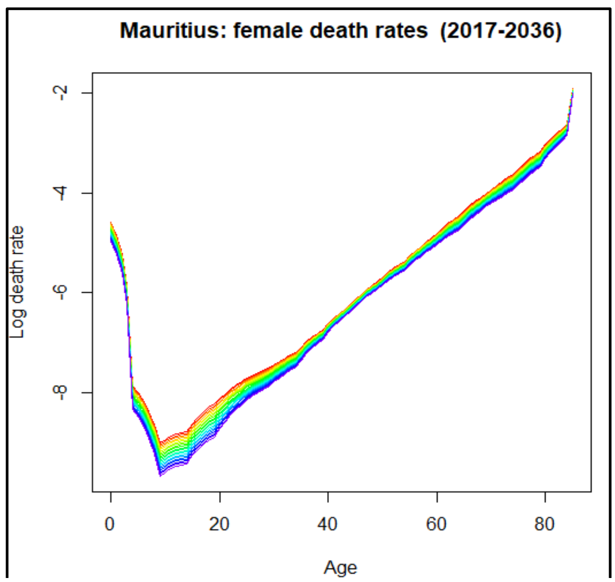

Figure 4: Forecasted death rates for Female.

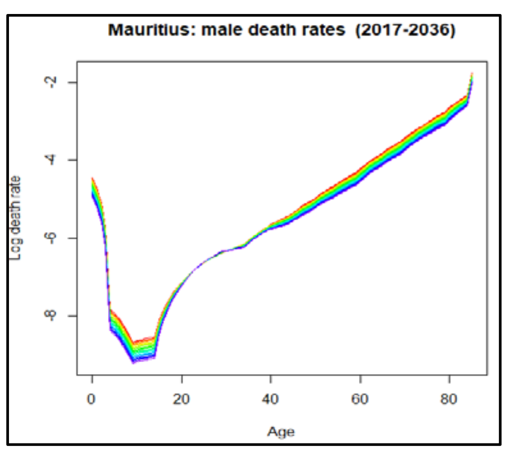

Figure 5: Forecasted death rates for Male.

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Using the forecasted death rates, as mentioned earlier, the life tables were constructed and extracts of them wereattached in the appendix for both males and females for the years 2016 to 2036.

IV. CONCLUSION

This study focused on the application of the Lee-Carter model in the aim of forecasting the next 20 years mortality rates of the Mauritian population as well as to develop mortality tables for the country with the aid of the forecasted death rates. Owing to increase in ageing population, there was a prodigious need to estimate future mortality rates to diminish mortality risk during pricing of insurance policies and pension annuities. Thus, a mortality model that can provide accurate predictions becomes vital to sound pricing techniques. Lee-Carter is used in this study due to its popularity as well as the fact that it outperforms other recommended models with respect to its predicted errors. Mauritian mortality data from 1984 to 2016 was fitted to the model and the Singular Value Decomposition approach was applied to estimate the parameters. The appeal of the Lee-Carter model is the long-term linearity of its time-series component i.e. the mortality index $\boldsymbol{k_t}$ which is modelled and projected using the ARIMA (0,1,0). In regard of the forecasted death rates obtained through the Lee-Carter model, the life tables for the years 2017 to 2036 were constructed, yet owing to time constraint, the reliability of these tables need to be further assessed.

With the aid of these life tables, not only the pricing techniques of insurance and pension industries in Mauritius will be improved, but also, the prices of the insurance policies or pension schemes will neither be over-estimated nor under-estimated. As a consequence, actuaries in Mauritius will be able to minimize additional costs and maximize their profits while ascertaining their future liabilities, thus, enhancing the economic condition of the country. Moreover, once the reliability of these mortality tables is tested, actuaries in Mauritius will no longer have to use the adjusted South-African life tables during pricing and valuation of reserves.

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APPENDIX

Period lifetable for Mauritius : male

Year: 2016

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0122	0.0120	1.0000	0.0120	0.9889	71.5227	71.5227
1	0.0092	0.0092	0.9880	0.0091	0.9834	70.5338	71.3923
2	0.0063	0.0062	0.9789	0.0061	0.9759	69.5504	71.0485
3	0.0033	0.0033	0.9728	0.0032	0.9712	68.5745	70.4921
4	0.0004	0.0004	0.9696	0.0004	0.9694	67.6033	69.7251
5	0.0003	0.0003	0.9692	0.0003	0.9690	66.6339	68.7513
6	0.0003	0.0003	0.9689	0.0003	0.9687	65.6649	67.7741
7	0.0002	0.0002	0.9686	0.0002	0.9685	64.6962	66.7936
8	0.0002	0.0002	0.9684	0.0002	0.9683	63.7277	65.8099
9	0.0002	0.0002	0.9682	0.0002	0.9681	62.7594	64.8232
10	0.0002	0.0002	0.9680	0.0002	0.9679	61.7913	63.8334
11	0.0002	0.0002	0.9678	0.0002	0.9678	60.8234	62.8439
12	0.0002	0.0002	0.9677	0.0002	0.9676	59.8556	61.8548
13	0.0002	0.0002	0.9675	0.0002	0.9674	58.8880	60.8659
14	0.0002	0.0002	0.9673	0.0002	0.9672	57.9206	59.8773
15	0.0003	0.0003	0.9671	0.0003	0.9670	56.9534	58.8890
16	0.0005	0.0005	0.9668	0.0005	0.9666	55.9864	57.9094
17	0.0007	0.0007	0.9663	0.0006	0.9660	55.0199	56.9382
18	0.0008	0.0008	0.9657	0.0008	0.9653	54.0539	55.9751
19	0.0010	0.0010	0.9649	0.0009	0.9644	53.0886	55.0198
20	0.0010	0.0010	0.9640	0.0010	0.9635	52.1242	54.0720
21	0.0011	0.0011	0.9630	0.0011	0.9625	51.1607	53.1273

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Period lifetable for Mauritius : female

Year: 2016

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0117	0.0116	1.0000	0.0116	0.9894	77.7693	77.7693
1	0.0089	0.0088	0.9884	0.0087	0.9841	76.7799	77.6792
2	0.0060	0.0060	0.9797	0.0059	0.9767	75.7958	77.3672
3	0.0032	0.0032	0.9738	0.0031	0.9722	74.8191	76.8334
4	0.0004	0.0004	0.9707	0.0004	0.9705	73.8469	76.0796
5	0.0003	0.0003	0.9703	0.0003	0.9701	72.8764	75.1092
6	0.0003	0.0003	0.9699	0.0003	0.9698	71.9063	74.1341
7	0.0002	0.0002	0.9697	0.0002	0.9696	70.9365	73.1546
8	0.0002	0.0002	0.9695	0.0002	0.9694	69.9669	72.1707
9	0.0001	0.0001	0.9693	0.0001	0.9693	68.9975	71.1826
10	0.0001	0.0001	0.9692	0.0001	0.9691	68.0283	70.1902
11	0.0002	0.0002	0.9691	0.0002	0.9690	67.0591	69.2007
12	0.0002	0.0002	0.9689	0.0002	0.9688	66.0902	68.2138
13	0.0003	0.0003	0.9686	0.0003	0.9685	65.1214	67.2296
14	0.0003	0.0003	0.9684	0.0003	0.9682	64.1529	66.2479
15	0.0003	0.0003	0.9681	0.0003	0.9679	63.1847	65.2687
16	0.0003	0.0003	0.9678	0.0003	0.9677	62.2168	64.2878
17	0.0003	0.0003	0.9675	0.0002	0.9674	61.2491	63.3054
18	0.0002	0.0002	0.9673	0.0002	0.9672	60.2817	62.3215
19	0.0002	0.0002	0.9670	0.0002	0.9669	59.3146	61.3361
20	0.0003	0.0003	0.9668	0.0003	0.9667	58.3476	60.3492
21	0.0003	0.0003	0.9666	0.0003	0.9664	57.3809	59.3653

Period lifetable for Mauritius : male

Year: 2018

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0115	0.0114	1.0000	0.0114	0.9895	72.1454	72.1454
1	0.0087	0.0087	0.9886	0.0086	0.9844	71.1559	71.9732
2	0.0059	0.0059	0.9801	0.0058	0.9772	70.1715	71.5983
3	0.0032	0.0032	0.9743	0.0031	0.9727	69.1943	71.0219
4	0.0004	0.0004	0.9712	0.0004	0.9710	68.2216	70.2458
5	0.0003	0.0003	0.9708	0.0003	0.9706	67.2506	69.2731
6	0.0003	0.0003	0.9705	0.0003	0.9703	66.2800	68.2969
7	0.0003	0.0003	0.9702	0.0003	0.9701	65.3097	67.3174
8	0.0002	0.0002	0.9699	0.0002	0.9698	64.3396	66.3346
9	0.0002	0.0002	0.9697	0.0002	0.9696	63.3698	65.3486
10	0.0002	0.0002	0.9696	0.0002	0.9695	62.4002	64.3595
11	0.0002	0.0002	0.9694	0.0002	0.9693	61.4307	63.3705
12	0.0002	0.0002	0.9692	0.0002	0.9691	60.4614	62.3817
13	0.0002	0.0002	0.9690	0.0002	0.9689	59.4922	61.3930
14	0.0002	0.0002	0.9689	0.0002	0.9688	58.5233	60.4044
15	0.0003	0.0003	0.9687	0.0003	0.9685	57.5545	59.4157
16	0.0004	0.0004	0.9684	0.0004	0.9682	56.5860	58.4331
17	0.0005	0.0005	0.9680	0.0005	0.9678	55.6178	57.4560
18	0.0006	0.0006	0.9675	0.0006	0.9672	54.6500	56.4842
19	0.0007	0.0007	0.9670	0.0007	0.9666	53.6828	55.5174
20	0.0008	0.0008	0.9663	0.0008	0.9659	52.7162	54.5555
21	0.0009	0.0009	0.9655	0.0009	0.9651	51.7503	53.5985

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Period lifetable for Mauritius : female

Year: 2018

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0100	0.0100	1.0000	0.0100	0.9909	78.5370	78.5370
1	0.0076	0.0076	0.9900	0.0075	0.9863	77.5461	78.3260
2	0.0052	0.0052	0.9825	0.0051	0.9800	76.5598	77.9225
3	0.0028	0.0028	0.9774	0.0027	0.9760	75.5799	77.3278
4	0.0004	0.0004	0.9747	0.0004	0.9745	74.6038	76.5437
5	0.0003	0.0003	0.9743	0.0003	0.9741	73.6294	75.5722
6	0.0003	0.0003	0.9740	0.0003	0.9738	72.6552	74.5964
7	0.0002	0.0002	0.9737	0.0002	0.9736	71.6814	73.6166
8	0.0002	0.0002	0.9735	0.0002	0.9734	70.7078	72.6328
9	0.0001	0.0001	0.9733	0.0001	0.9733	69.7344	71.6450
10	0.0001	0.0001	0.9732	0.0001	0.9732	68.7611	70.6533
11	0.0001	0.0001	0.9731	0.0001	0.9730	67.7879	69.6622
12	0.0001	0.0001	0.9730	0.0001	0.9729	66.8149	68.6714
13	0.0001	0.0001	0.9728	0.0001	0.9728	65.8420	67.6809
14	0.0001	0.0001	0.9727	0.0001	0.9726	64.8693	66.6906
15	0.0002	0.0002	0.9725	0.0002	0.9725	63.8966	65.7003
16	0.0002	0.0002	0.9724	0.0002	0.9723	62.9242	64.7116
17	0.0002	0.0002	0.9722	0.0002	0.9721	61.9519	63.7242
18	0.0002	0.0002	0.9720	0.0002	0.9719	60.9798	62.7380
19	0.0003	0.0003	0.9717	0.0002	0.9716	60.0079	61.7528
20	0.0003	0.0003	0.9715	0.0003	0.9714	59.0363	60.7685
21	0.0003	0.0003	0.9712	0.0003	0.9711	58.0650	59.7859

Period Life Table for Female

Year: 2019

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0099	0.0098	1.0000	0.0098	0.9910	78.7145	78.7145
1	0.0075	0.0075	0.9902	0.0074	0.9865	77.7235	78.4898
2	0.0051	0.0051	0.9829	0.0050	0.9803	76.7370	78.0756
3	0.0028	0.0027	0.9778	0.0027	0.9765	75.7566	77.4737
4	0.0004	0.0004	0.9752	0.0004	0.9750	74.7801	76.6857
5	0.0003	0.0003	0.9748	0.0003	0.9746	73.8052	75.7134
6	0.0003	0.0003	0.9745	0.0003	0.9744	72.8305	74.7371
7	0.0002	0.0002	0.9742	0.0002	0.9741	71.8561	73.7568
8	0.0002	0.0002	0.9740	0.0002	0.9739	70.8820	72.7726
9	0.0001	0.0001	0.9739	0.0001	0.9738	69.9081	71.7844
10	0.0001	0.0001	0.9738	0.0001	0.9737	68.9343	70.7925
11	0.0001	0.0001	0.9736	0.0001	0.9736	67.9606	69.8010
12	0.0001	0.0001	0.9735	0.0001	0.9734	66.9870	68.8100
13	0.0001	0.0001	0.9734	0.0001	0.9733	66.0136	67.8192
14	0.0001	0.0001	0.9732	0.0001	0.9732	65.0403	66.8286
15	0.0002	0.0002	0.9731	0.0002	0.9730	64.0671	65.8380
16	0.0002	0.0002	0.9729	0.0002	0.9728	63.0941	64.8489
17	0.0002	0.0002	0.9728	0.0002	0.9727	62.1212	63.8611
18	0.0002	0.0002	0.9726	0.0002	0.9724	61.1486	62.8745
19	0.0002	0.0002	0.9723	0.0002	0.9722	60.1761	61.8888
20	0.0003	0.0003	0.9721	0.0003	0.9720	59.2039	60.9040
21	0.0003	0.0003	0.9718	0.0003	0.9717	58.2320	59.9209

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Period Life Table for Male

Year:2019

	mx	qx	lx	dx	Lx	Tx	ex
0	0.0112	0.0111	1.0000	0.0111	0.9898	72.3787	72.3787
1	0.0085	0.0084	0.9889	0.0084	0.9848	71.3890	72.1877
2	0.0058	0.0058	0.9806	0.0057	0.9778	70.4042	71.7983
3	0.0031	0.0031	0.9749	0.0030	0.9734	69.4265	71.2120
4	0.0004	0.0004	0.9719	0.0004	0.9717	68.4530	70.4307
5	0.0003	0.0003	0.9716	0.0003	0.9714	67.4813	69.4572
6	0.0003	0.0003	0.9712	0.0003	0.9711	66.5099	68.4804
7	0.0003	0.0003	0.9709	0.0002	0.9708	65.5388	67.5004
8	0.0002	0.0002	0.9707	0.0002	0.9706	64.5680	66.5172
9	0.0002	0.0002	0.9705	0.0002	0.9704	63.5974	65.5309
10	0.0002	0.0002	0.9703	0.0002	0.9703	62.6270	64.5414
11	0.0002	0.0002	0.9702	0.0002	0.9701	61.6567	63.5522
12	0.0002	0.0002	0.9700	0.0002	0.9699	60.6867	62.5631
13	0.0002	0.0002	0.9698	0.0002	0.9697	59.7167	61.5741
14	0.0002	0.0002	0.9697	0.0002	0.9696	58.7470	60.5852
15	0.0003	0.0003	0.9695	0.0003	0.9693	57.7774	59.5963
16	0.0004	0.0004	0.9692	0.0004	0.9690	56.8081	58.6134
17	0.0005	0.0005	0.9688	0.0005	0.9686	55.8391	57.6360
18	0.0006	0.0006	0.9683	0.0006	0.9681	54.8705	56.6640
19	0.0007	0.0007	0.9678	0.0007	0.9674	53.9024	55.6971
20	0.0008	0.0008	0.9671	0.0008	0.9667	52.9350	54.7350
21	0.0009	0.0009	0.9663	0.0009	0.9659	51.9682	53.7780

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