

Estimation of Maximum Age Group Affected by Cardiovascular Disease(CVD) for Men in Nagapattinam town by using Fuzzy Matrix

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Abstract: In this Paper, we analyze the maximum age group affected cardiovascular problem by Men in Nagapattinam town by using (RTD/CETD) fuzzy Matrix. The data have been collected from local Nagapattinam town covering 100 people. Using these concepts we identify the peak age group in which people suffer the maximum health hazard.

I. INTRODUCTION

The Fuzzy set theory is a generalization of classical set theory. The Fuzzy set theory was introduced by Professor Lofti A.Zadeh in 1965 and can be seen as an infinite value. Then his research interests have been shifted to the theory of Fuzzy logic, soft computing, computing with words, and the newly developed computational theory of perceptions and natural language. Fuzzy logic theory is based on making the membership function lie over a range of real numbers from 0.0 to 1.0. The fuzzy set is characterized by (0.0, 0, 1.0). This paper analyses the maximum age group of men affected by cardiovascular disease by using RTD matrix. This paper has four sections. In the first section we must recall the ATD Matrix, RTD Matrix and CETD Matrix. In section two we describe the causes of Cardiovascular Disease. In section three we apply the main causes of the CVD by using CETD model to find out the peak age of group of men affected by Cardiovascular Disease. In the final section we derived conclusions and gives suggestions based on our study.

1.1 AVERAGE TIME DEPENDENT (ATD) MATRIX

Raw data transform it into a raw time dependent data matrix by taking along the rows the age group and along the columns disease using the raw data matrix we make it into the Average Time Dependent Data(ATD) matrix (a_{ij}) by dividing each entry of the raw data matrix by the number of years i.e., the time period.

1.2 REFINED TIME DEPENDENT (RTD) MATRIX

Using the average μ_j of each j^{th} column and σ_j the S.D of the each j^{th} column we chose a parameter α from the interval [0,1] and the Refined Time Dependent Matrix (RTD matrix), Using the formula

$$a_{ij} \leq (\mu_j - \alpha * \sigma_j) \text{ then } e_{ij} = -1 \text{ else}$$

$$\text{If } a_{ij} \in (\mu_j - \alpha * \sigma_j, \mu_j + \alpha * \sigma_j) \text{ then } e_{ij} = 0 \text{ else}$$

$$\text{If } a_{ij} \geq (\mu_j + \alpha * \sigma_j) \text{ then } e_{ij} = 1$$

We redefined the ATD matrix into the Refined Time Dependent fuzzy matrix for here the entries are -1, 0 or

1. Now the row sum of this matrix gives the maximum age group.

1.3 COMBINED EFFECTIVE TIME DEPENDENT DATA (CETD) MATRIX:

We also combine the above RTD matrices by varying the $\alpha \in [0,1]$, so that we get the Combined Effective Time Dependent Data (CETD) Matrix. The row sum is obtained for CETD matrix and conclusions are derived based on the row sums. All these are represented by graphs and graphs play a vital role in exhibiting the data by the simplest means, which can be even understood by a layman.

II. CARDIOVASCULAR DISEASE:

Cardiovascular Disease are a group of disorder of the heart and blood vessels. And includes coronary heart disease, cerebrovascular disease, arterial disease, rheumatic heart disease: damage to the heart muscle and heart valves from rheumatic fever, caused by streptococcal bacteria.

2.1 WHAT IS CARDIOVASCULAR DISEASE?

The Cardiovascular system is made up of the heart and blood vessels. Cardiovascular disease is defined as abnormal condition of the heart and blood vessels. Heart attack and strokes are usually acute events and are mainly caused by a blockage that prevents blood from flowing to the heart or brain. The most common reason is a build-up of fatty deposit on the inner walls of the blood vessels.

2.2 RISK FACTOR FOR CARDIOVASCULAR DISEASE

There are many risk factors for heart disease: Due to

- Age ,
- Gender,
- Tobacco uses,
- Physical inactivity,
- Excessive alcohol consumption,
- Unhealthy diet,
- Obesity,
- Genetic predisposition and family history of Cardiovascular disease,
- Raised blood pressure,
- Raised blood sugar,
- Raised blood cholesterol.

2.3 CARDIOVASCULAR RISK ASSESEMENT:

Existing cardiovascular disease or a previous cardiovascular event such as heart attack or stroke is the strongest prediction of a future cardiovascular event. Age, sex, and diabetes are important predictors of future cardiovascular disease in people who are not known to have cardiovascular disease. These measure and sometimes, may be combined into composite risk score to estimate an individual’s future risk of cardiovascular disease.

III. DESCRIPTION OF THE PROBLEM

In this section, we have interviewed 100 men in different ages affected by the cardiovascular disease in Nagapattinam town. We analyze these problem using Fuzzy matrix as the RTD Matrix for that take their entries from $\{-1,0,1\}$. In the study case of Cardiovascular disease, it will discuss ‘eight causes’ men affected by CVD. The raw data, it is transformed into a raw time dependent data matrix by taking along the row the age group and along the columns the health problem suffered by the men. Entries corresponding to the intersection of rows and columns are values corresponding to the live network. Using raw data

matrix, convert it into the Average Time Dependent Data(ATD) Matrix(a_{ij}) by dividing each entry of the raw data matrix by the number of years that is, the time period. At the third stage, the average and the standard deviation(S.D) of every column in the ATD matrix, are determined. At the fourth stage using the fuzzy matrices we obtain the Combined Effect Time Dependent Data (CETD) Matrix, which gives the cumulative effect of all these entries and finally we obtain the row sums of the CETD Matrix. The graph of the RTD and CETD matrix are given.

3.1 Estimation of maximum age group of Men affected by cardiovascular disease by using the Matrices of order 4X8.

Let us take the Cardiovascular under eight main causes. i.e., R_1 –Age, R_2 - Gender, R_3 - Tobacco uses, R_4 - Excessive alcohol consumption, R_5 - Obesity, R_6 - Raised blood pressure, R_7 - Raised blood sugar, R_8 - Raised blood cholesterol.

Table 1: Initial Raw Data Matrix of order 4 X 8

Age	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8
40-45	7	5	9	11	7	6	10	8
46-50	9	10	12	4	8	3	6	13
51-56	16	10	5	13	4	7	12	14
57-60	5	3	8	2	1	6	5	9

Table2: ATD Matrix of order 4 X 8

Age	R_1	R_2	R_3	R_4	R_5	R_6	R_7	R_8
40-45	1.16	0.84	1.5	1.84	1.16	1	1.67	1.33
46-50	1.8	2	2.4	0.8	1.6	0.6	1.2	2.6
51-56	2.6	1.67	0.8	2.16	0.67	1.16	2	2.3
57-60	1.25	0.75	2	0.5	0.25	1.5	1.25	2.25

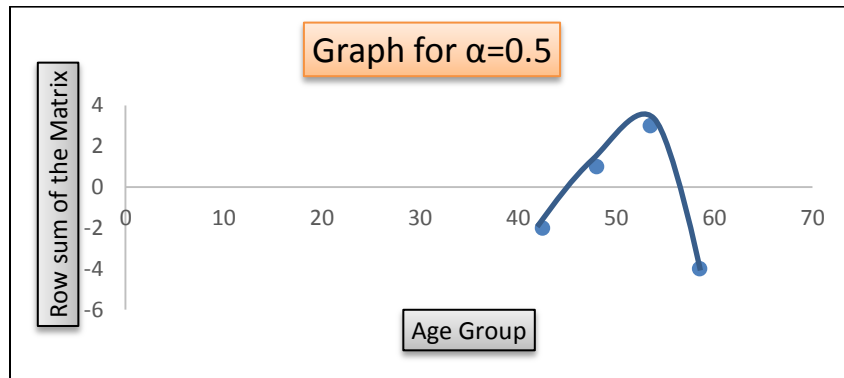
Table 3: Average and S.D of the above given ATD Matrix

Average	1.7	1.31	1.67	1.33	0.92	1.06	1.53	2.12
S.D	0.66	0.61	0.68	0.7	0.58	0.37	0.38	0.5

We have taken the value $\alpha = 0.5, 0.7, 0.75, \text{ and } 0.9$ to find the CETD Matrix.

RTD Matrix for $\alpha = 0.5$ Row Sum Matrix

$$\begin{bmatrix} -1 & -1 & 0 & 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 1 & -1 & 1 & -1 & -1 & 1 \\ 1 & 1 & -1 & 1 & 0 & 0 & 1 & 0 \\ -1 & -1 & 0 & -1 & -1 & 1 & -1 & 0 \end{bmatrix} \begin{bmatrix} -2 \\ 1 \\ 3 \\ -4 \end{bmatrix}$$

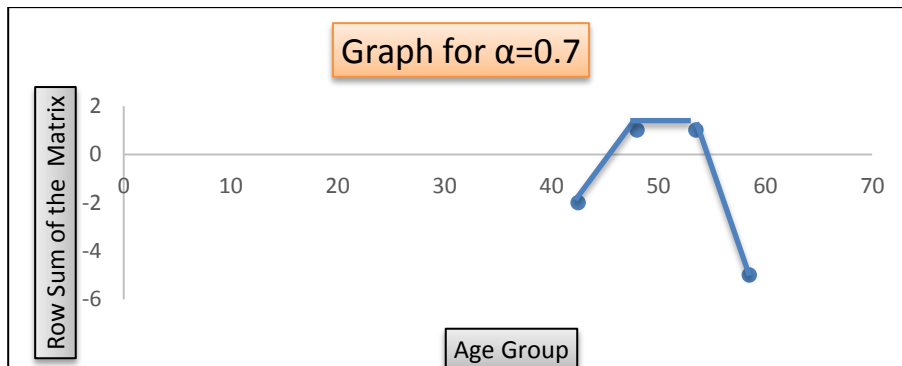


RTD Matrix for $\alpha = 0.7$

$$\begin{bmatrix} -1 & -1 & 0 & 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 1 & -1 & 1 & -1 & -1 & 1 \\ 1 & 0 & -1 & 1 & 0 & -1 & 1 & 0 \\ 0 & -1 & 0 & -1 & -1 & -1 & -1 & 0 \end{bmatrix}$$

Row Sum Matrix

$$\begin{bmatrix} -2 \\ 1 \\ 1 \\ -5 \end{bmatrix}$$

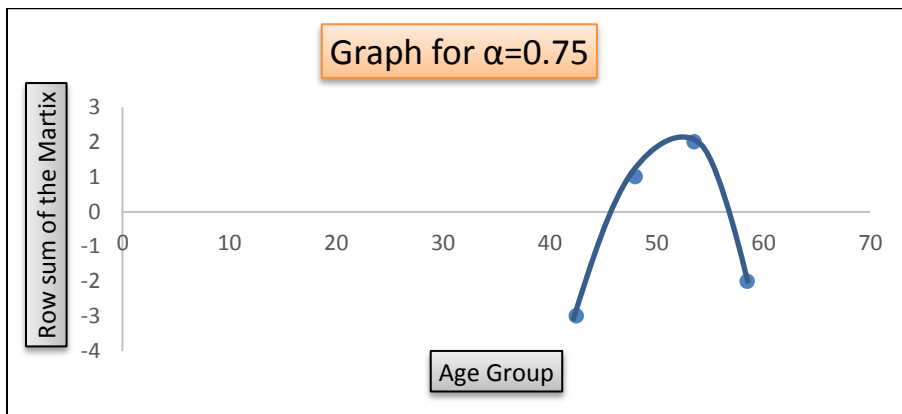


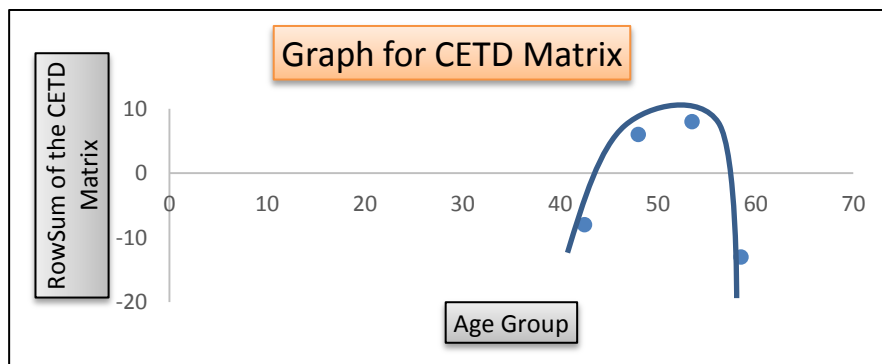
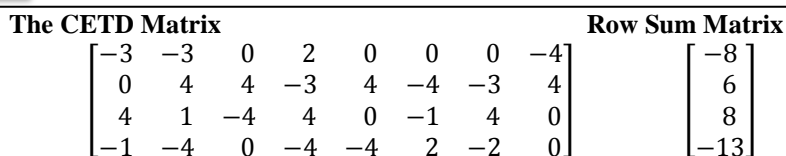
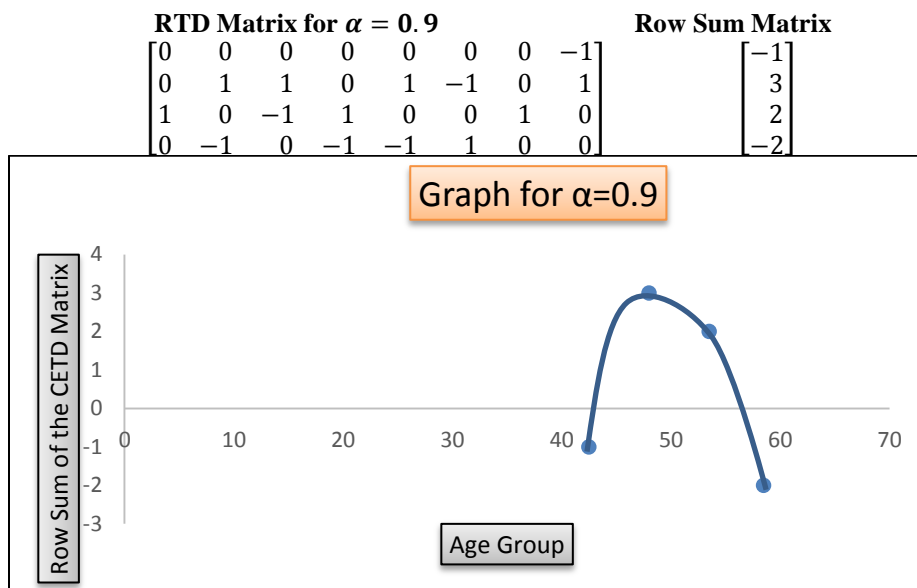
RTD Matrix for $\alpha = 0.75$

$$\begin{bmatrix} -1 & -1 & 0 & 0 & 0 & 0 & 0 & -1 \\ 0 & 1 & 1 & -1 & 1 & -1 & -1 & 1 \\ 1 & 0 & -1 & 1 & 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & -1 & -1 & 1 & 0 & 0 \end{bmatrix}$$

Row Sum Matrix

$$\begin{bmatrix} -3 \\ 1 \\ 2 \\ -2 \end{bmatrix}$$





CONCLUSION

From this paper, the survey proves the peak age of men affected by the Cardiovascular disease is 53. The problem initializes at the age of 48, the damage is peak at the age of 53-56. It is shown in the CETD Matrix.

Suggestion : (1) Take responsibility for our health, (2) Maintain a healthy blood pressure, (3) Monitor your cholesterol, (4) Make exercise a daily habit, (5) Reduce stress and don't smoke

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