Expected Time In Cancer Patient Survival Using Statistical Models

G.subash chandrabose, R Anandbabu

[3] Assistant Professor in Statistics, Department of Community Medicine, Aarupadai Veedu Medical College & Hospital, Puducherry, India. (E-mail:
2. Assistant Professor, Department of Community Medicine, Aarupadai Veedu Medical College & Hospital, Puducherry, India.

Abstract:

cancer is the major cause of cancer-related mortality around the world that kills about 1.8 million people annually. The predominant cause and risk factor of cancer is smoking. cancer is classified either as small cell carcinoma or non-small cell carcinoma which is used to determine the disease prognosis and treatment options. So far, no early detection of screening methods is available to screen lung cancer. So, smoking termination is remaining a critical component of primary care prevention.

1 INTRODUCTION

The most prevalent health issue in the world today is cancer. The widespread threat of cancer is an issue that millions of people throughout the world are becoming increasingly concerned about. Globally, cancer is becoming a significant issue, affecting both industrialised and developing nations. Over 10 million new cases of cancer are diagnosed each year, and more than 6 million people die from cancer globally.

These tumours are typically substantial, powerful masses of tissue. Blood-

related cancers, including leukaemia, typically do not form robust tumours. Malignant tumours are those that have the potential to expand into or harm nearby tissues. Additionally, some growth cells within these tumours have the capacity to split off as they grow, travel through the bloodstream or the lymphatic system, and +benign tumours are not the same as cancerous ones. The tissues around and immediately around them are neither distributed or attacked by them. Benign tumours are removed either surgically or via other methods of treatment, and they never come back. Malignant tumours, on the other hand, can recur after removal. Except for benign tumours that develop in the brain, benign tumours typically pose no threat to life. Brain benign tumours can pose risks and potentially result in a person's demise.

Mudholkar and Srivastava introduced the Exponentiated Weibull distribution family (EWD) at the beginning (1993). The one-parameter exponential family, the Exponentiated exponential family as a subfamily, and the most prevalent two-parameter Weibull family as a unique subfamily are all covered.

The EWD family supports non-monotonic hazard functions. Which is one of its distinctive qualities. To learn more about the anticipated time to cross the threshold level of the seroconversion period, see Esary et al., (1973), Elangovan et al., (2009), and Pandiyan et al., respectively (2015).

2. ASSUMPTIONS OF THE MODEL

These assumptions are somewhat artificial, but are made because of the lack of detailed real-world information on one hand and in order to illustrate the proceedings on the other hand. cancer tumour growth is exclusively triggered by

alcohol interaction. Any person's threshold is a random variable. A individual is identified as being infected if the total harm exceeds a threshold level Y, which is a random variable in itself. The chronology of damage, the threshold, and the inter-arrival intervals between alcohol and cancer are all independent of one another.

3. MODEL DESCRIPTION

The Cumulative density function (CDF) of the three parameter Exponentiated Weibull distribution

$$F(x,\lambda) = \left[1 - e^{-\left(\frac{x}{\lambda}\right)^{k}}\right]^{\alpha} \; ; \qquad x > 0$$

The corresponding survival function is

$$\overline{\mathrm{H}}(\mathrm{x}) = \mathrm{e}^{-\left(\frac{\mathrm{x}}{\lambda}\right)^{\mathrm{k}}} \qquad (1)$$

Y: Continuous random variable denoting the threshold level of three parameter Exponentiated Weibull distribution.

$$P(X_i < Y) = \int_0^{\infty} g^*(x)\overline{H}(x)dx \qquad (2)$$

S(t) : the survivor function i.e $P(T > t)$

$$P(T > t) = \sum_{k=0}^{\infty} V_k(t)P(X_i < Y) \qquad (3)$$

Taking Laplace Transformation of the life time $= 1 - S(t)$ we get Let the random variable U denoting inter arrival time which follows exponential with parameter c. Now $f^*(s) = \left(\frac{c}{c+s}\right)$, substituting in the above equation (4) we get

$$l^*(s) = \frac{\left[1 - g^*\left(\frac{1}{\sigma}\right)^{\beta}\right] f^*(s)}{\left[1 - g^*\left(\frac{1}{\sigma}\right)^{\beta} f^*(s)\right]} \qquad (4)$$

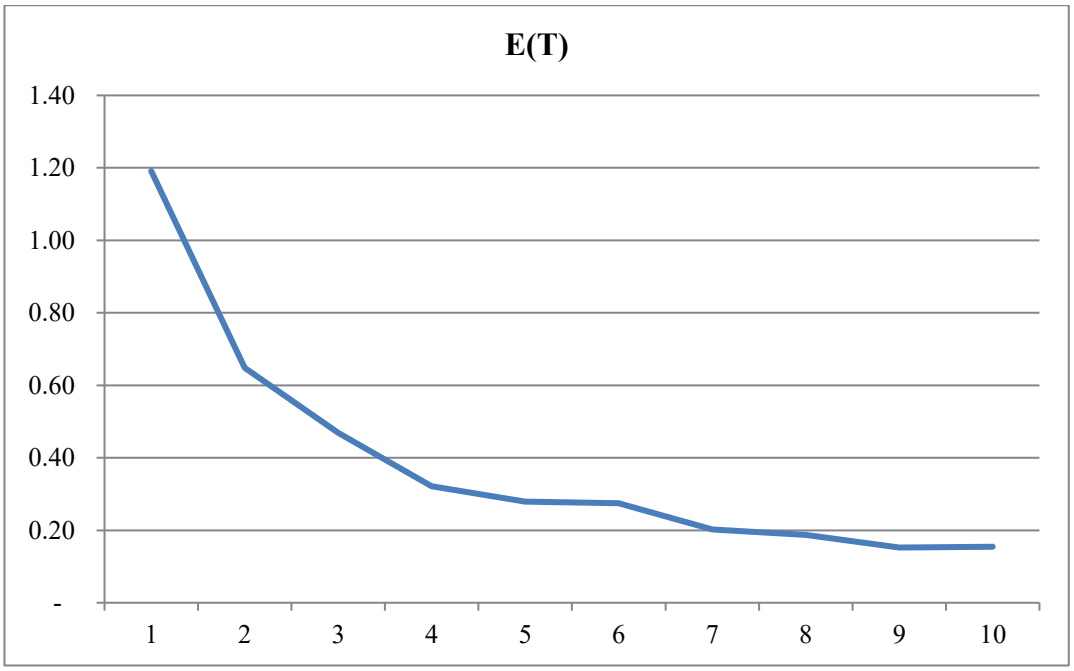
Let the random variable U denoting inter arrival time which follows exponential with parameter. Now $f^*(s) = \left(\frac{c}{c+s}\right)$, substituting in the above equation we get

$$E(T) = -\frac{d}{ds} l^*(s) \qquad given \quad s = 0$$

$$= \frac{1}{c\left[1 - g^*\left(\frac{1}{\lambda}\right)^{\beta}\right]} \qquad (5)$$

Then

$$E(T) = \frac{\mu\lambda^k + 1}{c} \qquad (6)$$



4. CONCLUSION

A person infected with cancer infection crosses the threshold level more quickly, the current researcher concludes based on the aforementioned study. Once a person has been infected, the cells are damaged, making it more likely that they may become infected in the future. The length of the infection depends on how long the sick person was exposed to alcohol. The model also demonstrates how the immune system begins to break down in an infected person. The period of time is when the infected person drank. The anticipated lifetime quickly falls below the threshold value. The length of the infection depends on how long the sick person was exposed to alcohol. The above table and figures demonstrate how the model predicts that as soon as an individual becomes infected, their immune system begins to deteriorate. The anticipated life span of a cancer patient will shorten if the number of contacts rises above the threshold level.

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