

Math 150 - Methods in Biostatistics - Homework 8

your name here

Due: Wednesday, March 27, 2019, in class

1. Chp 9, A2

For the chip melting study, describe the event of interest, the time-to-event random variable T , the beginning of time, and the scale for measuring time.

2. Chp 9, A4

Use equation (9.1) and the 7 milk chocolate melting times in Table 9.1 to compute $\hat{S}(25)_E$, $\hat{S}(30)_E$, $\hat{S}(40)_E$, and $\hat{S}(60)_E$.

3. Chp 9, A5

With the melting times provided in Table 9.2, use the following two approaches to calculate the estimated probability that it takes more than 45 seconds for a chocolate chip to melt, based on the empirical survival function $\hat{S}(45)_E$.

- Treat all the censored times as complete (actual observed) times, and use Equation (9.1) to calculate $\hat{S}(45)_E$.
- Eliminate all censored observations, and then use Equation (9.1) and the remaining complete observations to calculate $\hat{S}(45)_E$.

4. Chp 9, A6

Consider the chocolate chip melting time data in Table 9.2. What is m ? List t_1 through t_m for the chip melting times.

5. Chp 9, A7

The first two intervals for the chocolate chip melting times are $[0,25)$ and $[25, 30)$. Write out the remaining intervals. Notice that any incomplete times, such as $30+$ and $35+$, are ignored in creating intervals. (Apropos of nothing, I find the following website to be very helpful in making markdown tables: https://www.tablesgenerator.com/markdown_tables)

6. Chp 9, A8

Determine d_i , the number of melted chips in each interval, and n_i , the number of chips at risk of melting in each interval (all chips with complete or censored times that have not yet occurred), for $i = 0, 1, 2, 3, 4$.

7. Chp 9, A9

What is the value of \hat{p}_0 ? Interpret the value.

8. Chp 9, A10

\hat{p}_1 is the estimate of the conditional probability that a chip will melt between the 25th second and the 30th second, given that it has remained unmelted through the 25th second. Show that about 14% of the chips that have not melted just prior to the 25th second will melt between the 25th and the 30th second.

9. Chp 9, A11

Calculate the remaining estimated conditional probabilities \hat{p}_3 and \hat{p}_4 . Place these values in the appropriate cells in Table 9.3 and interpret the values.

10. Chp 9, A12

Calculate the remaining estimated conditional probabilities $1 - \hat{p}_3$ and $1 - \hat{p}_4$. Place these values in the appropriate cells in Table 9.3 and interpret the values.

11. Chp 9, A13

Use the remaining chocolate chip melting times to complete Table 9.3.

12. Chp 9, A14

What is the estimate for $S(45)$ in Table 9.3? That is, what proportion of chips in the sample has not melted after 45 seconds?

13. Chp 9, A15

Use the entries in Table 9.3 to estimate the proportion of chips that have melted by 35 seconds.

14. Chp 9, A16

Use the entries in Table 9.3 to estimate the proportion of chips that have not melted after 50 seconds.

15. Chp 10, A17

Assume that no censoring is present in the melting times (see the entries in Table 9.1). Estimate $S(25)$, $S(30)$, $S(45)$, and $S(55)$ using both the empirical survival function and the Kaplan-Meier estimator, and compare your answers. What do your answers suggest about the Kaplan-Meier estimator when no censoring is present?