

III. DATA FROM THE STUDY OF MACHIN AND GARDNER

Machin and Gardner (31) provide an example of data from a clinical study of 49 subjects with colorectal cancer. Twenty-five of the subjects were treated with study drug, while 24 were controls. The following discloses the times when a subject died, and times when a subject was censored. The time a subject died is the “survival time.”

The raw data provided were as follows:

Events of death. Subjects died on the following months. Repeated numbers mean that more than one subject died on that month. In Group 1, subjects died on months: 6, 6, 10, 10, 12, 12, 12, 12, 24, and 32. In Group 2, subjects died on months: 6, 6, 6, 6, 8, 8, 12, 12, 20, 24, 30, and 42.

Censored subjects. Subjects were censored on the following months. Repeated numbers mean that more than one subject was censored on that month. In Group 1, subjects were censored on month: 1, 5, 9, 10, 12, 13, 15, 16, 20, 24, 27, 34, 36, 36, 44. In Group 2, subjects were censored on month: 3, 12, 15, 16, 18, 18, 22, 28, 28, 28, 30, 33.

In all cases, a subject experiencing the event of interest (death) was a different human being than a subject who was censored. Events and censoring are entered into the calculations, but at different points in the mathematical formulas.

Table 9.1 provides numbers (r_{1i} , r_{2i} , and d_i) that occur as intermediates in the calculation of the hazard ratio.

In approaching the conclusion of the calculation of the hazard ratio, it is found that $O_1 = 10$, $E_1 = 11.37$, $O_2 = 12$, and $E_2 = 10.63$. In arriving at the conclusion of this calculation, it is seen that the hazard ratio is as follows (Eq. (4)):

$$\text{Hazard ratio} = \frac{[O_1 / E_1]}{[O_2 / E_2]} = \frac{[10 / 11.37]}{[12 / 10.63]} = 0.78 \quad (4)$$

This means that treatment with study drug is associated with a reduction in deaths to 78% compared to that found with the control treatment. Dawson and Trapp (32) provide another example of calculating the hazard ratio, along with intermediate numbers that were used during the course of the calculation.

IV. DATA USED FOR CONSTRUCTING THE KAPLAN-MEIER PLOT ARE FROM SUBJECTS ENROLLING AT DIFFERENT TIMES

In a typical clinical trial, the sequence of events for each subject involves responding to an advertisement, contacting the sponsor, and undergoing screening and enrollment.

³¹ Machin D, Gardner MJ. Calculating confidence intervals for survival time analyses. *Brit Med J*. 1988;296:1369–1371.

³² Dawson B, Trapp R.G. *Basic and Clinical Biostatistics*. 4th ed. New York, NY: Lange Medical Books; 2004;229–235.