|  |  |  |
| --- | --- | --- |
| Assignment 2 – Part 2 | August 13  15338673 | |
| Paul-Willem Janse van Rensburg | | Survival Analysis |

We estimate the survival function using the Kaplan-Meier method and arrive at an estimate for treatment 1:

We set up a 95% confidence interval, implementing the below equation:

Around the estimated mean, , with the following result (α = 0.05):

We repeat the above for treatment 2, with the following results:

Continuing from before, we estimate the survival function using the Kaplan-Meier method and retrieve the below summary (for treatment 1, treatment 2 to follow with same methodology applied).

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| time | n.risk | n.event | n.censor | surv | std.err | upper | lower | strata |
| 1.5 | 43 | 1 | 0 | 0.976744 | 0.023531 | 1 | 0.93272 | 1 |
| 2.5 | 42 | 0 | 2 | 0.976744 | 0.023531 | 1 | 0.93272 | 1 |
| 3.5 | 40 | 1 | 3 | 0.952326 | 0.034565 | 1 | 0.889946 | 1 |
| 4.5 | 36 | 2 | 1 | 0.899419 | 0.053186 | 0.998237 | 0.810383 | 1 |
| 5.5 | 33 | 1 | 1 | 0.872163 | 0.061447 | 0.983788 | 0.773205 | 1 |
| 6.5 | 31 | 0 | 2 | 0.872163 | 0.061447 | 0.983788 | 0.773205 | 1 |
| 7.5 | 29 | 0 | 4 | 0.872163 | 0.061447 | 0.983788 | 0.773205 | 1 |
| 8.5 | 25 | 2 | 1 | 0.80239 | 0.08517 | 0.948162 | 0.67903 | 1 |
| 9.5 | 22 | 1 | 1 | 0.765918 | 0.097049 | 0.926383 | 0.633249 | 1 |
| 10.5 | 20 | 1 | 1 | 0.727622 | 0.109773 | 0.902287 | 0.586769 | 1 |
| 11.5 | 18 | 1 | 1 | 0.687199 | 0.123766 | 0.875855 | 0.539179 | 1 |
| 12.5 | 16 | 0 | 2 | 0.687199 | 0.123766 | 0.875855 | 0.539179 | 1 |
| 13.5 | 14 | 0 | 1 | 0.687199 | 0.123766 | 0.875855 | 0.539179 | 1 |
| 14.5 | 13 | 0 | 2 | 0.687199 | 0.123766 | 0.875855 | 0.539179 | 1 |
| 15.5 | 11 | 1 | 0 | 0.624726 | 0.156234 | 0.848547 | 0.459942 | 1 |
| 16.5 | 10 | 1 | 0 | 0.562254 | 0.188468 | 0.813497 | 0.388605 | 1 |
| 18.5 | 9 | 1 | 0 | 0.499781 | 0.222281 | 0.772655 | 0.323276 | 1 |
| 21.5 | 8 | 0 | 2 | 0.499781 | 0.222281 | 0.772655 | 0.323276 | 1 |
| 22.5 | 6 | 0 | 2 | 0.499781 | 0.222281 | 0.772655 | 0.323276 | 1 |
| 23.5 | 4 | 1 | 0 | 0.374836 | 0.364338 | 0.765537 | 0.183534 | 1 |
| 25.5 | 3 | 0 | 1 | 0.374836 | 0.364338 | 0.765537 | 0.183534 | 1 |
| 26.5 | 2 | 1 | 0 | 0.187418 | 0.795451 | 0.891046 | 0.03942 | 1 |
| 27.5 | 1 | 0 | 1 | 0.187418 | 0.795451 | 0.891046 | 0.03942 | 1 |

Estimating the median, as retrieved from the above table as the largest smaller than 0.5. It is estimated as below:

We estimate a 95% confidence interval using the below equation:

Where is the median for the treatment, around the aforementioned mean, with the standard error as retrieved from the table and with a , with the following result (α = 0.05):

So we can only estimate a lower bound of 4.5, but no upper bound.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| time | n.risk | n.event | n.censor | surv | std.err | upper | lower | strata |
| 0.5 | 76 | 6 | 10 | 0.921053 | 0.033583 | 0.983717 | 0.86238 | 2 |
| 1.5 | 60 | 0 | 4 | 0.921053 | 0.033583 | 0.983717 | 0.86238 | 2 |
| 2.5 | 56 | 2 | 5 | 0.888158 | 0.042299 | 0.964928 | 0.817495 | 2 |
| 3.5 | 49 | 1 | 5 | 0.870032 | 0.047057 | 0.954092 | 0.793378 | 2 |
| 4.5 | 43 | 0 | 3 | 0.870032 | 0.047057 | 0.954092 | 0.793378 | 2 |
| 5.5 | 40 | 0 | 5 | 0.870032 | 0.047057 | 0.954092 | 0.793378 | 2 |
| 6.5 | 35 | 1 | 1 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 7.5 | 33 | 0 | 3 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 8.5 | 30 | 0 | 3 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 9.5 | 27 | 0 | 2 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 10.5 | 25 | 0 | 3 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 11.5 | 22 | 0 | 2 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 12.5 | 20 | 0 | 4 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 14.5 | 16 | 0 | 2 | 0.845174 | 0.055269 | 0.941871 | 0.758404 | 2 |
| 15.5 | 14 | 1 | 0 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 16.5 | 13 | 0 | 2 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 18.5 | 11 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 19.5 | 10 | 0 | 3 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 20.5 | 7 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 22.5 | 6 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 24.5 | 5 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 25.5 | 4 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 26.5 | 3 | 0 | 2 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |
| 28.5 | 1 | 0 | 1 | 0.784805 | 0.092462 | 0.940731 | 0.654723 | 2 |

As at no point does the survival estimate reach 0.5 (as can be seen in the above table). With an undefined median, we only have the below confidence interval:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| time | n.risk | n.event | n.censor | surv | std.err | upper | lower |
| 1.5 | 43 | 1 | 0 | 0.976744 | 0.023531 | 0.995468 | 0.885238 |
| 2.5 | 42 | 0 | 2 | 0.976744 | 0.023531 | 0.995468 | 0.885238 |
| 3.5 | 40 | 1 | 3 | 0.952326 | 0.034565 | 0.984862 | 0.855191 |
| 4.5 | 36 | 2 | 1 | 0.899419 | 0.053186 | 0.954618 | 0.78509 |
| 5.5 | 33 | 1 | 1 | 0.872163 | 0.061447 | 0.93676 | 0.750981 |
| 6.5 | 31 | 0 | 2 | 0.872163 | 0.061447 | 0.93676 | 0.750981 |
| 7.5 | 29 | 0 | 4 | 0.872163 | 0.061447 | 0.93676 | 0.750981 |
| 8.5 | 25 | 2 | 1 | 0.80239 | 0.08517 | 0.890015 | 0.659683 |
| 9.5 | 22 | 1 | 1 | 0.765918 | 0.097049 | 0.86367 | 0.615552 |
| 10.5 | 20 | 1 | 1 | 0.727622 | 0.109773 | 0.835095 | 0.570608 |
| 11.5 | 18 | 1 | 1 | 0.687199 | 0.123766 | 0.804108 | 0.524423 |
| 12.5 | 16 | 0 | 2 | 0.687199 | 0.123766 | 0.804108 | 0.524423 |
| 13.5 | 14 | 0 | 1 | 0.687199 | 0.123766 | 0.804108 | 0.524423 |
| 14.5 | 13 | 0 | 2 | 0.687199 | 0.123766 | 0.804108 | 0.524423 |
| 15.5 | 11 | 1 | 0 | 0.624726 | 0.156234 | 0.761519 | 0.443815 |
| 16.5 | 10 | 1 | 0 | 0.562254 | 0.188468 | 0.714558 | 0.372886 |
| 18.5 | 9 | 1 | 0 | 0.499781 | 0.222281 | 0.664039 | 0.30882 |
| 21.5 | 8 | 0 | 2 | 0.499781 | 0.222281 | 0.664039 | 0.30882 |
| 22.5 | 6 | 0 | 2 | 0.499781 | 0.222281 | 0.664039 | 0.30882 |
| 23.5 | 4 | 1 | 0 | 0.374836 | 0.364338 | 0.586967 | 0.164103 |
| 25.5 | 3 | 0 | 1 | 0.374836 | 0.364338 | 0.586967 | 0.164103 |
| 26.5 | 2 | 1 | 0 | 0.187418 | 0.795451 | 0.464645 | 0.025788 |
| 27.5 | 1 | 0 | 1 | 0.187418 | 0.795451 | 0.464645 | 0.025788 |

We estimate a 95% confidence interval using the below equation: