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Text S2. Calculation of incidence rate ratios and 95% confidence intervals


An effect estimate and 95% confidence interval was not reported in this study. However, the data necessary to calculate a rate ratio has been provided in the supplementary appendix. First, we must calculate the point estimate:

\[ \hat{R} = \frac{A_1/T_1}{A_0/T_0} \]

\( A_1 = 17 = \) tuberculosis cases in immediate ART arm
\( T_1 = 1661.9 = \) person-years at risk of a clinical event in immediate ART arm
\( A_0 = 33 = \) tuberculosis cases in deferred ART arm
\( T_0 = 1641.8 = \) person-time at risk of a clinical event in deferred ART arm

\[ \text{IR} = \frac{17}{1661.9} / \frac{33}{1641.8} = 0.5089 \]

Next, we must calculate the standard deviation of the log rate ratio:

\[ S\hat{D}[\ln(\hat{R})] = \left( \frac{1}{A_1} + \frac{1}{A_0} \right)^{1/2} \]

\[ \text{SD}[\ln(\text{IR})] = (1/17 + 1/33)^{0.5} = 0.2985 \]

Finally, we can calculate the lower and upper limits of the rate ratio:

\[ [\text{IR}, \hat{R}] = \exp[\ln(\hat{R}) \pm Z\gamma S\hat{D}[\ln(\hat{R})]] \]

\[ = \exp[\ln(0.5089) \pm 1.96(0.2985)] = 0.2835, 0.9136 \]

Therefore the rate ratio and its 95% confidence interval is: 0.51 (0.28 to 0.91).
An effect estimate and 95% confidence interval was not reported in participants with baseline CD4 counts < 200 cells/µL. However, the data necessary to calculate a rate ratio has been provided. In order to calculate the tuberculosis rate ratio for people with CD4 counts < 200 cells/µL we must use the incidence rates and their 95% confidence intervals.

The incidence rate in people who started ART with baseline CD4 counts < 200 cells/µL was 0.60 cases / 100 person-years of observation (95% CI, 0.15 to 2.37). Given

$$\hat{SD}[\ln(\hat{IR})] = \frac{1}{A^{1/2}}$$

we can solve for the (1/A^0.5), i.e. the standard deviation of the log incidence rate, using the lower 95% confidence interval:

$$\hat{R}, \hat{IR} = \exp[\ln(\hat{IR})] \pm Z_y(1/A^{1/2})$$

$$\ln(95\% \text{ IR Lower Limit, LL}) = \ln(\text{IR}) - Z_y \text{ SD}[\ln(\text{IR})]$$

$$\frac{\ln(\text{LL}) - \ln(\text{IR})}{-Z_y} = \text{SD}[\ln(\text{IR})]$$

$$\text{SD}[\ln(\text{IR})] = \frac{(\ln(0.15) - \ln(0.60))}{-1.96} = 0.7073$$

Given SD[ln(IR)] we can now calculate A1, or the number of events in the stratum on ART:

$$\hat{SD}[\ln(\hat{IR})] = \frac{1}{A^{1/2}}$$

$$0.7073 = 1/(A1^{0.5})$$

$$1 = 0.7073*(A1^{0.5})$$

$$1 / 0.7073 = (A1^{0.5})$$

$$1.4138 = (A1^{0.5})$$

$$1.9989 = A1$$

A1~2 cases of tuberculosis
The incidence rate in people off ART with baseline CD4 counts < 200 cells/µL was 5.47 cases / 100 person-years of observation (95% CI, 2.73 to 10.94). Given

$$\hat{SD}[\ln(\hat{IR})] = \frac{1}{A^{1/2}}$$

we can solve for the $(1/A^{0.5})$, i.e. the standard deviation of the log incidence rate, using the lower 95% confidence interval:

$$\ln(95\% \text{ IR Lower Limit, LL}) = \ln(\text{IR}) - Z_y \cdot SD[\ln(\text{IR})]$$

$$(\ln(\text{LL}) - \ln(\text{IR})) / -Z_y = SD[\ln(\text{IR})]$$

$$SD[\ln(\text{IR})] = (\ln(2.73) - \ln(5.47)) / -1.96 = 0.3546$$

Given SD[ln(IR)] we can now calculate $A_0$, or the number of events in the stratum off ART:

$$0.3546 = 1/(A_0^{0.5})$$

$$1 = 0.3546(A_0^{0.5})$$

$$1 / 0.3546 = (A_0^{0.5})$$

$$2.8202 = (A_0^{0.5})$$

$$7.9537 = A_0$$

$A_0 \sim 8$ cases of tuberculosis

Since we have calculated the number of cases in both study arms, we can now calculate the rate ratio and its 95% confidence interval. First, we must calculate the point estimate:

$$\hat{IR} = \frac{A_1/T_1}{A_0/T_0}$$

$$\text{IR} = (0.60/100) / (5.47/100) = 0.1097$$

Next we must calculate the standard deviation of the log rate ratio:

$$\hat{SD}[\ln(\hat{IR})] = \left( \frac{1}{A_1} + \frac{1}{A_0} \right)^{1/2}$$

$$SD[\ln(\text{IR})] = (1/2 + 1/8)^{0.5} = 0.7912$$

Finally, we can calculate the 95% limits of the rate ratio:

$$\hat{IR}, \hat{IR} = \exp[\ln(\hat{IR}) \pm Z_y \cdot SD[\ln(\hat{IR})]]$$

$$= \exp[\ln(0.1097) \pm 1.96(0.7912)] = 0.0233, 0.5172$$

Therefore the rate ratio and its 95% confidence interval is: 0.11 (0.02 to 0.52).