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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:

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

A1 = 17 = tuberculosis cases in immediate ART arm
T1 = 1661.9 = person-years at risk of a clinical event in immediate ART arm
A0 = 33 = tuberculosis cases in deferred ART arm
T0 = 1641.8 = person-time at risk of a clinical event in deferred ART arm

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

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

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

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

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

\[ IR \pm Z_{0.025} SD[\ln(\hat{IR})] \]

=exp[\ln(0.5089) ± 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

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

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:

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

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

\[
SD[\ln(\hat{IR})] = (\ln(0.15)-\ln(0.60)) / -1.96 = 0.7073
\]

Given \(SD[\ln(\hat{IR})]\) we can now calculate \(A_1\), or the number of events in the stratum on ART:

\[
SD[\ln(\hat{IR})] = \frac{1}{A_1^{1/2}}
\]

\[
0.7073 = 1/(A_1^{0.5})
\]

\[
1 = 0.7073*(A_1^{0.5})
\]

\[
1 / 0.7073 = (A_1^{0.5})
\]

\[
1.4138 = (A_1^{0.5})
\]

\[
1.9989 = A_1
\]

\(A_1\sim 2\) 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:

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

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

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

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

Given SD[ln(IR)] we can now calculate A0, or the number of events in the stratum off ART:

$$0.3546 = 1/(A0^{0.5})$$

$$1 = 0.3546(A0^{0.5})$$

$$1 / 0.3546 = (A0^{0.5})$$

$$2.8202 = (A0^{0.5})$$

$$7.9537 = A0$$

$$A0 \sim 8 \ cases \ of \ tuberculosis$$

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:

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

$$IR = (0.60/100) / (5.47/100) = 0.1097$$

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

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

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

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

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

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

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