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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:

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

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

\[ IR = (17/1661.9) / (33/1641.8) = 0.5089 \]

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

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

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

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

\[ IR, \hat{R} = \exp[\ln(\hat{R}) \pm Z_\gamma SD[\ln(\hat{R})]] \]

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

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

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

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:

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

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

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

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

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

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

\[
\begin{align*}
\text{SD}[\ln(I_R)] &= \frac{1}{A^{1/2}}
\end{align*}
\]

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:

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

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

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

Given \(\text{SD}[\ln(I_R)]\) we can now calculate \(A_0\), or the number of events in the stratum off ART:

\[
\begin{align*}
0.3546 &= 1/(A_0^{0.5}) \\
1 &= 0.3546(A_0^{0.5}) \\
1 / 0.3546 &= (A_0^{0.5}) \\
2.8202 &= (A_0^{0.5}) \\
7.9537 &= A_0
\end{align*}
\]

\(A_0 \sim 8\) 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:

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

\[
IR = (0.60/100) / (5.47/100) = 0.1097
\]

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

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

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

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

\[
\begin{align*}
I_R, \bar{I_R} = \exp[\ln(\hat{I_R}) \pm Z_y \cdot \text{SD}[\ln(\hat{I_R})]] \\
= \exp[\ln(0.1097) \pm 1.96(0.7912)] = 0.0233, 0.5172
\end{align*}
\]

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