SUPPLEMENT

In Supplement, we show the complete derivation of assurance probability for criteria (i)and (ii).

$$AP_{(\mathrm{i})} = P_{H_a}(D_s \geq \rho D \mid Z > z_{1-\epsilon}) = P_{H_a}\Big(D_s \geq \rho\Big(p_s D_s + (1-p_s)D_{sc}\Big) \mid Z > z_{1-\epsilon}\Big)$$

$$= P_{H_a}\Big(D_s \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)D_{sc} \mid Z > z_{1-\epsilon}\Big)$$

$$= P_{H_a}\Bigg(\frac{D_s}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}} \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)\frac{D_{sc}}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}} \mid Z > z_{1-\epsilon}\Bigg)$$

$$= P_{H_a}\Big(Z_s \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)Z_{sc} \mid Z > z_{1-\epsilon}\Big)$$

$$= P_{H_a}\Bigg(Z_s - \frac{\left[\frac{4}{n_s}\right]^{1/2}\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}V(t,\ \beta,\ \alpha)d\Lambda(t)}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}} \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)Z_{sc}$$

$$- \frac{\left[\frac{4}{n_s}\right]^{1/2}\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}V(t,\ \beta,\ \alpha)d\Lambda(t)}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}} \mid Z > z_{1-\epsilon}\Bigg)$$

$$= P_{H_0}\Bigg(Z_s \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)Z_{sc} + \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)\frac{\left[\frac{4}{n_{sc}}\right]^{1/2}\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}V(t,\ \beta,\ \alpha)d\Lambda(t)}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}}$$

$$- \frac{\left[\frac{4}{n_s}\right]^{1/2}\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}V(t,\ \beta,\ \alpha)d\Lambda(t)}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t)+A_1\pi_1(t)}d\Lambda(t))^{1/2}} \mid Z > -z_{1-\iota}\Bigg)$$

$$= P_{H_0}\Big(Z_s \geq \Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big)Z_{sc} + \Big(\frac{1}{\sqrt{p_s}}\Big(\frac{\rho(1-p_s)}{1-\rho p_s}\Big) - \frac{1}{\sqrt{1-p_s}}\Big)$$

$$\frac{\left[\frac{4}{n}\right]^{1/2}\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t) + A_1\pi_1(t)}V(t,\ \beta,\ \alpha)d\Lambda(t)}{(\int \frac{\pi_0(t)\pi_1(t)}{A_0\pi_0(t) + A_1\pi_1(t)}d\Lambda(t))^{1/2}} \mid Z > -z_{1-\iota}\Bigg)$$

$$= P_{H_0}\Bigg(Z_s \geq \left(\frac{\rho(1-p_s)}{1-\rho p_s}\right)Z_{sc} + \left(\frac{1}{\sqrt{p_s}}\left(\frac{\rho(1-p_s)}{1-\rho p_s}\right) - \frac{1}{\sqrt{1-p_s}}\right)(z_{1-\epsilon}+z_{1-\iota}) \mid Z > -z_{1-\iota}\Bigg)$$

$$= P_{H_0}\Bigg(Z_s \geq \left(\frac{\rho(1-p_s)}{1-\rho p_s}\right)Z_{sc} + \left(\frac{1}{\sqrt{p_s}}\left(\frac{\rho(1-p_s)}{1-\rho p_s}\right) - \frac{1}{\sqrt{1-p_s}}\right)(z_{1-\epsilon}+z_{1-\iota}),$$

$$\sqrt{p_s}Z_s + \sqrt{1-p_s}Z_{sc} > -z_{1-\iota}\Bigg) \times \frac{1}{1-\iota}$$

$$= \frac{\left[\int_a^\infty \left(\Phi\left(\frac{u-c_2}{c_1}\right) - \Phi\left(\frac{c_5-c_3u}{c_4}\right)\right)\phi(u)du\right]}{1-\iota}$$

where $(a,\ b)$ is the solution of $u = c_1v + c_2$ and $c_3u + c_4v = c_5$. $c_1 = \frac{\rho(1-p_s)}{1-\rho p_s}$, $c_2 = \left(\frac{1}{\sqrt{p_s}}\left(\frac{\rho(1-p_s)}{1-\rho p_s}\right) - \frac{1}{\sqrt{1-p_s}}\right)(z_{1-\epsilon}+z_{1-\iota})$, $c_3 = \sqrt{p_s}$, $c_4 = \sqrt{1-p_s}$, $c_5 = -z_{1-\iota}$. Thus, $AP_{(\text{i})} = P_{H_a}(D_s \geq \rho D \mid Z > z_{1-\epsilon}) = \frac{P_{H_a}(D_s \geq \rho D,\ Z > z_{1-\epsilon})}{1-\iota}$ can be obtained.

$$AP_{(\text{ii})} = P_{H_a}(D_s \geq \rho D_{sc} \mid Z > z_{1-\epsilon}) = P_{H_a}\Bigg(Z_s \geq \rho Z_{sc} \mid Z > z_{1-\epsilon}\Bigg)$$

$$= P_{H_0}\Bigg(Z_s \geq \rho Z_{sc} + \left(\frac{\rho}{\sqrt{p_s}} - \frac{1}{\sqrt{1-p_s}}\right)(z_{1-\epsilon}+z_{1-\iota}) \mid Z > -z_{1-\iota}\Bigg)$$

$$= P_{H_0}\Bigg(Z_s \geq \rho Z_{sc} + \left(\frac{\rho}{\sqrt{p_s}} - \frac{1}{\sqrt{1-p_s}}\right)(z_{1-\epsilon}+z_{1-\iota}),$$

$$\sqrt{p_s}Z_s + \sqrt{1-p_s}Z_{sc} > -z_{1-\iota}\Bigg) \times \frac{1}{1-\iota}$$

$$= \frac{\left[\int_a^\infty \left(\Phi\left(\frac{u - c_2}{c_1}\right) - \Phi\left(\frac{c_5 - c_3 u}{c_4}\right)\right)\phi(u)du\right]}{1 - \iota}$$

where $(a,\ b)$ is the solution of $u = c_1 v + c_2$ and $c_3 u + c_4 v = c_5$. $c_1 = \rho$, $c_2 = \frac{\rho}{\sqrt{p_s}} - \frac{1}{\sqrt{1 - p_s}}(z_{1-\epsilon} + z_{1-\iota})$, $c_3 = \sqrt{p_s}$, $c_4 = \sqrt{1 - p_s}$, $c_5 = -z_{1-\iota}$.
Thus, $AP_{(\text{ii})} = P_{H_a}(D_s \geq \rho D_{sc} \mid Z > z_{1-\epsilon}) = \frac{P_{H_a}(D_s \geq \rho D_{sc},\ Z > z_{1-\epsilon})}{1 - \iota}$ can be obtained.