

Simulation Result 1: C~Exp(0.2)

Yi

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Biomarker1; EXP(0.2)

Table 1: Summary of the estimated SAUC for Biomarker1 when the true censoring is distributed as $Exp(0.2)$.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 75.75 (73.86, 77.74) | 75.63 (74.12, 77.25) | 75.45 (74.17, 76.88) |
| | | BNM _P | 75.01 (73.31, 76.39) | 74.82 (73.57, 75.99) | 74.66 (73.68, 75.64) |
| | | BNM _O | 75.43 (73.62, 77.02) | 75.32 (73.98, 76.56) | 75.12 (74.09, 76.13) |
| | | Succuess | 99.7 | 99.9 | 100 |
| | 30 | Proposed | 75.63 (74.01, 77.26) | 75.47 (73.98, 77.07) | 75.30 (74.27, 76.35) |
| | | BNM _P | 74.70 (73.47, 75.92) | 74.68 (73.56, 75.85) | 74.63 (73.89, 75.43) |
| | | BNM _O | 75.20 (73.92, 76.49) | 75.16 (73.96, 76.35) | 75.08 (74.29, 75.89) |
| | | Succuess | 100 | 99.9 | 100 |
| | 50 | Proposed | 75.36 (74.16, 76.69) | 75.27 (74.19, 76.32) | 75.11 (74.33, 75.97) |
| | | BNM _P | 74.61 (73.65, 75.57) | 74.57 (73.77, 75.33) | 74.49 (73.86, 75.08) |
| | | BNM _O | 75.04 (74.04, 76.09) | 75.05 (74.19, 75.83) | 74.91 (74.29, 75.53) |
| | | Succuess | 100 | 100 | 100 |
| 50-300 | 20 | Proposed | 76.38 (74.85, 78.11) | 76.30 (74.79, 77.62) | 76.29 (75.21, 77.26) |
| | | BNM _P | 75.94 (74.76, 77.08) | 75.77 (74.70, 76.74) | 75.80 (75.03, 76.57) |
| | | BNM _O | 76.27 (75.00, 77.58) | 76.11 (74.97, 77.12) | 76.11 (75.22, 76.92) |
| | | Succuess | 99.8 | 99.9 | 100 |
| | 30 | Proposed | 76.41 (75.13, 77.67) | 76.13 (75.08, 77.20) | 76.14 (75.34, 76.94) |
| | | BNM _P | 75.80 (74.88, 76.66) | 75.74 (74.86, 76.51) | 75.66 (75.00, 76.33) |
| | | BNM _O | 76.11 (75.10, 77.14) | 75.98 (75.17, 76.87) | 75.94 (75.26, 76.65) |
| | | Succuess | 99.9 | 100 | 100 |
| | 50 | Proposed | 76.15 (75.13, 77.13) | 76.15 (75.36, 76.98) | 76.04 (75.43, 76.65) |
| | | BNM _P | 75.69 (74.83, 76.45) | 75.66 (75.02, 76.26) | 75.63 (75.11, 76.06) |
| | | BNM _O | 75.98 (75.10, 76.79) | 75.96 (75.29, 76.68) | 75.90 (75.36, 76.40) |
| | | Succuess | 100 | 100 | 100 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.

Biomarker2; EXP(0.2)

Table 2: Summary of the estimated SAUC for Biomarker2 when the true censoring is distributed as $Exp(0.2)$.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 65.57 (64.33, 66.65) | 65.62 (64.64, 66.61) | 65.46 (64.61, 66.29) |
| | | BNM _P | 65.04 (63.79, 66.14) | 65.13 (64.10, 66.03) | 64.99 (64.21, 65.77) |
| | | BNM _O | 65.48 (64.17, 66.58) | 65.57 (64.50, 66.60) | 65.45 (64.59, 66.29) |
| | | Succuess | 99.1 | 97.7 | 97.3 |
| | 30 | Proposed | 65.59 (64.59, 66.55) | 65.43 (64.61, 66.31) | 65.46 (64.77, 66.14) |
| | | BNM _P | 65.08 (64.13, 66.03) | 65.02 (64.09, 65.76) | 64.97 (64.30, 65.56) |
| | | BNM _O | 65.51 (64.58, 66.50) | 65.44 (64.55, 66.27) | 65.43 (64.71, 66.07) |
| | | Succuess | 98.4 | 97.6 | 96.2 |
| | 50 | Proposed | 65.48 (64.72, 66.22) | 65.45 (64.80, 66.05) | 65.46 (64.93, 66.02) |
| | | BNM _P | 65.01 (64.21, 65.74) | 64.97 (64.33, 65.57) | 65.02 (64.45, 65.49) |
| | | BNM _O | 65.46 (64.64, 66.25) | 65.46 (64.78, 66.05) | 65.47 (64.87, 65.99) |
| | | Succuess | 97.5 | 96.5 | 96.2 |
| 50-300 | 20 | Proposed | 65.76 (64.78, 66.68) | 65.83 (65.02, 66.68) | 65.76 (65.13, 66.42) |
| | | BNM _P | 65.35 (64.53, 66.23) | 65.46 (64.68, 66.20) | 65.35 (64.80, 65.99) |
| | | BNM _O | 65.73 (64.88, 66.65) | 65.85 (65.12, 66.63) | 65.80 (65.22, 66.43) |
| | | Succuess | 97.3 | 98.3 | 98.8 |
| | 30 | Proposed | 65.73 (64.96, 66.53) | 65.77 (65.13, 66.38) | 65.77 (65.26, 66.27) |
| | | BNM _P | 65.36 (64.66, 66.06) | 65.34 (64.75, 65.97) | 65.37 (64.93, 65.81) |
| | | BNM _O | 65.75 (65.03, 66.52) | 65.77 (65.15, 66.34) | 65.80 (65.35, 66.28) |
| | | Succuess | 98.2 | 98.7 | 98.2 |
| | 50 | Proposed | 65.74 (65.14, 66.33) | 65.74 (65.22, 66.22) | 65.73 (65.35, 66.13) |
| | | BNM _P | 65.36 (64.81, 65.90) | 65.36 (64.92, 65.82) | 65.35 (65.04, 65.70) |
| | | BNM _O | 65.77 (65.24, 66.34) | 65.80 (65.32, 66.27) | 65.80 (65.46, 66.13) |
| | | Succuess | 98.9 | 98.7 | 98 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.

Biomarker3; EXP(0.2)

Biomarker1; U(1,4)

Biomarker2; U(1,4)

Biomarker3; U(1,4)

Table 3: Summary of the estimated SAUC for Biomarker3 when the true censoring is distributed as $Exp(0.2)$.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 83.77 (81.87, 86.02) | 84.10 (82.18, 86.10) | 84.10 (82.77, 85.73) |
| | | BNM _P | 83.24 (81.25, 85.20) | 83.47 (81.46, 85.36) | 83.26 (81.73, 84.55) |
| | | BNM _O | 83.45 (81.39, 85.27) | 83.62 (81.76, 85.30) | 83.31 (82.04, 84.65) |
| | | Succuess | 97.2 | 98.3 | 99.3 |
| | 30 | Proposed | 84.07 (82.34, 85.98) | 84.21 (82.69, 85.82) | 84.11 (82.78, 85.70) |
| | | BNM _P | 83.15 (81.68, 84.93) | 83.38 (81.97, 84.71) | 83.06 (81.98, 84.28) |
| | | BNM _O | 83.52 (81.84, 85.08) | 83.54 (82.09, 84.87) | 83.34 (82.25, 84.41) |
| | | Succuess | 98.6 | 99 | 99.9 |
| | 50 | Proposed | 84.07 (82.68, 85.74) | 84.20 (82.95, 85.62) | 84.24 (83.17, 85.32) |
| | | BNM _P | 83.14 (81.88, 84.30) | 83.14 (82.01, 84.34) | 83.03 (82.15, 83.91) |
| | | BNM _O | 83.35 (82.14, 84.60) | 83.35 (82.36, 84.47) | 83.23 (82.37, 84.07) |
| | | Succuess | 99.7 | 99.7 | 100 |
| 50-300 | 20 | Proposed | 83.58 (81.23, 85.58) | 83.81 (82.11, 85.61) | 84.01 (82.73, 85.32) |
| | | BNM _P | 84.08 (82.49, 85.65) | 83.85 (82.63, 85.19) | 83.86 (82.84, 84.86) |
| | | BNM _O | 84.17 (82.45, 85.59) | 83.94 (82.62, 85.15) | 83.88 (82.87, 84.91) |
| | | Succuess | 95.5 | 95.4 | 97.2 |
| | 30 | Proposed | 83.79 (82.23, 85.45) | 84.01 (82.57, 85.29) | 84.18 (83.21, 85.26) |
| | | BNM _P | 83.86 (82.64, 85.18) | 83.78 (82.74, 84.79) | 83.89 (83.00, 84.74) |
| | | BNM _O | 83.90 (82.72, 85.16) | 83.90 (82.76, 84.82) | 83.90 (83.03, 84.73) |
| | | Succuess | 96.3 | 97.6 | 99.1 |
| | 50 | Proposed | 84.03 (82.93, 85.38) | 84.08 (83.04, 85.22) | 84.28 (83.38, 85.23) |
| | | BNM _P | 83.81 (82.87, 84.91) | 83.75 (82.96, 84.63) | 83.78 (83.11, 84.51) |
| | | BNM _O | 83.83 (82.96, 84.82) | 83.85 (82.99, 84.69) | 83.83 (83.17, 84.55) |
| | | Succuess | 98.5 | 99.4 | 99.9 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.

Table 4: Summary of the estimated SAUC for Biomarker1 when the true censoring is distributed as $U(1, 4)$, but a misspecified exponential distribution is fitted.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 76.66 (74.74, 78.60) | 76.59 (74.66, 78.34) | 76.37 (74.92, 77.64) |
| | | BNM _P | 75.34 (73.89, 76.74) | 75.06 (73.80, 76.43) | 74.96 (73.99, 75.84) |
| | | BNM _O | 75.71 (74.17, 77.22) | 75.62 (74.18, 76.91) | 75.41 (74.37, 76.32) |
| | | Succuess | 100 | 100 | 100 |
| | 30 | Proposed | 76.41 (74.84, 78.14) | 76.29 (74.81, 77.71) | 75.97 (74.75, 77.31) |
| | | BNM _P | 75.05 (73.86, 76.13) | 74.89 (73.89, 75.86) | 74.80 (74.05, 75.61) |
| | | BNM _O | 75.47 (74.22, 76.63) | 75.42 (74.27, 76.37) | 75.26 (74.46, 76.12) |
| | | Succuess | 100 | 100 | 100 |
| | 50 | Proposed | 76.11 (74.90, 77.54) | 76.06 (74.88, 77.41) | 75.92 (75.01, 76.84) |
| | | BNM _P | 74.81 (73.87, 75.71) | 74.79 (74.03, 75.52) | 74.80 (74.30, 75.38) |
| | | BNM _O | 75.36 (74.33, 76.28) | 75.27 (74.49, 76.05) | 75.28 (74.65, 75.88) |
| | | Succuess | 100 | 100 | 100 |
| 50-300 | 20 | Proposed | 77.12 (75.13, 79.38) | 77.07 (75.28, 78.97) | 76.66 (75.47, 78.15) |
| | | BNM _P | 76.12 (75.02, 77.16) | 76.05 (75.03, 76.95) | 75.93 (75.19, 76.65) |
| | | BNM _O | 76.52 (75.28, 77.60) | 76.34 (75.21, 77.43) | 76.21 (75.39, 77.01) |
| | | Succuess | 100 | 100 | 100 |
| | 30 | Proposed | 77.02 (75.38, 78.95) | 76.85 (75.49, 78.39) | 76.69 (75.71, 77.85) |
| | | BNM _P | 76.04 (75.06, 76.98) | 76.02 (75.12, 76.75) | 75.87 (75.31, 76.45) |
| | | BNM _O | 76.37 (75.36, 77.42) | 76.31 (75.43, 77.09) | 76.18 (75.54, 76.78) |
| | | Succuess | 100 | 100 | 100 |
| | 50 | Proposed | 76.79 (75.72, 78.29) | 76.67 (75.55, 77.82) | 76.62 (75.87, 77.39) |
| | | BNM _P | 76.01 (75.28, 76.69) | 75.84 (75.27, 76.42) | 75.80 (75.33, 76.25) |
| | | BNM _O | 76.33 (75.53, 77.07) | 76.16 (75.50, 76.73) | 76.07 (75.61, 76.58) |
| | | Succuess | 99.9 | 100 | 100 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.

Table 5: Summary of the estimated SAUC for Biomarker2 when the true censoring is distributed as $U(1, 4)$, but a misspecified exponential distribution is fitted.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 65.93 (64.78, 67.15) | 65.92 (64.90, 66.88) | 65.93 (65.19, 66.69) |
| | | BNM _P | 65.14 (63.99, 66.25) | 65.14 (64.15, 66.02) | 65.22 (64.49, 65.92) |
| | | BNM _O | 65.77 (64.54, 66.96) | 65.80 (64.82, 66.76) | 65.87 (65.17, 66.58) |
| | | Succuess | 98.7 | 97.7 | 97.6 |
| | 30 | Proposed | 65.94 (64.95, 66.87) | 65.90 (65.04, 66.66) | 65.91 (65.23, 66.49) |
| | | BNM _P | 65.16 (64.31, 66.09) | 65.12 (64.34, 65.86) | 65.13 (64.55, 65.76) |
| | | BNM _O | 65.87 (64.95, 66.76) | 65.77 (65.00, 66.53) | 65.83 (65.21, 66.44) |
| | | Succuess | 98.4 | 97.2 | 96.9 |
| | 50 | Proposed | 65.86 (65.07, 66.54) | 65.90 (65.19, 66.50) | 65.83 (65.28, 66.30) |
| | | BNM _P | 65.11 (64.40, 65.79) | 65.12 (64.60, 65.70) | 65.10 (64.61, 65.56) |
| | | BNM _O | 65.73 (65.01, 66.43) | 65.81 (65.20, 66.40) | 65.80 (65.30, 66.27) |
| | | Succuess | 98.2 | 97 | 96.4 |
| 50-300 | 20 | Proposed | 66.14 (65.24, 67.12) | 66.13 (65.31, 66.91) | 66.07 (65.46, 66.72) |
| | | BNM _P | 65.52 (64.70, 66.38) | 65.50 (64.75, 66.19) | 65.46 (64.95, 65.99) |
| | | BNM _O | 66.00 (65.22, 66.92) | 66.05 (65.29, 66.79) | 66.00 (65.48, 66.52) |
| | | Succuess | 98.5 | 98.4 | 98.2 |
| | 30 | Proposed | 65.99 (65.24, 66.83) | 66.00 (65.30, 66.71) | 65.98 (65.48, 66.48) |
| | | BNM _P | 65.43 (64.69, 66.17) | 65.48 (64.88, 66.01) | 65.48 (65.06, 65.95) |
| | | BNM _O | 65.95 (65.25, 66.66) | 65.96 (65.38, 66.56) | 65.98 (65.54, 66.44) |
| | | Succuess | 98.5 | 98.6 | 97.4 |
| | 50 | Proposed | 66.06 (65.47, 66.68) | 66.00 (65.51, 66.52) | 65.98 (65.57, 66.35) |
| | | BNM _P | 65.45 (64.89, 66.00) | 65.46 (65.05, 65.88) | 65.46 (65.12, 65.78) |
| | | BNM _O | 66.00 (65.45, 66.54) | 65.99 (65.55, 66.42) | 65.97 (65.62, 66.31) |
| | | Succuess | 98.4 | 98 | 97.1 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.

Table 6: Summary of the estimated SAUC for Biomarker2 when the true censoring is distributed as $U(1, 4)$, but a misspecified exponential distribution is fitted.

| Patients | N | Method | $p = 0.7$ | $p = 0.5$ | $p = 0.3$ |
|----------|----|------------------|----------------------|----------------------|----------------------|
| | | | Median (Q1, Q3) | Median (Q1, Q3) | Median (Q1, Q3) |
| 50-150 | 20 | Proposed | 83.51 (81.14, 85.89) | 83.86 (81.74, 85.83) | 83.86 (82.36, 85.56) |
| | | BNM _P | 83.64 (81.75, 85.59) | 83.49 (81.93, 85.38) | 83.37 (82.19, 84.82) |
| | | BNM _O | 83.73 (81.83, 85.60) | 83.67 (82.05, 85.34) | 83.61 (82.40, 84.91) |
| | | Succuess | 99.8 | 99.9 | 99.9 |
| | 30 | Proposed | 83.97 (82.05, 85.71) | 84.01 (82.34, 85.84) | 84.06 (82.73, 85.53) |
| | | BNM _P | 83.55 (82.09, 85.18) | 83.60 (82.22, 84.87) | 83.52 (82.29, 84.60) |
| | | BNM _O | 83.63 (82.06, 85.05) | 83.71 (82.39, 84.99) | 83.60 (82.46, 84.57) |
| | | Succuess | 99.6 | 99.9 | 99.9 |
| | 50 | Proposed | 83.91 (82.35, 85.69) | 83.97 (82.68, 85.43) | 84.07 (83.02, 85.35) |
| | | BNM _P | 83.47 (82.17, 84.75) | 83.33 (82.26, 84.36) | 83.27 (82.44, 84.06) |
| | | BNM _O | 83.61 (82.42, 84.88) | 83.50 (82.49, 84.48) | 83.45 (82.70, 84.18) |
| | | Succuess | 99.9 | 100 | 100 |
| 50-300 | 20 | Proposed | 81.80 (77.95, 84.86) | 82.70 (78.87, 85.28) | 83.33 (80.49, 84.97) |
| | | BNM _P | 84.34 (82.72, 85.74) | 84.24 (83.04, 85.40) | 84.16 (83.26, 85.07) |
| | | BNM _O | 84.38 (82.83, 85.74) | 84.26 (83.13, 85.40) | 84.19 (83.32, 85.03) |
| | | Succuess | 99.2 | 99.6 | 99.8 |
| | 30 | Proposed | 82.64 (78.86, 85.02) | 83.11 (79.82, 84.91) | 83.62 (81.82, 84.99) |
| | | BNM _P | 84.19 (82.98, 85.26) | 84.05 (83.09, 85.01) | 83.96 (83.19, 84.83) |
| | | BNM _O | 84.17 (82.99, 85.28) | 84.07 (83.11, 85.03) | 84.01 (83.25, 84.84) |
| | | Succuess | 99.3 | 99.7 | 99.7 |
| | 50 | Proposed | 83.26 (80.27, 85.02) | 83.57 (81.33, 85.02) | 83.82 (82.61, 84.83) |
| | | BNM _P | 84.03 (83.11, 84.92) | 84.01 (83.24, 84.91) | 83.96 (83.39, 84.54) |
| | | BNM _O | 84.09 (83.22, 85.00) | 84.09 (83.30, 84.87) | 84.02 (83.48, 84.58) |
| | | Succuess | 99.7 | 99.9 | 99.5 |

Median with 25th and 75th empirical quartiles (Q1, Q3) of the SAUC at $t = 2$ are reported. N denotes the number of the published studies. Proposed denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies. CR denotes the proportion of convergence among 1000 repetition All the entries are multiplied by 100.