

Simulation Result 1: C~Exp(0.2)

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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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	75.63 (73.32, 77.87)	63.5	74.75 (72.28, 76.89)	62.4	73.58 (71.26, 76.68)	56.0
		BNM _P	75.01 (73.32, 76.39)	99.6	74.82 (73.58, 75.97)	99.3	74.66 (73.69, 75.65)	98.0
		BNM _O	76.11 (74.26, 78.11)	99.6	76.55 (74.56, 78.29)	99.3	77.30 (75.17, 79.30)	98.0
	30	Proposed	75.15 (73.42, 77.04)	72.9	74.71 (72.67, 76.58)	67.6	73.88 (71.90, 76.18)	66.2
		BNM _P	74.82 (73.56, 75.96)	100.0	74.79 (73.60, 75.73)	99.6	74.56 (73.83, 75.42)	98.9
		BNM _O	75.93 (74.40, 77.38)	100.0	76.50 (74.81, 77.92)	99.6	77.16 (75.65, 78.68)	98.9
	50	Proposed	75.01 (73.49, 76.46)	83.4	74.36 (72.73, 75.94)	77.7	73.89 (72.18, 75.86)	74.2
		BNM _P	74.61 (73.66, 75.57)	99.9	74.59 (73.74, 75.33)	99.9	74.46 (73.86, 75.17)	99.0
		BNM _O	75.71 (74.52, 76.89)	99.9	76.10 (74.89, 77.24)	99.9	76.90 (75.72, 78.07)	99.0
50-300	20	Proposed	76.12 (73.50, 78.06)	61.5	75.61 (72.76, 77.94)	55.0	74.06 (70.53, 76.67)	31.7
		BNM _P	75.95 (74.80, 77.04)	99.6	75.84 (74.90, 76.82)	98.6	75.73 (74.91, 76.48)	67.4
		BNM _O	76.89 (75.28, 78.27)	99.6	77.37 (75.88, 78.84)	98.6	78.20 (76.41, 79.80)	67.4
	30	Proposed	75.93 (74.22, 77.53)	68.9	75.50 (73.53, 77.29)	63.9	74.13 (71.41, 76.47)	34.7
		BNM _P	75.77 (74.84, 76.70)	99.6	75.91 (75.01, 76.64)	99.3	75.64 (75.07, 76.30)	69.4
		BNM _O	76.60 (75.47, 77.85)	99.6	77.23 (75.80, 78.62)	99.3	77.73 (76.37, 79.02)	69.4
	50	Proposed	76.00 (74.75, 77.21)	77.9	75.71 (74.18, 76.92)	70.7	74.80 (72.91, 76.39)	44.3
		BNM _P	75.83 (75.05, 76.46)	100.0	75.69 (75.04, 76.38)	99.7	75.60 (75.10, 76.09)	75.9
		BNM _O	76.47 (75.55, 77.48)	100.0	76.89 (75.90, 77.86)	99.7	77.51 (76.32, 78.49)	75.9

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denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies.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 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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	59.89 (58.26, 61.40)	65.6	59.06 (57.25, 61.22)	64.9	58.37 (56.22, 61.66)	67.8
		BNM _P	60.11 (59.08, 61.15)	99.0	60.17 (59.22, 61.03)	98.9	60.16 (59.46, 60.74)	99.3
		BNM _O	61.12 (59.71, 62.33)	99.1	61.97 (60.64, 63.44)	98.4	63.30 (61.72, 64.97)	99.1
	30	Proposed	59.60 (58.40, 61.07)	74.7	58.66 (57.33, 60.50)	73.9	58.00 (56.19, 60.39)	73.9
		BNM _P	60.09 (59.31, 60.95)	99.6	60.13 (59.44, 60.80)	99.6	60.06 (59.53, 60.60)	99.7
		BNM _O	61.02 (60.01, 62.14)	99.6	62.05 (60.98, 63.13)	99.6	63.35 (62.15, 64.66)	99.6
	50	Proposed	59.51 (58.66, 60.46)	80.9	58.47 (57.48, 59.53)	82.0	57.36 (56.11, 58.77)	80.4
		BNM _P	60.09 (59.44, 60.78)	100.0	60.04 (59.50, 60.65)	100.0	60.08 (59.63, 60.46)	99.9
		BNM _O	61.08 (60.25, 61.87)	100.0	62.03 (61.12, 62.86)	100.0	63.23 (62.22, 64.18)	99.9
50-300	20	Proposed	60.30 (58.98, 61.50)	60.1	60.13 (58.70, 61.75)	62.7	59.89 (58.17, 61.89)	60.6
		BNM _P	60.29 (59.53, 61.07)	97.3	60.37 (59.65, 60.96)	96.2	60.38 (59.88, 60.87)	97.4
		BNM _O	61.24 (60.30, 62.26)	97.1	62.09 (61.07, 63.17)	96.0	63.24 (62.13, 64.33)	97.4
	30	Proposed	60.06 (59.02, 61.18)	68.3	59.81 (58.64, 61.37)	71.1	59.73 (58.22, 61.66)	71.3
		BNM _P	60.26 (59.71, 60.91)	97.7	60.34 (59.76, 60.88)	97.6	60.35 (59.96, 60.72)	98.3
		BNM _O	61.30 (60.52, 62.07)	97.7	62.11 (61.33, 62.99)	97.6	63.19 (62.31, 64.05)	98.3
	50	Proposed	59.97 (59.25, 60.85)	74.7	59.64 (58.72, 60.84)	75.5	59.29 (58.21, 60.92)	77.8
		BNM _P	60.33 (59.85, 60.84)	99.0	60.33 (59.90, 60.72)	99.0	60.30 (59.99, 60.60)	99.8
		BNM _O	61.29 (60.75, 61.88)	99.0	62.11 (61.47, 62.77)	99.0	63.12 (62.41, 63.84)	99.8

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)

Biomarker3; EXP(0.2)

Biomarker1; U(1,4)

Biomarker2; 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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	80.85 (32.25, 84.42)	78.1	80.35 (27.77, 84.10)	74.3	80.94 (27.93, 84.77)	42.2
		BNM _P	78.02 (74.73, 81.15)	95.5	78.05 (75.53, 80.71)	93.4	77.98 (75.87, 79.88)	55.5
		BNM _O	78.97 (75.63, 82.35)	96.5	79.88 (76.86, 82.85)	93.1	80.93 (77.12, 83.84)	55.7
	30	Proposed	81.78 (78.00, 84.62)	83.5	80.95 (27.41, 84.15)	81.7	80.73 (26.72, 83.93)	54.8
		BNM _P	77.84 (75.34, 80.16)	96.8	77.75 (75.22, 79.64)	95.4	77.76 (76.03, 79.41)	64.5
		BNM _O	79.09 (76.22, 81.70)	96.7	80.01 (76.92, 82.47)	96.2	80.40 (77.72, 82.67)	64.7
	50	Proposed	81.66 (79.56, 83.81)	92.0	81.43 (78.53, 83.84)	87.0	81.05 (26.43, 83.82)	65.4
		BNM _P	77.64 (75.55, 79.54)	98.6	77.78 (76.05, 79.33)	96.1	77.67 (76.35, 78.85)	73.7
		BNM _O	78.90 (76.88, 80.95)	99.2	79.54 (77.51, 81.58)	96.0	80.29 (78.34, 82.23)	73.7
50-300	20	Proposed	76.85 (27.13, 83.52)	71.4	78.70 (27.56, 83.80)	35.1	79.97 (69.48, 82.93)	12.4
		BNM _P	79.94 (77.50, 82.42)	89.9	79.61 (77.73, 81.69)	53.5	79.56 (78.20, 80.84)	28.1
		BNM _O	80.54 (77.88, 83.10)	90.0	81.26 (78.44, 83.60)	53.2	81.40 (79.54, 84.31)	28.2
	30	Proposed	28.48 (27.05, 82.42)	79.7	78.95 (27.07, 83.08)	44.1	80.42 (77.13, 83.02)	16.5
		BNM _P	79.50 (77.41, 81.43)	93.0	79.55 (77.86, 81.29)	57.5	79.23 (78.21, 80.25)	29.9
		BNM _O	79.96 (77.83, 82.19)	93.2	80.68 (78.86, 82.78)	57.6	81.06 (79.53, 83.14)	29.9
	50	Proposed	27.94 (27.11, 81.21)	86.4	27.86 (26.79, 81.87)	55.5	81.22 (79.30, 83.61)	23.5
		BNM _P	79.36 (77.79, 80.80)	96.4	79.27 (77.93, 80.40)	65.8	79.08 (78.11, 80.01)	34.4
		BNM _O	79.97 (78.17, 81.61)	96.3	80.54 (78.78, 81.88)	65.3	80.78 (79.35, 82.39)	34.2

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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	76.18 (74.04, 78.41)	40.7	75.47 (72.89, 78.00)	39.3	73.96 (71.54, 76.67)	34.7
		BNM _P	75.33 (73.88, 76.73)	99.8	75.05 (73.80, 76.42)	99.5	74.97 (74.00, 75.85)	97.4
		BNM _O	76.37 (74.46, 78.02)	99.7	76.84 (74.98, 78.96)	99.5	77.60 (75.86, 79.43)	97.3
	30	Proposed	76.11 (74.18, 78.32)	48.9	75.14 (73.18, 77.23)	41.3	73.62 (71.59, 75.69)	41.0
		BNM _P	75.05 (73.86, 76.22)	99.9	74.92 (73.95, 75.90)	99.7	74.84 (74.13, 75.58)	98.6
		BNM _O	76.27 (74.76, 77.70)	99.9	76.65 (75.18, 78.06)	99.7	77.25 (75.83, 78.70)	98.6
	50	Proposed	75.90 (74.43, 77.45)	57.8	74.94 (73.30, 76.72)	51.7	73.59 (71.92, 75.35)	48.6
		BNM _P	75.00 (73.99, 75.83)	100.0	74.84 (74.09, 75.52)	99.8	74.77 (74.16, 75.29)	99.1
		BNM _O	75.97 (74.90, 77.10)	100.0	76.39 (75.39, 77.48)	99.8	77.08 (75.83, 78.20)	99.1
50-300	20	Proposed	77.31 (74.09, 80.12)	28.1	76.36 (73.21, 79.34)	22.9	75.12 (71.20, 77.28)	11.4
		BNM _P	76.13 (75.11, 77.20)	99.6	76.12 (75.11, 77.07)	93.4	76.05 (75.30, 76.87)	65.1
		BNM _O	77.21 (75.63, 78.55)	99.6	77.63 (75.98, 79.03)	93.4	78.50 (76.91, 79.89)	65.1
	30	Proposed	76.69 (74.46, 79.06)	34.2	76.06 (73.49, 78.52)	27.1	74.89 (71.70, 76.88)	11.7
		BNM _P	76.02 (75.11, 76.93)	99.8	76.05 (75.24, 76.90)	95.3	75.87 (75.27, 76.50)	70.5
		BNM _O	76.97 (75.60, 78.11)	99.8	77.45 (75.93, 78.73)	95.3	78.21 (76.70, 79.52)	70.5
	50	Proposed	76.49 (74.79, 78.21)	40.3	75.69 (73.95, 77.57)	33.8	74.33 (72.37, 76.45)	13.3
		BNM _P	75.99 (75.21, 76.68)	99.9	75.83 (75.21, 76.46)	96.7	75.81 (75.39, 76.26)	65.7
		BNM _O	76.65 (75.79, 77.73)	99.9	77.06 (76.14, 78.02)	96.7	77.66 (76.71, 78.89)	65.7

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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	60.33 (58.73, 62.03)	45.5	59.87 (58.03, 61.87)	45.2	59.19 (57.33, 61.42)	45.7
		BNM _P	60.23 (59.21, 61.22)	99.0	60.19 (59.41, 60.98)	99.7	60.26 (59.60, 60.81)	99.5
		BNM _O	61.64 (60.24, 62.94)	99.1	62.79 (61.38, 64.09)	99.5	64.40 (62.88, 65.77)	99.2
	30	Proposed	60.15 (58.83, 61.45)	48.8	59.55 (57.99, 61.07)	50.9	58.79 (57.33, 60.52)	51.2
		BNM _P	60.19 (59.37, 61.01)	99.8	60.16 (59.52, 60.78)	100.0	60.17 (59.65, 60.69)	99.9
		BNM _O	61.60 (60.56, 62.62)	99.8	62.70 (61.59, 63.75)	99.9	64.28 (63.02, 65.44)	99.7
	50	Proposed	59.84 (58.96, 60.88)	51.9	59.16 (58.16, 60.18)	56.8	58.52 (57.28, 59.77)	55.7
		BNM _P	60.14 (59.57, 60.77)	99.8	60.23 (59.67, 60.73)	99.9	60.19 (59.80, 60.58)	99.8
		BNM _O	61.50 (60.76, 62.30)	99.8	62.70 (61.91, 63.55)	99.9	64.25 (63.34, 65.06)	99.8
50-300	20	Proposed	60.73 (59.48, 61.98)	36.8	60.75 (59.43, 61.94)	40.3	60.37 (58.95, 61.88)	38.9
		BNM _P	60.41 (59.60, 61.14)	99.2	60.37 (59.77, 61.03)	98.8	60.37 (59.89, 60.82)	99.4
		BNM _O	61.70 (60.72, 62.67)	99.0	62.63 (61.71, 63.58)	98.8	63.70 (62.72, 64.66)	99.4
	30	Proposed	60.54 (59.60, 61.60)	44.5	60.42 (59.27, 61.47)	42.5	60.03 (58.85, 61.19)	40.5
		BNM _P	60.35 (59.77, 61.06)	99.7	60.34 (59.81, 60.89)	99.4	60.36 (59.99, 60.74)	100.0
		BNM _O	61.65 (60.81, 62.45)	99.7	62.59 (61.73, 63.34)	99.4	63.64 (62.81, 64.45)	100.0
	50	Proposed	60.45 (59.66, 61.33)	46.6	60.25 (59.43, 61.10)	46.9	59.92 (58.88, 60.90)	45.0
		BNM _P	60.39 (59.92, 60.83)	99.7	60.42 (60.00, 60.80)	99.5	60.39 (60.06, 60.69)	99.8
		BNM _O	61.64 (61.06, 62.27)	99.7	62.59 (61.98, 63.16)	99.5	63.70 (63.06, 64.37)	99.8

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.