

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	75.45 (73.04, 77.67)	63.76	74.83 (72.20, 77.37)	62.84	74.20 (71.65, 77.28)	57.14
		BNM _P	75.01 (73.32, 76.39)	100.00	74.82 (73.58, 75.97)	100.00	74.66 (73.69, 75.65)	100.00
		BNM _O	76.11 (74.26, 78.11)	100.00	76.55 (74.56, 78.29)	100.00	77.30 (75.17, 79.30)	100.00
	30	Proposed	75.16 (73.26, 77.17)	72.90	75.00 (72.82, 76.97)	67.87	74.34 (72.33, 76.80)	66.94
		BNM _P	74.82 (73.56, 75.96)	100.00	74.79 (73.60, 75.73)	100.00	74.56 (73.83, 75.42)	100.00
		BNM _O	75.93 (74.40, 77.38)	100.00	76.50 (74.81, 77.92)	100.00	77.16 (75.65, 78.68)	100.00
	50	Proposed	75.00 (73.44, 76.47)	83.48	74.48 (72.80, 76.25)	77.78	74.25 (72.56, 76.06)	74.95
		BNM _P	74.61 (73.66, 75.57)	100.00	74.59 (73.74, 75.33)	100.00	74.46 (73.86, 75.17)	100.00
		BNM _O	75.71 (74.52, 76.89)	100.00	76.10 (74.89, 77.24)	100.00	76.90 (75.72, 78.07)	100.00
50-300	20	Proposed	75.70 (72.74, 77.63)	61.75	75.53 (72.09, 77.61)	55.78	74.08 (35.19, 76.59)	47.03
		BNM _P	75.95 (74.80, 77.04)	100.00	75.84 (74.90, 76.82)	100.00	75.73 (74.91, 76.48)	100.00
		BNM _O	76.89 (75.28, 78.27)	100.00	77.37 (75.88, 78.84)	100.00	78.20 (76.41, 79.80)	100.00
	30	Proposed	75.83 (74.12, 77.38)	69.18	75.63 (73.55, 77.13)	64.35	75.13 (71.22, 77.24)	50.00
		BNM _P	75.77 (74.84, 76.70)	100.00	75.91 (75.01, 76.64)	100.00	75.64 (75.07, 76.30)	100.00
		BNM _O	76.60 (75.47, 77.85)	100.00	77.23 (75.80, 78.62)	100.00	77.73 (76.37, 79.02)	100.00
	50	Proposed	76.01 (74.74, 77.13)	77.90	75.71 (74.18, 76.87)	70.91	75.37 (73.65, 76.77)	58.37
		BNM _P	75.83 (75.05, 76.46)	100.00	75.69 (75.04, 76.38)	100.00	75.60 (75.10, 76.09)	100.00
		BNM _O	76.47 (75.55, 77.48)	100.00	76.89 (75.90, 77.86)	100.00	77.51 (76.32, 78.49)	100.00

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denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies.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	59.98 (58.36, 61.56)	66.20	59.22 (57.33, 61.85)	65.62	58.48 (56.30, 63.12)	68.28
		BNM _P	60.11 (59.09, 61.15)	99.90	60.17 (59.22, 61.03)	100.00	60.16 (59.46, 60.74)	100.00
		BNM _O	61.12 (59.71, 62.33)	100.00	61.98 (60.68, 63.44)	99.49	63.30 (61.72, 64.96)	99.80
	30	Proposed	59.62 (58.38, 61.15)	75.00	58.75 (57.34, 60.61)	74.20	58.03 (56.16, 61.24)	74.12
		BNM _P	60.09 (59.31, 60.95)	100.00	60.13 (59.44, 60.80)	100.00	60.06 (59.53, 60.60)	100.00
		BNM _O	61.02 (60.01, 62.14)	100.00	62.05 (60.98, 63.13)	100.00	63.35 (62.16, 64.66)	99.90
	50	Proposed	59.51 (58.64, 60.56)	80.90	58.46 (57.47, 59.56)	82.00	57.34 (56.06, 58.82)	80.48
		BNM _P	60.09 (59.44, 60.78)	100.00	60.04 (59.50, 60.65)	100.00	60.08 (59.63, 60.46)	100.00
		BNM _O	61.08 (60.25, 61.87)	100.00	62.03 (61.12, 62.86)	100.00	63.23 (62.22, 64.18)	100.00
50-300	20	Proposed	60.28 (58.90, 61.66)	61.77	60.47 (58.91, 62.17)	65.18	60.25 (58.13, 62.77)	62.22
		BNM _P	60.29 (59.53, 61.07)	100.00	60.37 (59.65, 60.96)	100.00	60.38 (59.88, 60.87)	100.00
		BNM _O	61.25 (60.30, 62.26)	99.79	62.09 (61.07, 63.17)	99.79	63.24 (62.13, 64.33)	100.00
	30	Proposed	60.02 (58.94, 61.23)	69.91	59.76 (58.61, 61.64)	72.85	59.76 (58.19, 62.51)	72.53
		BNM _P	60.26 (59.71, 60.91)	100.00	60.34 (59.76, 60.88)	100.00	60.35 (59.96, 60.72)	100.00
		BNM _O	61.30 (60.52, 62.07)	100.00	62.11 (61.33, 62.99)	100.00	63.19 (62.31, 64.05)	100.00
	50	Proposed	59.96 (59.23, 60.84)	75.45	59.69 (58.68, 61.04)	76.26	59.29 (58.14, 61.90)	77.96
		BNM _P	60.33 (59.85, 60.84)	100.00	60.33 (59.90, 60.72)	100.00	60.30 (59.99, 60.60)	100.00
		BNM _O	61.29 (60.75, 61.88)	100.00	62.11 (61.47, 62.77)	100.00	63.12 (62.41, 63.84)	100.00

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)

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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	84.02 (81.22, 86.75)	60.74	82.92 (79.74, 85.87)	57.22	83.20 (80.31, 86.67)	51.01
		BNM _P	83.33 (81.21, 85.42)	100.00	83.26 (81.52, 85.00)	100.00	83.30 (81.93, 84.63)	100.00
		BNM _O	83.88 (81.42, 86.14)	99.89	84.22 (82.07, 86.35)	99.69	84.71 (82.90, 86.67)	100.00
	30	Proposed	84.22 (82.31, 86.33)	66.91	83.63 (81.50, 86.21)	62.76	83.36 (81.43, 86.11)	58.98
		BNM _P	83.26 (81.74, 84.96)	100.00	83.12 (81.60, 84.65)	100.00	83.15 (81.97, 84.35)	100.00
		BNM _O	83.90 (82.07, 85.57)	100.00	83.97 (82.13, 85.75)	100.00	84.63 (82.98, 86.04)	100.00
	50	Proposed	84.09 (82.54, 85.70)	75.53	84.08 (82.37, 85.89)	68.88	83.72 (82.06, 85.79)	64.26
		BNM _P	83.09 (81.80, 84.39)	100.00	83.08 (81.99, 84.26)	100.00	82.96 (82.07, 83.94)	100.00
		BNM _O	83.71 (82.24, 84.99)	100.00	84.10 (82.77, 85.32)	100.00	84.51 (83.15, 85.80)	100.00
50-300	20	Proposed	83.71 (81.16, 85.94)	48.14	83.27 (80.55, 85.44)	33.38	82.58 (79.52, 84.78)	25.59
		BNM _P	84.16 (82.66, 85.65)	100.00	83.93 (82.73, 85.17)	100.00	83.92 (82.78, 84.89)	100.00
		BNM _O	84.40 (82.83, 86.00)	100.00	84.46 (82.88, 85.97)	100.00	84.87 (83.43, 86.29)	100.00
	30	Proposed	83.78 (82.01, 85.41)	55.34	83.40 (81.82, 85.03)	39.64	83.41 (81.32, 85.29)	33.73
		BNM _P	83.92 (82.71, 85.26)	100.00	83.85 (82.68, 84.91)	100.00	83.81 (83.12, 84.80)	100.00
		BNM _O	84.11 (82.80, 85.44)	100.00	84.19 (82.96, 85.43)	100.00	84.73 (83.56, 85.90)	100.00
	50	Proposed	84.02 (82.64, 85.47)	64.43	83.82 (82.56, 85.07)	51.43	83.52 (82.57, 84.96)	36.11
		BNM _P	83.88 (82.84, 84.81)	100.00	83.85 (82.87, 84.73)	100.00	83.78 (83.09, 84.59)	100.00
		BNM _O	83.97 (82.93, 84.95)	100.00	84.15 (83.15, 85.03)	100.00	84.50 (83.62, 85.49)	100.00

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	75.56 (73.28, 77.85)	40.78	75.09 (72.45, 78.01)	39.50	73.81 (71.60, 77.24)	35.63
		BNM _P	75.33 (73.88, 76.73)	100.00	75.05 (73.80, 76.42)	100.00	74.97 (74.00, 75.85)	100.00
		BNM _O	76.37 (74.47, 78.03)	99.90	76.84 (74.98, 78.96)	100.00	77.60 (75.86, 79.43)	99.90
	30	Proposed	75.77 (73.73, 78.10)	48.95	75.10 (72.80, 77.02)	41.42	74.15 (71.76, 76.69)	41.58
		BNM _P	75.05 (73.86, 76.22)	100.00	74.92 (73.95, 75.90)	100.00	74.84 (74.13, 75.58)	100.00
		BNM _O	76.27 (74.76, 77.70)	100.00	76.65 (75.18, 78.06)	100.00	77.25 (75.83, 78.70)	100.00
	50	Proposed	75.63 (74.07, 77.21)	57.80	74.82 (73.29, 76.51)	51.80	73.80 (72.16, 75.66)	49.04
		BNM _P	75.00 (73.99, 75.83)	100.00	74.84 (74.09, 75.52)	100.00	74.77 (74.16, 75.29)	100.00
		BNM _O	75.97 (74.90, 77.10)	100.00	76.39 (75.39, 77.48)	100.00	77.08 (75.83, 78.20)	100.00
50-300	20	Proposed	76.04 (73.45, 78.01)	28.21	75.19 (72.33, 77.38)	24.52	74.07 (34.92, 77.37)	17.51
		BNM _P	76.13 (75.11, 77.20)	100.00	76.12 (75.11, 77.07)	100.00	76.05 (75.30, 76.87)	100.00
		BNM _O	77.21 (75.63, 78.55)	100.00	77.63 (75.98, 79.03)	100.00	78.50 (76.91, 79.89)	100.00
	30	Proposed	76.04 (74.43, 77.55)	34.27	75.50 (73.53, 77.20)	28.44	74.50 (68.79, 76.91)	16.60
		BNM _P	76.02 (75.11, 76.93)	100.00	76.05 (75.24, 76.90)	100.00	75.87 (75.27, 76.50)	100.00
		BNM _O	76.97 (75.60, 78.11)	100.00	77.45 (75.93, 78.73)	100.00	78.21 (76.70, 79.52)	100.00
	50	Proposed	76.03 (74.90, 77.20)	40.34	75.64 (74.71, 76.83)	34.95	75.42 (73.73, 76.62)	20.24
		BNM _P	75.99 (75.21, 76.68)	100.00	75.83 (75.21, 76.46)	100.00	75.81 (75.39, 76.26)	100.00
		BNM _O	76.65 (75.79, 77.73)	100.00	77.06 (76.14, 78.02)	100.00	77.66 (76.71, 78.89)	100.00

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	60.62 (58.89, 62.44)	45.91	60.16 (57.93, 62.94)	45.34	59.46 (57.70, 63.25)	45.93	
		BNM _P	60.23 (59.20, 61.22)	99.90	60.19 (59.41, 60.98)	100.00	60.26 (59.60, 60.81)	100.00	
		BNM _O	61.64 (60.24, 62.94)	100.00	62.79 (61.38, 64.09)	99.80	64.40 (62.88, 65.78)	99.70	
	30	Proposed	60.19 (58.83, 61.70)	48.90	59.48 (57.87, 61.81)	50.90	58.51 (56.93, 60.91)	51.25	
		BNM _P	60.19 (59.37, 61.01)	100.00	60.16 (59.52, 60.78)	100.00	60.17 (59.65, 60.69)	100.00	
		BNM _O	61.60 (60.56, 62.62)	100.00	62.71 (61.59, 63.75)	99.90	64.29 (63.04, 65.45)	99.80	
	50	Proposed	59.72 (58.82, 60.88)	52.00	59.02 (58.10, 60.17)	56.86	58.19 (56.86, 59.41)	55.81	
		BNM _P	60.14 (59.57, 60.77)	100.00	60.23 (59.67, 60.73)	100.00	60.19 (59.80, 60.58)	100.00	
		BNM _O	61.50 (60.76, 62.30)	100.00	62.70 (61.91, 63.55)	100.00	64.25 (63.34, 65.06)	100.00	
	50-300	20	Proposed	60.93 (59.54, 62.27)	37.10	60.45 (59.13, 62.18)	40.79	60.11 (58.41, 62.41)	39.13
			BNM _P	60.41 (59.60, 61.14)	100.00	60.37 (59.77, 61.03)	100.00	60.37 (59.89, 60.82)	100.00
			BNM _O	61.70 (60.72, 62.67)	99.80	62.63 (61.71, 63.58)	100.00	63.70 (62.72, 64.66)	100.00
30		Proposed	60.51 (59.52, 61.72)	44.63	59.80 (58.76, 61.18)	42.76	59.47 (58.26, 60.68)	40.50	
		BNM _P	60.35 (59.77, 61.06)	100.00	60.34 (59.81, 60.89)	100.00	60.36 (59.99, 60.74)	100.00	
		BNM _O	61.65 (60.81, 62.45)	100.00	62.59 (61.73, 63.34)	100.00	63.64 (62.81, 64.45)	100.00	
50		Proposed	60.12 (59.40, 61.03)	46.74	59.90 (59.20, 60.60)	47.14	59.38 (58.46, 60.32)	45.09	
		BNM _P	60.39 (59.92, 60.83)	100.00	60.42 (60.00, 60.80)	100.00	60.39 (60.06, 60.69)	100.00	
		BNM _O	61.64 (61.06, 62.27)	100.00	62.59 (61.98, 63.16)	100.00	63.70 (63.06, 64.37)	100.00	

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)	CR	Median (Q1, Q3)	CR	Median (Q1, Q3)	CR
50-150	20	Proposed	81.66 (78.18, 84.10)	69.10	81.13 (77.70, 83.36)	62.86	81.75 (79.34, 84.05)	44.74
		BNM _P	78.88 (75.77, 81.47)	98.78	78.40 (75.85, 81.09)	98.73	78.74 (76.81, 80.44)	98.88
		BNM _O	79.61 (76.32, 82.66)	99.19	79.79 (76.33, 82.85)	99.68	81.63 (79.06, 84.17)	100.00
	30	Proposed	81.68 (79.77, 83.88)	75.70	81.44 (79.51, 83.23)	69.96	81.72 (79.93, 83.79)	49.89
		BNM _P	78.34 (75.77, 80.58)	98.09	78.35 (76.29, 80.22)	99.17	78.38 (76.99, 79.77)	98.86
		BNM _O	78.98 (76.50, 81.70)	99.50	79.74 (77.06, 82.01)	99.38	80.60 (78.47, 83.02)	99.77
	50	Proposed	81.84 (80.37, 83.38)	82.71	81.50 (80.13, 82.85)	77.02	81.41 (80.02, 82.59)	64.52
		BNM _P	78.26 (76.41, 80.11)	98.69	78.17 (76.58, 79.68)	98.77	78.17 (77.07, 79.42)	99.40
		BNM _O	79.37 (77.29, 81.22)	98.59	79.77 (77.69, 81.62)	98.57	80.63 (78.56, 82.38)	98.79
50-300	20	Proposed	80.51 (53.43, 84.91)	49.61	80.36 (34.94, 83.53)	32.78	79.93 (63.07, 85.23)	19.56
		BNM _P	80.45 (77.99, 82.96)	99.61	80.40 (78.50, 82.24)	99.37	80.66 (78.77, 81.91)	100.00
		BNM _O	81.23 (78.51, 84.63)	99.48	82.10 (79.72, 84.98)	99.58	83.64 (80.83, 87.09)	98.89
	30	Proposed	80.76 (77.54, 83.73)	60.30	80.74 (28.86, 83.08)	42.56	80.83 (78.78, 83.62)	22.86
		BNM _P	79.97 (78.06, 81.88)	99.50	80.19 (78.68, 81.84)	99.81	79.87 (78.62, 81.07)	99.18
		BNM _O	80.58 (78.53, 82.90)	99.75	81.54 (79.62, 83.80)	99.25	82.31 (80.60, 84.37)	98.37
	50	Proposed	80.61 (78.82, 82.60)	69.65	80.16 (76.43, 82.02)	59.25	81.01 (79.39, 83.79)	33.17
		BNM _P	79.66 (78.32, 81.18)	99.65	79.73 (78.44, 80.81)	99.66	79.80 (78.79, 80.96)	100.00
		BNM _O	80.23 (78.69, 82.01)	99.42	80.68 (79.16, 82.20)	99.32	81.87 (80.26, 83.74)	99.02

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.