

Simulation Result 1: C~Exp(0.2)

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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	BNM _P	0.00 (73.31, 76.39)	100.00	0.00 (73.57, 75.99)	100.00	0.00 (73.68, 75.64)	100.0
		BNM _O	0.43 (73.62, 77.02)	100.00	0.51 (73.98, 76.56)	100.00	0.47 (74.09, 76.13)	100.0
		Proposed	0.60 (73.73, 77.50)	71.82	0.76 (74.12, 77.17)	77.68	0.77 (74.12, 76.87)	86.4
	30	BNM _P	0.00 (73.47, 75.92)	100.00	0.00 (73.56, 75.85)	100.00	0.00 (73.89, 75.43)	100.0
		BNM _O	0.50 (73.92, 76.49)	100.00	0.48 (73.96, 76.35)	100.00	0.46 (74.29, 75.89)	100.0
		Proposed	0.86 (73.90, 77.22)	79.40	0.74 (73.94, 77.05)	84.78	0.65 (74.25, 76.31)	91.1
	50	BNM _P	0.00 (73.65, 75.57)	100.00	0.00 (73.77, 75.33)	100.00	0.00 (73.86, 75.08)	100.0
		BNM _O	0.43 (74.04, 76.09)	100.00	0.48 (74.19, 75.83)	100.00	0.42 (74.29, 75.53)	100.0
		Proposed	0.71 (74.04, 76.69)	87.30	0.63 (74.14, 76.28)	90.50	0.61 (74.35, 75.96)	91.7
50-300	20	BNM _P	0.00 (74.76, 77.08)	100.00	0.00 (74.70, 76.74)	100.00	0.00 (75.03, 76.57)	100.0
		BNM _O	0.32 (75.00, 77.58)	100.00	0.34 (74.97, 77.12)	100.00	0.31 (75.22, 76.92)	100.0
		Proposed	0.18 (74.70, 77.69)	68.04	0.37 (74.56, 77.34)	74.17	0.38 (75.18, 77.17)	85.7
	30	BNM _P	0.00 (74.88, 76.66)	100.00	0.00 (74.86, 76.51)	100.00	0.00 (75.00, 76.33)	100.0
		BNM _O	0.31 (75.10, 77.14)	100.00	0.23 (75.17, 76.87)	100.00	0.27 (75.26, 76.65)	100.0
		Proposed	0.48 (75.07, 77.47)	74.67	0.28 (75.00, 77.02)	82.80	0.42 (75.30, 76.87)	86.1
	50	BNM _P	0.00 (74.83, 76.45)	100.00	0.00 (75.02, 76.26)	100.00	0.00 (75.11, 76.06)	100.0
		BNM _O	0.29 (75.10, 76.79)	100.00	0.29 (75.29, 76.68)	100.00	0.27 (75.36, 76.40)	100.0
		Proposed	0.39 (75.09, 77.05)	87.70	0.47 (75.36, 76.96)	88.20	0.38 (75.40, 76.62)	88.6

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denotes the proposed sensitivity analysis method; BNM_P denotes the HZ model using the population (published and unpublished) studies; BNM_O denotes the HZ model using only the observed (published) studies.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	BNM _P	0.00 (63.78, 66.13)	98.99	0.00 (64.10, 66.04)	99.49	0.00 (64.20, 65.77)	99.79
		BNM _O	0.47 (64.20, 66.58)	98.49	0.44 (64.51, 66.60)	98.98	0.46 (64.59, 66.29)	99.79
		Proposed	0.53 (64.33, 66.62)	78.30	0.49 (64.62, 66.58)	84.34	0.44 (64.62, 66.27)	87.77
	30	BNM _P	0.00 (64.14, 66.03)	99.49	0.00 (64.09, 65.76)	100.00	0.00 (64.30, 65.56)	99.79
		BNM _O	0.44 (64.58, 66.50)	98.98	0.42 (64.55, 66.27)	99.69	0.46 (64.71, 66.07)	100.00
		Proposed	0.56 (64.65, 66.57)	86.48	0.45 (64.61, 66.34)	86.78	0.49 (64.77, 66.14)	88.25
	50	BNM _P	0.00 (64.21, 65.74)	100.00	0.00 (64.33, 65.57)	99.90	0.00 (64.45, 65.49)	100.00
		BNM _O	0.45 (64.65, 66.25)	99.90	0.49 (64.78, 66.05)	99.79	0.45 (64.87, 65.99)	100.00
		Proposed	0.49 (64.75, 66.24)	89.74	0.48 (64.80, 66.05)	88.39	0.43 (64.91, 66.01)	89.60
	20	BNM _P	0.00 (64.53, 66.23)	99.69	0.00 (64.69, 66.20)	99.90	0.00 (64.80, 65.99)	100.00
		BNM _O	0.38 (64.87, 66.65)	99.79	0.39 (65.11, 66.62)	99.90	0.45 (65.22, 66.43)	100.00
		Proposed	0.43 (64.85, 66.65)	79.65	0.39 (65.05, 66.67)	81.28	0.42 (65.12, 66.42)	85.02
50-300	30	BNM _P	0.00 (64.66, 66.06)	99.90	0.00 (64.75, 65.97)	100.00	0.00 (64.93, 65.81)	100.00
		BNM _O	0.39 (65.03, 66.51)	99.59	0.43 (65.15, 66.34)	100.00	0.42 (65.35, 66.28)	100.00
		Proposed	0.39 (64.94, 66.51)	81.57	0.43 (65.13, 66.37)	87.54	0.39 (65.26, 66.28)	86.56
	50	BNM _P	0.00 (64.81, 65.90)	100.00	0.00 (64.92, 65.82)	100.00	0.00 (65.04, 65.70)	100.00
		BNM _O	0.41 (65.24, 66.34)	100.00	0.44 (65.32, 66.27)	100.00	0.45 (65.46, 66.13)	100.00
		Proposed	0.39 (65.15, 66.33)	86.86	0.39 (65.24, 66.24)	87.84	0.39 (65.37, 66.13)	86.22

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 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	BNM _P	0.00 (81.25, 85.20)	100.00	0.00 (81.46, 85.36)	100.00	0.00 (81.73, 84.55)	100.00
		BNM _O	0.21 (81.39, 85.27)	100.00	0.15 (81.76, 85.30)	100.00	0.04 (82.04, 84.65)	100.00
		Proposed	0.76 (82.12, 86.14)	71.30	0.87 (82.41, 86.33)	74.06	1.05 (82.86, 85.85)	84.69
	30	BNM _P	0.00 (81.68, 84.93)	100.00	0.00 (81.97, 84.71)	100.00	0.00 (81.98, 84.28)	100.00
		BNM _O	0.37 (81.84, 85.08)	100.00	0.16 (82.09, 84.87)	100.00	0.28 (82.25, 84.41)	100.00
		Proposed	1.14 (82.62, 86.16)	77.59	0.97 (82.92, 86.07)	81.31	1.24 (82.93, 85.85)	86.69
	50	BNM _P	0.00 (81.88, 84.30)	100.00	0.00 (82.01, 84.34)	100.00	0.00 (82.15, 83.91)	100.00
		BNM _O	0.21 (82.14, 84.60)	100.00	0.21 (82.36, 84.47)	100.00	0.19 (82.37, 84.07)	100.00
		Proposed	1.04 (82.83, 85.93)	84.95	1.16 (83.05, 85.74)	86.26	1.24 (83.20, 85.34)	93.70
	20	BNM _P	0.00 (82.49, 85.65)	100.00	0.00 (82.63, 85.19)	100.00	0.00 (82.84, 84.86)	100.00
		BNM _O	0.08 (82.45, 85.59)	100.00	0.09 (82.62, 85.15)	100.00	0.03 (82.87, 84.91)	100.00
		Proposed	-0.09 (81.85, 85.97)	57.70	0.27 (82.58, 85.77)	66.25	0.33 (83.04, 85.43)	68.42
50-300	30	BNM _P	0.00 (82.64, 85.18)	100.00	0.00 (82.74, 84.79)	100.00	0.00 (83.00, 84.74)	100.00
		BNM _O	0.04 (82.72, 85.16)	100.00	0.11 (82.76, 84.82)	100.00	0.01 (83.03, 84.73)	100.00
		Proposed	0.38 (82.91, 85.64)	64.17	0.37 (82.92, 85.44)	69.06	0.36 (83.31, 85.37)	73.56
	50	BNM _P	0.00 (82.87, 84.91)	100.00	0.00 (82.96, 84.63)	100.00	0.00 (83.11, 84.51)	100.00
		BNM _O	0.02 (82.96, 84.82)	100.00	0.10 (82.99, 84.69)	100.00	0.05 (83.17, 84.55)	100.00
		Proposed	0.49 (83.17, 85.64)	71.47	0.55 (83.25, 85.38)	72.84	0.63 (83.59, 85.43)	73.27

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	BNM _P	0.00 (73.89, 76.74)	100.00	0.00 (73.80, 76.43)	100.0	0.00 (73.99, 75.84)	100.0
		BNM _O	0.36 (74.17, 77.22)	100.00	0.57 (74.18, 76.91)	100.0	0.46 (74.37, 76.32)	100.0
		Proposed	0.77 (74.09, 78.10)	49.90	1.06 (74.33, 77.98)	54.9	1.09 (74.62, 77.40)	69.8
	30	BNM _P	0.00 (73.86, 76.13)	100.00	0.00 (73.89, 75.86)	100.0	0.00 (74.05, 75.61)	100.0
		BNM _O	0.41 (74.22, 76.63)	100.00	0.53 (74.27, 76.37)	100.0	0.45 (74.46, 76.12)	100.0
		Proposed	0.79 (74.29, 77.60)	57.40	0.90 (74.54, 77.31)	62.2	0.99 (74.64, 77.13)	73.1
	50	BNM _P	0.00 (73.87, 75.71)	100.00	0.00 (74.03, 75.52)	100.0	0.00 (74.30, 75.38)	100.0
		BNM _O	0.55 (74.33, 76.28)	100.00	0.48 (74.49, 76.05)	100.0	0.48 (74.65, 75.88)	100.0
		Proposed	1.02 (74.59, 77.14)	68.10	1.01 (74.73, 77.16)	73.6	0.95 (74.90, 76.73)	81.4
50-300	20	BNM _P	0.00 (75.02, 77.16)	100.00	0.00 (75.03, 76.95)	100.0	0.00 (75.19, 76.65)	100.0
		BNM _O	0.40 (75.28, 77.60)	100.00	0.29 (75.21, 77.43)	100.0	0.28 (75.39, 77.01)	100.0
		Proposed	0.34 (74.97, 77.86)	32.60	0.34 (75.11, 77.73)	37.9	0.42 (75.40, 77.20)	48.5
	30	BNM _P	0.00 (75.06, 76.98)	100.00	0.00 (75.12, 76.75)	100.0	0.00 (75.31, 76.45)	100.0
		BNM _O	0.33 (75.36, 77.42)	100.00	0.29 (75.43, 77.09)	100.0	0.31 (75.54, 76.78)	100.0
		Proposed	0.42 (75.31, 77.53)	42.20	0.38 (75.28, 77.49)	44.8	0.40 (75.51, 77.05)	51.7
	50	BNM _P	0.00 (75.28, 76.69)	100.00	0.00 (75.27, 76.42)	100.0	0.00 (75.33, 76.25)	100.0
		BNM _O	0.32 (75.53, 77.07)	100.00	0.32 (75.50, 76.73)	100.0	0.27 (75.61, 76.58)	100.0
		Proposed	0.32 (75.50, 77.21)	49.95	0.42 (75.40, 77.00)	52.1	0.61 (75.78, 76.95)	58.6

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	BNM _P	0.00 (63.99, 66.25)	99.09	0.00 (64.16, 66.03)	99.08	0.00 (64.49, 65.92)	99.90
		BNM _O	0.63 (64.54, 66.96)	98.99	0.66 (64.83, 66.76)	99.39	0.65 (65.17, 66.58)	99.59
		Proposed	0.94 (64.87, 67.14)	62.82	0.93 (65.08, 66.96)	63.36	0.71 (65.23, 66.71)	66.50
	30	BNM _P	0.00 (64.31, 66.09)	99.29	0.00 (64.33, 65.86)	99.69	0.00 (64.55, 65.76)	100.00
		BNM _O	0.72 (64.96, 66.76)	99.19	0.65 (65.00, 66.53)	100.00	0.70 (65.21, 66.44)	99.79
		Proposed	0.80 (65.03, 66.91)	65.14	0.95 (65.15, 66.71)	68.00	0.83 (65.31, 66.57)	67.39
	50	BNM _P	0.00 (64.40, 65.78)	99.90	0.00 (64.60, 65.70)	99.90	0.00 (64.61, 65.56)	100.00
		BNM _O	0.62 (65.01, 66.44)	99.69	0.69 (65.20, 66.40)	100.00	0.70 (65.30, 66.27)	100.00
		Proposed	0.85 (65.22, 66.67)	65.07	0.82 (65.24, 66.58)	67.94	0.77 (65.29, 66.31)	62.86
	20	BNM _P	0.00 (64.72, 66.38)	99.29	0.00 (64.75, 66.20)	99.70	0.00 (64.95, 65.99)	100.00
		BNM _O	0.48 (65.22, 66.92)	99.49	0.55 (65.28, 66.80)	99.90	0.54 (65.48, 66.52)	100.00
		Proposed	0.51 (65.27, 66.93)	48.32	0.58 (65.29, 66.82)	50.51	0.52 (65.41, 66.57)	57.13
50-300	30	BNM _P	0.00 (64.69, 66.17)	100.00	0.00 (64.88, 66.01)	100.00	0.00 (65.06, 65.95)	100.00
		BNM _O	0.51 (65.25, 66.66)	100.00	0.48 (65.38, 66.56)	100.00	0.49 (65.54, 66.44)	100.00
		Proposed	0.55 (65.24, 66.80)	50.66	0.49 (65.29, 66.66)	52.54	0.44 (65.46, 66.44)	59.14
	50	BNM _P	0.00 (64.89, 66.00)	100.00	0.00 (65.05, 65.88)	100.00	0.00 (65.12, 65.78)	100.00
		BNM _O	0.56 (65.45, 66.54)	100.00	0.53 (65.55, 66.42)	100.00	0.50 (65.62, 66.31)	100.00
		Proposed	0.56 (65.46, 66.60)	54.57	0.51 (65.55, 66.48)	54.59	0.50 (65.60, 66.35)	48.30

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	BNM $_P$	0.00 (81.75, 85.59)	100.00	0.00 (81.93, 85.38)	100.00	0.00 (82.19, 84.82)	100.00
		BNM $_O$	0.09 (81.83, 85.60)	100.00	0.17 (82.05, 85.34)	100.00	0.24 (82.40, 84.91)	100.00
		Proposed	0.44 (82.17, 86.22)	55.41	0.87 (82.55, 86.18)	58.76	0.80 (82.74, 85.64)	66.57
	30	BNM $_P$	0.00 (82.09, 85.18)	100.00	0.00 (82.22, 84.87)	100.00	0.00 (82.29, 84.60)	100.00
		BNM $_O$	0.09 (82.06, 85.05)	100.00	0.11 (82.39, 84.99)	99.90	0.09 (82.46, 84.57)	100.00
		Proposed	0.61 (82.53, 85.76)	62.15	0.71 (82.84, 86.04)	68.67	0.68 (83.02, 85.71)	76.78
	50	BNM $_P$	0.00 (82.17, 84.75)	100.00	0.00 (82.26, 84.36)	100.00	0.00 (82.44, 84.06)	100.00
		BNM $_O$	0.14 (82.42, 84.88)	100.00	0.17 (82.49, 84.48)	100.00	0.18 (82.70, 84.18)	100.00
		Proposed	0.70 (82.84, 85.79)	71.17	0.85 (82.89, 85.58)	77.20	0.83 (83.05, 85.36)	84.80
50-300	20	BNM $_P$	0.00 (82.72, 85.74)	100.00	0.00 (83.04, 85.40)	100.00	0.00 (83.26, 85.07)	100.00
		BNM $_O$	0.04 (82.83, 85.74)	100.00	0.02 (83.13, 85.40)	100.00	0.04 (83.32, 85.03)	100.00
		Proposed	-1.18 (81.23, 84.93)	33.97	-0.18 (82.43, 85.61)	39.36	-0.04 (82.99, 85.33)	47.90
	30	BNM $_P$	0.00 (82.98, 85.26)	100.00	0.00 (83.09, 85.01)	100.00	0.00 (83.19, 84.83)	100.00
		BNM $_O$	-0.02 (82.99, 85.28)	100.00	0.02 (83.11, 85.03)	100.00	0.05 (83.25, 84.84)	100.00
		Proposed	-0.35 (82.18, 85.42)	39.48	-0.16 (82.70, 85.17)	45.94	0.11 (83.16, 85.21)	54.56
	50	BNM $_P$	0.00 (83.11, 84.92)	100.00	0.00 (83.24, 84.91)	100.00	0.00 (83.39, 84.54)	100.00
		BNM $_O$	0.06 (83.22, 85.00)	100.00	0.08 (83.30, 84.87)	100.00	0.06 (83.48, 84.58)	100.00
		Proposed	-0.03 (82.91, 85.30)	50.45	0.18 (83.16, 85.40)	51.65	0.24 (83.47, 84.97)	59.80

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.