

# 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)	Median (Q1, Q3)	Median (Q1, Q3)
50-150	20	HZ <sub>P</sub>	75.01 (73.32, 76.39)	74.82 (73.57, 75.97)	74.69 (73.75, 75.67)
		HZ <sub>O</sub>	76.12 (74.27, 78.11)	76.52 (74.56, 78.28)	78.56 (75.73, 80.61)
		Proposed	75.58 (73.33, 77.85)	74.75 (72.35, 76.96)	72.82 (69.93, 76.60)
		Succuess	63.96	61.86	41.51
	30	HZ <sub>P</sub>	74.70 (73.48, 75.93)	74.68 (73.56, 75.85)	74.67 (73.96, 75.46)
		HZ <sub>O</sub>	75.90 (74.25, 77.35)	76.35 (74.65, 77.90)	78.03 (76.09, 79.93)
		Proposed	75.38 (73.43, 77.37)	74.60 (72.77, 76.70)	73.07 (70.27, 76.02)
		Succuess	72.72	71.82	55.65
	50	HZ <sub>P</sub>	74.61 (73.65, 75.57)	74.57 (73.77, 75.33)	74.50 (73.86, 75.08)
		HZ <sub>O</sub>	75.74 (74.60, 76.89)	76.24 (75.04, 77.40)	77.43 (76.00, 78.94)
		Proposed	75.14 (73.65, 76.80)	74.52 (73.08, 76.17)	73.17 (71.15, 75.53)
		Succuess	83.5	80	67.34
50-300	20	HZ <sub>P</sub>	75.95 (74.78, 77.08)	75.80 (74.71, 76.76)	75.81 (75.13, 76.61)
		HZ <sub>O</sub>	76.89 (75.41, 78.40)	77.25 (75.70, 78.87)	79.17 (77.36, 80.93)
		Proposed	76.05 (73.63, 78.28)	75.52 (72.78, 77.77)	73.40 (70.27, 76.25)
		Succuess	60.7	58.09	27.81
	30	HZ <sub>P</sub>	75.80 (74.88, 76.66)	75.74 (74.86, 76.51)	75.64 (74.90, 76.33)
		HZ <sub>O</sub>	76.65 (75.43, 77.71)	77.03 (75.70, 78.31)	78.49 (76.56, 80.31)
		Proposed	76.04 (74.34, 77.67)	75.55 (73.52, 77.32)	73.55 (69.89, 76.35)
		Succuess	67.8	67.94	38.21
	50	HZ <sub>P</sub>	75.69 (74.83, 76.45)	75.66 (75.02, 76.26)	75.67 (75.13, 76.09)
		HZ <sub>O</sub>	76.44 (75.36, 77.36)	76.86 (75.89, 77.93)	78.28 (76.76, 79.73)
		Proposed	75.97 (74.64, 77.20)	75.66 (74.37, 76.92)	74.27 (71.30, 76.41)
		Succuess	78.4	72.74	48.19

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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)	Median (Q1, Q3)	Median (Q1, Q3)
50-150	20	HZ <sub>P</sub>	60.11 (59.09, 61.16)	60.15 (59.21, 61.02)	60.16 (59.46, 60.75)
		HZ <sub>O</sub>	61.12 (59.72, 62.34)	61.97 (60.65, 63.44)	64.47 (62.44, 66.40)
		Proposed	59.88 (58.26, 61.42)	59.06 (57.23, 61.22)	59.29 (56.01, 63.63)
		Succuess	65.46	65.28	65.88
	30	HZ <sub>P</sub>	60.12 (59.27, 60.95)	60.17 (59.45, 60.82)	60.07 (59.51, 60.63)
		HZ <sub>O</sub>	61.11 (60.07, 62.18)	62.02 (60.99, 63.12)	64.41 (62.90, 65.94)
		Proposed	59.86 (58.55, 61.11)	58.72 (57.34, 60.20)	58.25 (55.69, 63.06)
		Succuess	73.72	75	68.7
	50	HZ <sub>P</sub>	60.10 (59.44, 60.76)	60.09 (59.56, 60.62)	60.11 (59.67, 60.53)
		HZ <sub>O</sub>	61.01 (60.26, 61.90)	62.04 (61.18, 62.87)	64.41 (63.18, 65.65)
		Proposed	59.46 (58.57, 60.53)	58.48 (57.50, 59.60)	57.57 (55.66, 60.14)
		Succuess	81.66	80.64	79.46
50-300	20	HZ <sub>P</sub>	60.36 (59.51, 61.06)	60.35 (59.70, 61.00)	60.32 (59.84, 60.86)
		HZ <sub>O</sub>	61.23 (60.24, 62.20)	62.13 (61.15, 63.12)	63.97 (62.38, 65.28)
		Proposed	60.23 (59.07, 61.47)	60.21 (58.69, 61.78)	60.21 (57.82, 63.35)
		Succuess	61.78	64.59	56.23
	30	HZ <sub>P</sub>	60.29 (59.71, 60.98)	60.28 (59.76, 60.85)	60.33 (59.92, 60.73)
		HZ <sub>O</sub>	61.27 (60.50, 62.05)	62.04 (61.29, 62.93)	63.89 (62.76, 64.96)
		Proposed	60.11 (59.16, 61.23)	59.87 (58.76, 61.30)	59.83 (57.79, 62.31)
		Succuess	69.1	73.33	64.59
	50	HZ <sub>P</sub>	60.29 (59.85, 60.79)	60.29 (59.93, 60.71)	60.31 (60.01, 60.62)
		HZ <sub>O</sub>	61.26 (60.67, 61.83)	62.10 (61.41, 62.74)	63.88 (63.00, 64.76)
		Proposed	59.93 (59.17, 60.76)	59.64 (58.72, 60.94)	59.46 (57.76, 61.88)
		Succuess	76.55	78.61	72.24

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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)	Median (Q1, Q3)	Median (Q1, Q3)
50-150	20	HZ <sub>P</sub>	87.12 (85.74, 88.43)	87.21 (86.15, 88.30)	87.04 (86.15, 88.04)
		HZ <sub>O</sub>	88.05 (86.35, 89.37)	88.72 (87.32, 89.87)	89.81 (88.09, 91.16)
		Proposed	88.79 (87.05, 90.07)	88.48 (86.73, 89.69)	85.30 (82.21, 88.14)
		Succuess	55.24	53.33	33.04
	30	HZ <sub>P</sub>	87.24 (86.10, 88.31)	87.23 (86.29, 88.07)	86.94 (86.28, 87.82)
		HZ <sub>O</sub>	87.94 (86.63, 89.06)	88.57 (87.26, 89.57)	89.72 (88.54, 90.74)
		Proposed	88.99 (87.50, 90.04)	88.50 (87.17, 89.56)	85.92 (83.27, 87.86)
		Succuess	59.83	59.83	35.58
	50	HZ <sub>P</sub>	87.11 (86.32, 87.93)	87.09 (86.34, 87.85)	87.02 (86.45, 87.57)
		HZ <sub>O</sub>	87.88 (86.91, 88.71)	88.48 (87.58, 89.30)	89.76 (88.69, 90.56)
		Proposed	88.85 (87.83, 89.86)	88.79 (87.77, 89.62)	87.18 (84.74, 88.68)
		Succuess	74.4	71.32	51.63
50-300	20	HZ <sub>P</sub>	89.27 (88.37, 89.93)	89.12 (88.32, 89.78)	88.86 (88.21, 89.49)
		HZ <sub>O</sub>	89.83 (89.03, 90.48)	90.33 (89.58, 90.89)	91.03 (90.35, 91.57)
		Proposed	88.51 (81.25, 90.34)	80.20 (68.82, 87.93)	70.51 (63.57, 76.12)
		Succuess	30.72	19.29	7.81
	30	HZ <sub>P</sub>	88.98 (88.21, 89.63)	88.96 (88.31, 89.54)	88.85 (88.36, 89.36)
		HZ <sub>O</sub>	89.67 (88.88, 90.33)	90.22 (89.57, 90.69)	90.93 (90.40, 91.42)
		Proposed	89.42 (84.93, 90.50)	83.10 (72.31, 89.22)	70.36 (63.78, 76.98)
		Succuess	40.45	21.76	6.94
	50	HZ <sub>P</sub>	88.95 (88.33, 89.52)	88.89 (88.39, 89.33)	88.82 (88.40, 89.23)
		HZ <sub>O</sub>	89.72 (88.97, 90.26)	90.20 (89.60, 90.56)	91.01 (90.59, 91.43)
		Proposed	89.89 (88.20, 90.63)	88.48 (75.90, 90.15)	70.92 (65.12, 77.81)
		Succuess	52.46	30.87	11.2

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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	HZ <sub>P</sub>	75.34 (73.88, 76.73)	75.06 (73.80, 76.42)	74.97 (73.99, 75.81)
		HZ <sub>O</sub>	76.35 (74.43, 78.03)	76.81 (74.98, 78.94)	78.54 (76.15, 80.69)
		Proposed	76.24 (74.09, 78.36)	75.49 (73.03, 78.09)	73.00 (70.03, 76.53)
		Succuess	39.74	39.76	23.31
	30	HZ <sub>P</sub>	75.05 (73.86, 76.13)	74.89 (73.89, 75.86)	74.80 (73.99, 75.61)
		HZ <sub>O</sub>	76.11 (74.67, 77.55)	76.75 (75.24, 78.03)	77.89 (76.13, 79.84)
		Proposed	76.22 (74.23, 78.15)	75.36 (73.15, 77.45)	72.37 (70.06, 75.43)
		Succuess	47.95	46.35	25.99
	50	HZ <sub>P</sub>	74.81 (73.87, 75.71)	74.80 (74.03, 75.52)	74.80 (74.29, 75.39)
		HZ <sub>O</sub>	75.83 (74.68, 77.00)	76.48 (75.24, 77.59)	77.67 (76.39, 79.08)
		Proposed	75.68 (74.39, 77.44)	74.96 (73.25, 76.72)	72.30 (70.56, 74.39)
		Succuess	61.5	49.35	32.25
50-300	20	HZ <sub>P</sub>	76.21 (75.06, 77.18)	76.09 (75.07, 77.02)	75.95 (75.30, 76.67)
		HZ <sub>O</sub>	77.15 (75.71, 78.52)	77.67 (76.06, 79.16)	79.52 (77.53, 81.06)
		Proposed	77.16 (74.44, 79.94)	76.39 (73.05, 79.35)	74.21 (71.19, 75.89)
		Succuess	29.86	27.62	10.24
	30	HZ <sub>P</sub>	76.09 (75.15, 77.00)	75.97 (75.18, 76.70)	75.92 (75.36, 76.56)
		HZ <sub>O</sub>	76.99 (75.78, 78.20)	77.36 (76.08, 78.57)	78.89 (77.35, 80.33)
		Proposed	76.95 (74.70, 79.19)	76.13 (73.68, 78.76)	73.86 (70.38, 75.72)
		Succuess	35.47	28.72	10.85
	50	HZ <sub>P</sub>	75.99 (75.28, 76.70)	75.89 (75.27, 76.50)	75.83 (75.31, 76.31)
		HZ <sub>O</sub>	76.83 (75.82, 77.73)	77.15 (75.98, 78.23)	78.61 (77.34, 79.86)
		Proposed	76.51 (74.90, 78.36)	75.90 (74.07, 77.73)	73.57 (70.10, 75.45)
		Succuess	38.42	33.57	10.6

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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	HZ <sub>P</sub>	60.23 (59.20, 61.22)	60.19 (59.40, 60.98)	60.27 (59.61, 60.82)
		HZ <sub>O</sub>	61.65 (60.25, 62.93)	62.81 (61.39, 64.10)	65.36 (63.51, 67.13)
		Proposed	60.34 (58.76, 62.04)	59.80 (58.07, 61.97)	59.69 (56.87, 63.44)
		Succuess	45.98	47.24	43.46
	30	HZ <sub>P</sub>	60.17 (59.44, 60.97)	60.16 (59.51, 60.84)	60.20 (59.67, 60.73)
		HZ <sub>O</sub>	61.56 (60.67, 62.63)	62.75 (61.59, 63.81)	65.23 (63.79, 66.69)
		Proposed	60.18 (58.88, 61.39)	59.42 (58.05, 61.04)	58.92 (56.70, 61.77)
		Succuess	49.75	50.95	49.2
	50	HZ <sub>P</sub>	60.16 (59.58, 60.75)	60.17 (59.66, 60.69)	60.13 (59.73, 60.54)
		HZ <sub>O</sub>	61.50 (60.71, 62.27)	62.81 (61.85, 63.56)	65.31 (64.16, 66.37)
		Proposed	59.81 (59.02, 60.86)	59.20 (58.12, 60.25)	58.60 (56.72, 60.40)
		Succuess	53.92	54.5	54.15
50-300	20	HZ <sub>P</sub>	60.38 (59.64, 61.21)	60.33 (59.74, 60.95)	60.36 (59.91, 60.85)
		HZ <sub>O</sub>	61.72 (60.78, 62.63)	62.59 (61.56, 63.51)	64.39 (63.00, 65.63)
		Proposed	60.79 (59.55, 62.03)	60.56 (59.28, 61.86)	60.29 (58.38, 62.29)
		Succuess	37.53	36.13	31.61
	30	HZ <sub>P</sub>	60.40 (59.77, 61.05)	60.37 (59.88, 60.84)	60.36 (60.00, 60.77)
		HZ <sub>O</sub>	61.70 (60.90, 62.49)	62.58 (61.84, 63.33)	64.47 (63.32, 65.45)
		Proposed	60.63 (59.61, 61.71)	60.40 (59.44, 61.49)	59.97 (58.41, 61.65)
		Succuess	43.82	41.27	37.63
	50	HZ <sub>P</sub>	60.37 (59.89, 60.78)	60.33 (59.87, 60.75)	60.40 (60.10, 60.71)
		HZ <sub>O</sub>	61.61 (61.02, 62.22)	62.51 (61.87, 63.07)	64.40 (63.55, 65.17)
		Proposed	60.44 (59.65, 61.24)	60.17 (59.24, 60.98)	59.68 (58.43, 60.90)
		Succuess	47.49	50.3	43.9

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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	HZ <sub>P</sub>	87.64 (86.34, 88.74)	87.57 (86.56, 88.54)	87.38 (86.58, 88.21)
		HZ <sub>O</sub>	88.38 (87.04, 89.51)	89.12 (87.82, 90.10)	89.94 (88.41, 90.88)
		Proposed	88.84 (87.08, 90.02)	88.28 (86.33, 89.46)	82.96 (78.76, 85.94)
		Succuess	36.68	35.59	19.83
	30	HZ <sub>P</sub>	87.57 (86.66, 88.49)	87.58 (86.66, 88.43)	87.33 (86.70, 87.95)
		HZ <sub>O</sub>	88.30 (87.16, 89.21)	88.92 (87.75, 89.79)	89.92 (88.93, 90.76)
		Proposed	88.73 (87.19, 89.87)	88.31 (86.70, 89.42)	82.60 (78.59, 86.05)
		Succuess	45.38	39.16	21.22
	50	HZ <sub>P</sub>	87.52 (86.60, 88.21)	87.44 (86.77, 88.08)	87.38 (86.79, 87.87)
		HZ <sub>O</sub>	88.21 (87.36, 89.06)	88.70 (87.89, 89.57)	89.79 (88.86, 90.50)
		Proposed	88.92 (87.70, 89.86)	88.45 (87.20, 89.39)	81.84 (77.93, 85.89)
		Succuess	52.57	48.21	19.94
50-300	20	HZ <sub>P</sub>	89.34 (88.59, 89.95)	89.31 (88.60, 89.87)	89.33 (88.75, 89.85)
		HZ <sub>O</sub>	89.96 (89.20, 90.57)	90.26 (89.64, 90.79)	90.85 (90.38, 91.38)
		Proposed	77.41 (69.90, 86.64)	73.32 (64.59, 80.29)	68.46 (61.61, 76.02)
		Succuess	16.78	15.28	12.12
	30	HZ <sub>P</sub>	89.38 (88.71, 89.92)	89.27 (88.68, 89.81)	89.17 (88.76, 89.60)
		HZ <sub>O</sub>	90.01 (89.39, 90.49)	90.32 (89.78, 90.78)	90.96 (90.54, 91.40)
		Proposed	78.33 (70.24, 88.11)	72.41 (64.17, 82.09)	68.73 (61.87, 76.95)
		Succuess	14.69	16.65	12.09
	50	HZ <sub>P</sub>	89.22 (88.65, 89.71)	89.23 (88.75, 89.63)	89.09 (88.76, 89.48)
		HZ <sub>O</sub>	89.91 (89.33, 90.34)	90.33 (89.89, 90.70)	90.97 (90.56, 91.29)
		Proposed	80.04 (71.24, 89.42)	73.15 (63.37, 84.97)	68.64 (61.81, 77.64)
		Succuess	18.53	12.13	6.85

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<sub>P</sub> denotes the HZ model using the population (published and unpublished) studies; BNM<sub>O</sub> 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.