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Additional file to the article 'Introducing a new estimator and test for the weighted all-cause hazard ratio': Further Simulation Results

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Additional Simulation Results

The following two tables show further simulation results with weights of 1 and 0.7 and the same distributions as considered in the main manuscript. The number of simulations is also 1000 with 1000 runs in the permutation test. A total of 100 individuals per treatment group are considered with a minimal follow-up of 1 or 2 years.

Table 1 Simulation results.

Sc.	Assumptions for original parametric estimator*	Assumptions for new non-parametric estimator#	τ	Weights		Ln of True WHR	Mean number of events (sd)		Mean of estimated Ln(WHR) (sd)		Power for permutation test	Power for weight-based log-rank test
				w_{EP_1}	w_{EP_2}	$ln(\theta^w_{CE}(\tau))$	EP_1	EP_2	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$	$\hat{\theta}^w_{CE}(\tau)$	$\tilde{\theta}^w_{CE}(\tau)$
1a	✓	✗	1	1	0.7	-0.86	50.21 (6.51)	35.16 (5.21)	-0.87 (0.25)	-0.75 (0.24)	0.97	0.97
1b			2	1	0.7	-0.97	72.60 (6.74)	80.13 (6.73)	-0.98 (0.17)	-0.86 (0.17)	1.00	1.00
1c			2	0.7	1	-1.07			-1.08 (0.19)	-0.98 (0.17)	1.00	1.00
2a	✗	✗	1	1	0.7	-0.70	48.22 (6.08)	37.15 (5.33)	-0.77 (0.25)	-0.76 (0.24)	0.92	0.98
2b			2	1	0.7	-0.68	67.79 (6.75)	51.93 (5.60)	-0.75 (0.20)	-0.73 (0.19)	0.98	0.99
3a	✓	✗	1	1	0.7	-0.19	39.97 (5.63)	47.94 (5.87)	-0.20 (0.24)	-0.36 (0.22)	0.18	0.60
3b			1	0.7	1	0.07			0.05 (0.24)	-0.08 (0.22)	0.01	0.18
3c			2	1	0.7	0.06	69.84 (6.39)	124.63 (6.40)	0.06 (0.17)	-0.08 (0.17)	0.02	0.48
4a	✗	✗	1	1	0.7	-0.32	62.84 (6.39)	6.49 (2.50)	-0.14 (0.69)	-0.20 (0.25)	0.07	0.23
4b			1	0.7	1	-0.26			-0.08 (0.73)	-0.16 (0.25)	0.04	0.23
4c			2	1	0.7	-0.42	86.66 (6.95)	24.29 (4.57)	-0.20 (0.24)	-0.25 (0.19)	0.14	0.43
4d			2	0.7	1	-0.39			-0.17 (0.28)	-0.23 (0.20)	0.09	0.40
5a	✗	✗	1	1	0.7	-0.45	133.27 (6.26)	19.31 (4.05)	-0.65 (0.38)	-0.71 (0.16)	0.94	1.00
5b			1	0.7	1	-0.35			-0.51 (0.42)	-0.61 (0.17)	0.66	1.00
6a	✓	✗	2	1	0.7	0.00	67.04 (6.74)	56.49 (6.37)	0.00 (0.18)	0.00 (0.18)	0.02	0.07
6b			2	0.7	1	0.60			0.60 (0.16)	0.60 (0.16)	0.00	0.06
7a	✓	✓	2	1	0.7	0.51	15.83 (3.84)	141.89 (6.18)	0.51 (0.17)	0.52 (0.16)	0.00	0.00
7b			2	0.7	1	0.15			0.16 (0.18)	0.16 (0.21)	0.01	0.00
8a	✗	✓	2	1	0.7	-0.74	108.25 (6.93)	78.79 (6.69)	-0.90 (0.19)	-0.75 (0.16)	1.00	1.00
8b			2	0.7	1	-0.86			-1.02 (0.20)	-0.87 (0.16)	1.00	1.00
9a	✗	✗	1	0.7	1	-0.61	132.78 (6.43)	15.22 (3.56)	-0.76 (0.21)	-0.63 (0.16)	0.97	0.99
9b			2	1	0.7	-0.53	178.24 (4.21)	21.76 (4.21)	-0.85 (0.27)	-0.58 (0.16)	0.99	0.99
9c			2	0.7	1	-0.55			-0.97 (0.33)	-0.63 (0.18)	0.98	1.00
10a	✗	✗	1	1	0.7	-0.74	84.95 (7.02)	62.44 (6.34)	-0.73 (0.17)	-0.74 (0.17)	0.99	1.00
10b			1	0.7	1	-0.80			-0.82 (0.17)	-0.84 (0.17)	1.00	1.00
10c			2	1	0.7	-0.74	113.64 (6.92)	80.58 (6.55)	-0.68 (0.14)	-0.75 (0.16)	1.00	1.00
10d			2	0.7	1	-0.76			-0.76 (0.14)	-0.83 (0.16)	1.00	1.00

Ln: natural logarithm; WHR: Weighted all-cause hazard ratio; sd: Standard deviation;

*It is assumed that the Weibull model used to estimate the cause-specific hazards is the correct one;

#It is assumed that the cause-specific baseline hazards are equal.

Table 2 Simulation results: Performance.

Sc.	Amount of Simulations		Bias		Standardized Bias		$\sqrt{\text{Mean Square Error}}$		Relative Efficiency	Coverage*	
	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$	$\frac{MSE(ln(\hat{\theta}^w_{CE}(\tau)))}{MSE(ln(\tilde{\theta}^w_{CE}(\tau)))}$	$ln(\hat{\theta}^w_{CE}(\tau))$	$ln(\tilde{\theta}^w_{CE}(\tau))$
1a	991	1000	-0.02	0.10	-0.07	0.43	0.25	0.26	0.93	92.84	90.00
1b	997	1000	-0.01	0.11	-0.05	0.66	0.17	0.20	0.75	94.48	88.80
1c	997	1000	-0.01	0.09	-0.05	0.50	0.19	0.20	0.97	95.29	92.30
2a	1000	1000	-0.07	-0.06	-0.30	-0.26	0.26	0.25	1.08	92.70	92.50
2b	999	1000	-0.07	-0.06	-0.36	-0.31	0.21	0.20	1.09	91.89	93.10
3a	1000	1000	-0.02	-0.17	-0.06	-0.78	0.24	0.28	0.73	92.60	87.30
3b	1000	1000	-0.02	-0.15	-0.06	-0.67	0.25	0.27	0.85	93.60	89.40
3c	1000	1000	0.00	-0.14	-0.01	-0.82	0.17	0.22	0.60	92.48	78.95
4a	993	1000	0.17	0.12	0.25	0.47	0.72	0.28	6.77	90.76	91.94
4b	993	1000	0.18	0.09	0.24	0.36	0.76	0.26	8.13	92.56	92.65
4c	996	1000	0.21	0.17	0.90	0.85	0.32	0.26	1.53	84.21	85.57
4d	996	1000	0.22	0.17	0.78	0.84	0.36	0.26	1.88	87.42	86.17
5a	995	1000	-0.21	-0.26	-0.55	-1.62	0.43	0.31	1.91	82.50	62.56
5b	995	1000	-0.16	-0.26	-0.39	-1.55	0.45	0.31	2.08	89.74	64.56
6a	998	1000	0.00	0.00	0.00	0.00	0.18	0.18	1.04	95.19	95.20
6b	998	1000	-0.00	-0.00	-0.01	-0.00	0.20	0.18	1.26	95.89	95.40
7a	984	1000	0.00	0.01	0.00	0.04	0.17	0.16	1.08	94.51	94.09
7b	984	1000	0.00	0.01	0.01	0.04	0.16	0.16	1.01	95.41	94.89
8a	1000	1000	-0.16	-0.01	-0.83	-0.03	0.25	0.16	2.45	84.20	93.30
8b	1000	1000	-0.17	-0.01	-0.84	-0.04	0.26	0.16	2.56	83.80	92.90
9a	998	998	-0.15	-0.02	-0.75	-0.13	0.26	0.17	2.42	88.68	95.35
9b	990	1000	-0.32	-0.05	-1.19	-0.28	0.41	0.17	6.25	64.14	92.20
9c	990	1000	-0.42	-0.08	-1.30	-0.49	0.53	0.19	7.60	55.86	88.30
10a	1000	1000	0.01	-0.00	0.06	-0.02	0.17	0.17	0.98	94.30	94.70
10b	1000	1000	-0.02	-0.03	-0.11	-0.20	0.17	0.17	0.97	93.90	94.20
10c	1000	1000	0.06	-0.01	0.45	-0.05	0.16	0.16	0.95	92.40	92.70
10d	1000	1000	-0.01	-0.08	-0.03	-0.49	0.14	0.18	0.62	94.20	90.10

* Defined as proportion of times the 95%-confidence interval for the estimator includes the true effect.