Results

Figure 1 presents the true survival curves as well as the WKM and AWKM survival curves averaged over 250 replications for each intervention rule and scenario. Qualitatively, the WKM estimator consistently over-estimates survival whereas the the AWKM survival curve is much closer to the truth. The bias of the AWKM survival estimate appears to be larger earlier in follow-up and smaller as follow-up extends forward. The bias of both the the WKM and the AWKM survival curves appears largest in Scenario 5.

Table 1 presents true and estimated average cancer-free survival times under each intervention rule and scenario. Table 2 presents differences in survival time contrasting rule a_1 to rule a_0. Table 3 presents estimates of the bias of the WKM and AWKM estimators for ψ, the difference in average cancer-free survival time over 20 years of follow-up. These numeric results are consistent with the qualitative interpretations of Figure 1. The WKM estimator over-estimates the difference in cancer-free survival time, resulting in bias toward the null, whereas the AWKM estimator under-estimates the cancer-free survival, resulting in bias away from the null. In every scenario, the bias of the WKM-derived contrast is several times larger in magnitude than that of the AWKM-derived contrast. The bias of both estimators is greatest for Scenario 5.

Table 1: True cancer-free survival time μ_a over 20-year follow-up and estimator averages over 250 replicates.

Rule	Estimator	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
a_0	Truth	19.08	19.10	19.10	18.02	17.83
	WKM	19.52	19.51	19.53	18.92	18.90
	AWKM	19.02	19.00	19.02	17.79	17.72
a_1	Truth	18.80	18.79	18.76	17.54	17.29
	WKM	19.39	19.37	19.37	18.68	18.62
	AWKM	18.70	18.67	18.67	17.30	17.07

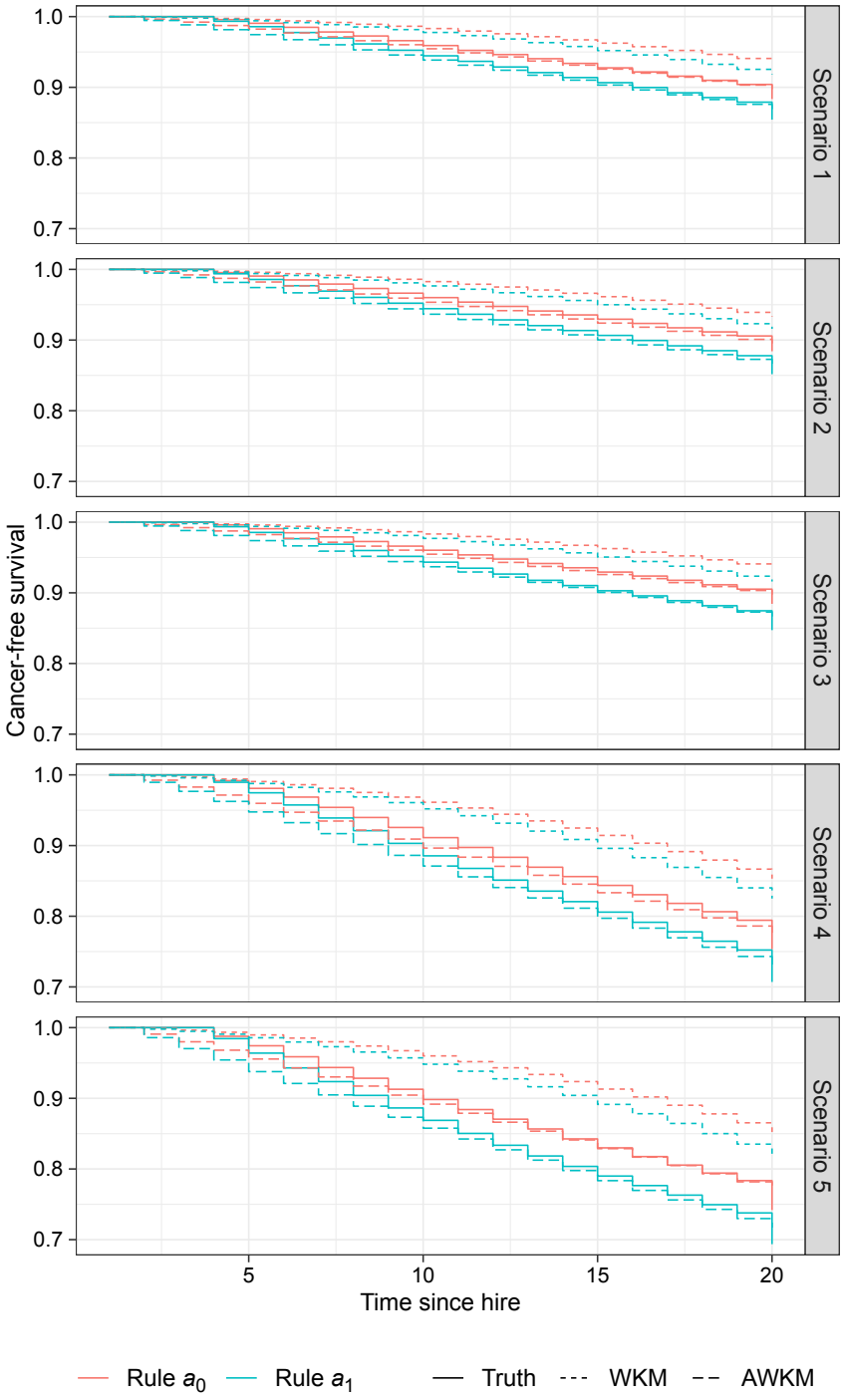
Table 2: Difference in average cancer-free survival time over 20-year follow-up comparing rule a_1 always exposed to rule a_0 never exposed at work: true value ψ and estimator averages over 250 replicates.

Estimator	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Truth	-0.28	-0.31	-0.34	-0.48	-0.54
WKM	-0.14	-0.15	-0.15	-0.23	-0.28
AWKM	-0.31	-0.33	-0.35	-0.50	-0.64

Table 3: Bias estimates of estimators for ψ, the difference in average cancer-free survival time over 20 years of follow-up.

Estimator	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
WKM	0.14	0.16	0.19	0.25	0.26
AWKM	-0.03	-0.02	-0.01	-0.02	-0.10

Figure 1: Cancer-free survival over time since hire in five simulation scenarios. The true (discrete) survival curve is represented by the solid lines. The average inverse probability weighted Kaplan-Meier (WKM) survival curve is represented by the dashed-line with short dashes. The average Aalen-filtered inverse probability weighted Kaplan-Meier (AWKM) survival curve is represented by the dashed-line with long dashes. Estimated survival curves were averaged over 250 replicates. Salmon color indicates survival and survival estimates under rule a_0 when workers are always unexposed. Cyan color indicates those under rule a_1 when workers are always exposed while employed.



Comparison to previous results