Supplementary Materials for "A Bayesian Adaptive Phase II Clinical Trial Design Accounting for Spatial Variation"

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Table S1: True model parameters for the 8 scenarios.

scenario	β_0	β_1	β_2	β_3	γ
1	0.1	0.2	0.5	0.8	1.3
2	0.4	0.2	-0.7	0.3	1.0
3	0.5	1.0	0.5	-0.7	1.7
4	0.0	0.5	-0.4	-0.4	1.0
5	0.3	0.2	0.5	0.2	1.0
6	0.2	0.3	1.0	0.1	1.4
7	-0.5	0.4	0.5	0.3	0.8
8	0.1	0.7	-0.8	-0.3	0.9

Table S2: Percent of correct selection of the true recommended treatment for the 8 scenarios with equal relative population.

	$\sigma = 2$				$\sigma = 10$			
	$X = 0$	$X = 0$	$X = 1$	$X = 1$	$X = 0$	$X = 0$	$X = 1$	$X = 1$
Region	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)
Scenario 1								
1	0.624	0.648	0.828	0.650	0.702	0.576	0.876	0.488
2	0.644	0.590	0.784	0.736	0.686	0.606	0.862	0.476
3	0.618	0.598	0.804	0.648	0.668	0.632	0.890	0.500
4	0.670	0.634	0.828	0.626	0.716	0.568	0.874	0.556
5	0.648	0.616	0.810	0.744	0.716	0.620	0.852	0.488
6	0.662	0.606	0.790	0.792	0.692	0.598	0.812	0.498
7	0.628	0.618	0.816	0.744	0.642	0.636	0.818	0.540
8	0.668	0.608	0.812	0.740	0.710	0.618	0.842	0.538
9	0.636	0.626	0.808	0.606	0.718	0.628	0.878	0.514
10	0.664	0.600	0.814	0.766	0.718	0.632	0.858	0.518
11	0.680	0.594	0.806	0.756	0.704	0.624	0.838	0.564
12	0.682	0.504	0.820	0.744	0.732	0.574	0.878	0.562
Scenario 2								
1	0.770	0.664	0.662	0.562	0.730	0.588	0.754	0.432
2	0.728	0.706	0.670	0.570	0.720	0.614	0.744	0.482
3	0.726	0.642	0.670	0.618	0.712	0.594	0.768	0.420
4	0.798	0.644	0.734	0.596	0.752	0.568	0.778	0.462
5	0.718	0.660	0.670	0.584	0.702	0.570	0.754	0.486
6	0.748	0.698	0.654	0.588	0.692	0.600	0.748	0.490
7	0.754	0.700	0.636	0.594	0.730	0.620	0.746	0.502
8	0.726	0.680	0.684	0.606	0.730	0.628	0.736	0.534
9	0.744	0.672	0.720	0.526	0.742	0.556	0.794	0.528
10	0.734	0.688	0.680	0.544	0.740	0.604	0.768	0.492
11	0.718	0.682	0.646	0.598	0.750	0.640	0.768	0.532
12	0.742	0.662	0.684	0.582	0.722	0.648	0.780	0.498
Scenario 3								
1	0.838	0.762	0.786	0.658	0.890	0.526	0.798	0.564
2	0.842	0.778	0.760	0.704	0.876	0.516	0.760	0.640
3	0.838	0.754	0.690	0.702	0.848	0.538	0.760	0.604
4	0.854	0.688	0.688	0.658	0.902	0.510	0.770	0.570
5	0.830	0.748	0.714	0.680	0.848	0.556	0.804	0.588
6	0.834	0.788	0.702	0.716	0.846	0.546	0.756	0.642
7	0.816	0.772	0.722	0.726	0.832	0.542	0.752	0.662
8	0.834	0.716	0.724	0.690	0.862	0.556	0.804	0.614
9	0.862	0.698	0.762	0.620	0.854	0.528	0.800	0.552
10	0.832	0.744	0.736	0.702	0.854	0.526	0.742	0.590
11	0.830	0.722	0.696	0.694	0.836	0.584	0.756	0.630
12	0.834	0.674	0.748	0.680	0.876	0.518	0.808	0.558
Scenario 4								
1	0.768	0.580	0.656	0.584	0.752	0.512	0.680	0.506
2	0.738	0.510	0.640	0.574	0.716	0.492	0.660	0.526
3	0.684	0.588	0.630	0.576	0.764	0.472	0.644	0.516
4	0.682	0.572	0.604	0.520	0.760	0.472	0.682	0.492
5	0.748	0.550	0.646	0.588	0.760	0.498	0.652	0.528
6	0.692	0.548	0.580	0.584	0.720	0.480	0.664	0.540
7	0.716	0.552	0.578	0.576	0.704	0.494	0.638	0.566
8	0.700	0.582	0.594	0.580	0.738	0.448	0.682	0.602
9	0.748	0.570	0.658	0.592	0.760	0.516	0.680	0.586
10	0.720	0.568	0.578	0.604	0.742	0.496	0.660	0.568
11	0.710	0.576	0.624	0.594	0.742	0.510	0.726	0.600
12	0.748	0.584	0.628	0.580	0.770	0.456	0.664	0.558

Table S2 continued.

	$\sigma = 2$				$\sigma = 10$			
	$X = 0$	$X = 0$	$X = 1$	$X = 1$	$X = 0$	$X = 0$	$X = 1$	$X = 1$
Region	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)
Scenario 5								
1	0.736	0.636	0.752	0.556	0.680	0.584	0.734	0.534
2	0.724	0.650	0.728	0.596	0.704	0.658	0.712	0.610
3	0.712	0.656	0.742	0.570	0.708	0.610	0.814	0.560
4	0.748	0.652	0.754	0.582	0.716	0.568	0.788	0.562
5	0.746	0.640	0.740	0.590	0.748	0.602	0.754	0.530
6	0.716	0.636	0.694	0.566	0.708	0.616	0.710	0.566
7	0.728	0.702	0.694	0.614	0.804	0.666	0.782	0.564
8	0.696	0.708	0.682	0.630	0.716	0.564	0.786	0.580
9	0.748	0.602	0.754	0.554	0.764	0.518	0.768	0.498
10	0.704	0.602	0.716	0.580	0.746	0.608	0.762	0.570
11	0.688	0.672	0.718	0.574	0.716	0.548	0.744	0.562
12	0.714	0.600	0.748	0.538	0.744	0.602	0.760	0.570
Scenario 6								
1	0.670	0.556	0.764	0.696	0.702	0.512	0.778	0.582
2	0.604	0.554	0.792	0.704	0.714	0.550	0.798	0.664
3	0.624	0.524	0.778	0.706	0.726	0.504	0.862	0.618
4	0.676	0.596	0.764	0.698	0.750	0.524	0.796	0.566
5	0.676	0.584	0.758	0.710	0.698	0.568	0.782	0.608
6	0.620	0.548	0.816	0.718	0.670	0.502	0.774	0.624
7	0.606	0.576	0.798	0.746	0.730	0.596	0.766	0.648
8	0.616	0.552	0.778	0.716	0.722	0.540	0.812	0.618
9	0.654	0.568	0.786	0.676	0.670	0.588	0.798	0.568
10	0.648	0.550	0.808	0.696	0.722	0.570	0.776	0.610
11	0.686	0.550	0.816	0.684	0.672	0.488	0.720	0.586
12	0.680	0.522	0.788	0.682	0.734	0.544	0.794	0.546
Scenario 7								
1	0.676	0.554	0.756	0.638	0.746	0.446	0.784	0.462
2	0.660	0.550	0.746	0.640	0.724	0.440	0.768	0.478
3	0.660	0.546	0.728	0.666	0.746	0.480	0.788	0.544
4	0.666	0.586	0.730	0.646	0.788	0.478	0.798	0.482
5	0.666	0.554	0.764	0.652	0.730	0.474	0.784	0.414
6	0.640	0.576	0.732	0.690	0.698	0.460	0.764	0.488
7	0.654	0.578	0.706	0.692	0.736	0.494	0.776	0.584
8	0.688	0.594	0.760	0.646	0.780	0.508	0.784	0.536
9	0.624	0.574	0.744	0.672	0.626	0.514	0.788	0.484
10	0.616	0.576	0.722	0.636	0.646	0.524	0.742	0.532
11	0.668	0.610	0.730	0.656	0.708	0.582	0.750	0.546
12	0.664	0.562	0.754	0.634	0.758	0.560	0.794	0.500
Scenario 8								
1	0.788	0.642	0.756	0.620	0.834	0.488	0.762	0.516
2	0.746	0.620	0.738	0.654	0.812	0.540	0.736	0.484
3	0.762	0.594	0.744	0.658	0.782	0.488	0.740	0.474
4	0.760	0.624	0.716	0.618	0.826	0.528	0.768	0.512
5	0.802	0.652	0.728	0.666	0.762	0.530	0.738	0.528
6	0.756	0.636	0.736	0.660	0.742	0.524	0.698	0.488
7	0.730	0.620	0.736	0.654	0.740	0.450	0.708	0.390
8	0.756	0.606	0.734	0.636	0.780	0.496	0.736	0.450
9	0.746	0.628	0.704	0.634	0.820	0.506	0.758	0.512
10	0.762	0.628	0.710	0.644	0.830	0.524	0.724	0.528
11	0.764	0.632	0.732	0.624	0.810	0.512	0.732	0.444
12	0.768	0.636	0.726	0.618	0.826	0.530	0.758	0.468

Table S3: Percent of correct selection of the true recommended treatment for the 8 scenarios with unequal relative population.

	$\sigma = 2$				$\sigma = 10$			
Region	$X = 0$	$X = 0$	$X = 1$	$X = 1$	$X = 0$	$X = 0$	$X = 1$	$X = 1$
Region	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)
				Scenario 1				
1	0.602	0.598	0.734	0.582	0.682	0.550	0.774	0.460
2	0.590	0.592	0.734	0.614	0.712	0.528	0.770	0.474
3	0.626	0.598	0.770	0.684	0.702	0.542	0.808	0.482
4	0.654	0.580	0.772	0.632	0.684	0.584	0.848	0.460
5	0.624	0.618	0.792	0.626	0.712	0.594	0.836	0.518
6	0.570	0.622	0.824	0.704	0.692	0.594	0.824	0.518
7	0.616	0.610	0.844	0.692	0.688	0.632	0.826	0.518
8	0.630	0.626	0.820	0.648	0.696	0.624	0.848	0.502
9	0.642	0.610	0.830	0.684	0.710	0.586	0.870	0.548
10	0.606	0.606	0.818	0.712	0.674	0.630	0.860	0.570
11	0.626	0.618	0.762	0.716	0.696	0.656	0.846	0.584
12	0.690	0.620	0.816	0.662	0.724	0.610	0.852	0.522
				Scenario 2				
1	0.710	0.608	0.638	0.548	0.702	0.544	0.660	0.414
2	0.734	0.672	0.606	0.556	0.682	0.554	0.684	0.466
3	0.706	0.616	0.638	0.598	0.742	0.634	0.694	0.436
4	0.714	0.646	0.700	0.636	0.754	0.596	0.762	0.460
5	0.698	0.632	0.650	0.516	0.738	0.594	0.724	0.484
6	0.696	0.702	0.606	0.626	0.722	0.630	0.684	0.466
7	0.746	0.710	0.634	0.616	0.702	0.624	0.694	0.490
8	0.736	0.674	0.682	0.546	0.712	0.592	0.730	0.476
9	0.684	0.636	0.740	0.642	0.782	0.630	0.740	0.482
10	0.698	0.750	0.644	0.642	0.718	0.586	0.742	0.488
11	0.732	0.692	0.658	0.614	0.736	0.598	0.768	0.532
12	0.706	0.676	0.750	0.546	0.730	0.596	0.742	0.498
				Scenario 3				
1	0.754	0.652	0.730	0.650	0.740	0.472	0.742	0.596
2	0.794	0.740	0.708	0.660	0.786	0.506	0.790	0.596
3	0.796	0.768	0.726	0.662	0.796	0.500	0.750	0.550
4	0.806	0.658	0.738	0.678	0.856	0.476	0.788	0.564
5	0.788	0.740	0.728	0.694	0.842	0.484	0.776	0.620
6	0.812	0.748	0.736	0.688	0.844	0.476	0.766	0.670
7	0.844	0.748	0.718	0.692	0.818	0.512	0.752	0.666
8	0.826	0.728	0.734	0.666	0.910	0.564	0.748	0.632
9	0.824	0.692	0.732	0.654	0.864	0.514	0.788	0.578
10	0.832	0.734	0.736	0.672	0.884	0.538	0.792	0.674
11	0.846	0.752	0.748	0.702	0.870	0.528	0.752	0.672
12	0.820	0.746	0.758	0.690	0.888	0.578	0.806	0.624
				Scenario 4				
1	0.614	0.492	0.590	0.592	0.692	0.438	0.676	0.540
2	0.610	0.470	0.590	0.574	0.724	0.448	0.690	0.552
3	0.660	0.528	0.618	0.556	0.722	0.486	0.682	0.556
4	0.628	0.504	0.620	0.528	0.770	0.492	0.682	0.502
5	0.668	0.488	0.658	0.588	0.734	0.428	0.644	0.516
6	0.594	0.536	0.630	0.586	0.714	0.422	0.628	0.604
7	0.612	0.560	0.560	0.578	0.772	0.482	0.668	0.554
8	0.630	0.544	0.602	0.532	0.780	0.512	0.668	0.594
9	0.664	0.500	0.630	0.594	0.766	0.508	0.708	0.606
10	0.646	0.582	0.588	0.562	0.736	0.510	0.632	0.588
11	0.664	0.576	0.632	0.524	0.744	0.560	0.660	0.618
12	0.674	0.570	0.624	0.558	0.778	0.556	0.718	0.618

Table S3 continued.

	$\sigma = 2$				$\sigma = 10$			
	$X = 0$	$X = 0$	$X = 1$	$X = 1$	$X = 0$	$X = 0$	$X = 1$	$X = 1$
Region	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)	(Spatial)	(Nonspatial)	(Spatial)	(NonSpatial)
Scenario 5								
1	0.646	0.574	0.692	0.590	0.730	0.540	0.730	0.470
2	0.702	0.570	0.740	0.574	0.704	0.588	0.694	0.506
3	0.686	0.640	0.684	0.580	0.678	0.550	0.760	0.532
4	0.716	0.626	0.716	0.604	0.724	0.528	0.782	0.514
5	0.644	0.618	0.726	0.578	0.710	0.600	0.790	0.550
6	0.684	0.644	0.724	0.618	0.716	0.630	0.762	0.604
7	0.714	0.664	0.722	0.602	0.702	0.604	0.760	0.654
8	0.710	0.658	0.776	0.616	0.716	0.602	0.754	0.552
9	0.666	0.648	0.802	0.560	0.784	0.574	0.808	0.508
10	0.742	0.654	0.748	0.658	0.724	0.604	0.778	0.618
11	0.652	0.666	0.726	0.658	0.748	0.564	0.818	0.590
12	0.684	0.630	0.722	0.672	0.744	0.546	0.766	0.602
Scenario 6								
1	0.572	0.518	0.728	0.628	0.692	0.492	0.722	0.552
2	0.638	0.544	0.778	0.678	0.662	0.570	0.710	0.620
3	0.572	0.542	0.790	0.682	0.644	0.568	0.742	0.566
4	0.668	0.532	0.774	0.648	0.730	0.526	0.746	0.534
5	0.662	0.562	0.772	0.686	0.712	0.506	0.774	0.590
6	0.628	0.592	0.774	0.734	0.690	0.568	0.802	0.588
7	0.622	0.566	0.814	0.718	0.724	0.574	0.750	0.676
8	0.688	0.558	0.798	0.686	0.696	0.572	0.778	0.632
9	0.674	0.554	0.802	0.688	0.738	0.492	0.748	0.572
10	0.648	0.596	0.768	0.696	0.746	0.506	0.790	0.604
11	0.608	0.550	0.784	0.692	0.662	0.566	0.724	0.588
12	0.680	0.550	0.832	0.720	0.692	0.564	0.714	0.568
Scenario 7								
1	0.608	0.538	0.696	0.498	0.670	0.496	0.688	0.508
2	0.644	0.520	0.684	0.602	0.674	0.456	0.738	0.496
3	0.642	0.578	0.726	0.670	0.638	0.506	0.718	0.520
4	0.690	0.568	0.754	0.650	0.734	0.488	0.800	0.456
5	0.680	0.518	0.774	0.620	0.732	0.468	0.794	0.472
6	0.678	0.566	0.744	0.616	0.680	0.426	0.770	0.500
7	0.688	0.600	0.750	0.668	0.668	0.488	0.778	0.496
8	0.720	0.584	0.776	0.650	0.744	0.456	0.812	0.494
9	0.728	0.546	0.816	0.608	0.736	0.562	0.820	0.538
10	0.698	0.564	0.780	0.628	0.712	0.470	0.816	0.540
11	0.686	0.616	0.764	0.646	0.720	0.462	0.808	0.530
12	0.718	0.544	0.822	0.598	0.758	0.490	0.828	0.520
Scenario 8								
1	0.708	0.596	0.708	0.508	0.748	0.464	0.700	0.470
2	0.708	0.602	0.692	0.528	0.778	0.490	0.742	0.446
3	0.764	0.590	0.772	0.530	0.758	0.512	0.724	0.504
4	0.760	0.602	0.740	0.592	0.822	0.496	0.730	0.522
5	0.748	0.602	0.738	0.554	0.804	0.498	0.740	0.478
6	0.748	0.616	0.762	0.508	0.788	0.440	0.748	0.466
7	0.728	0.638	0.718	0.564	0.730	0.524	0.692	0.472
8	0.704	0.630	0.714	0.592	0.810	0.540	0.756	0.524
9	0.794	0.630	0.764	0.504	0.826	0.512	0.756	0.504
10	0.772	0.648	0.746	0.562	0.810	0.554	0.694	0.490
11	0.754	0.608	0.728	0.562	0.828	0.512	0.752	0.478
12	0.796	0.602	0.678	0.566	0.840	0.566	0.784	0.524

Table S4: Two alternative utilities for sensitivity analysis.

	Utility 1			Utility 2		
	Y=1	Y=2	Y=3	Y=1	Y=2	Y=3
ω	0	60	100	0	30	100

Table S5: Percent of correct selection (PCS) of the true overall recommended treatment under the original simulation setting, alternative prior distributions, and two new utility functions.

	Original results		New Priors		New utility 1		New utility 2	
Scenario	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$
				Biomarker subgroup $X = 1$				
1	0.814	0.664	0.894	0.788	0.762	0.666	0.916	0.886
2	0.688	0.674	0.846	0.680	0.696	0.626	0.772	0.690
3	0.746	0.676	0.750	0.512	0.788	0.780	0.588	0.508
4	0.544	0.570	0.528	0.556	0.508	0.596	0.606	0.512
5	0.732	0.722	0.700	0.698	0.744	0.758	0.578	0.660
6	0.792	0.808	0.734	0.738	0.858	0.808	0.676	0.676
7	0.812	0.678	0.830	0.772	0.810	0.714	0.812	0.720
8	0.776	0.698	0.692	0.748	0.808	0.764	0.772	0.742
				Biomarker subgroup $X = 0$				
1	0.576	0.574	0.608	0.616	0.534	0.624	0.600	0.542
2	0.646	0.658	0.852	0.680	0.698	0.700	0.614	0.600
3	0.864	0.834	0.878	0.988	0.850	0.756	0.920	0.898
4	0.662	0.636	0.684	0.614	0.546	0.548	0.584	0.602
5	0.688	0.668	0.662	0.648	0.704	0.694	0.634	0.576
6	0.626	0.652	0.602	0.590	0.618	0.620	0.538	0.572
7	0.700	0.606	0.702	0.594	0.684	0.572	0.700	0.668
8	0.836	0.746	0.806	0.758	0.862	0.698	0.786	0.834

Table S6: Mean percent of correct selection (PCS) of the region-specific true recommended treatment across the 24 combinations of the region and biomarker status under the original simulation setting, alternative prior distributions, and two new utility functions.

	Original results		New Priors		New utility 1		New utility 2	
Scenario	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$
1	0.731	0.778	0.734	0.777	0.703	0.770	0.732	0.775
2	0.709	0.744	0.713	0.720	0.709	0.738	0.683	0.720
3	0.782	0.818	0.815	0.798	0.802	0.818	0.772	0.800
4	0.670	0.707	0.623	0.702	0.639	0.716	0.638	0.710
5	0.724	0.745	0.695	0.738	0.734	0.749	0.669	0.721
6	0.717	0.749	0.671	0.727	0.742	0.757	0.655	0.711
7	0.698	0.750	0.711	0.751	0.713	0.758	0.754	0.728
8	0.746	0.768	0.709	0.748	0.765	0.779	0.750	0.788

Table S7: Percent of correct treatment assignment (PCTA) for patients in the second stage of the trial under the original simulation setting, alternative prior distributions, and two new utility functions.

	Original results		New Priors		New utility 1		New utility 2	
Scenario	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$	$\sigma = 2$	$\sigma = 10$
1	0.646	0.702	0.651	0.702	0.627	0.699	0.643	0.684
2	0.639	0.673	0.638	0.670	0.638	0.692	0.615	0.645
3	0.691	0.738	0.695	0.721	0.705	0.733	0.677	0.717
4	0.598	0.654	0.588	0.656	0.594	0.658	0.581	0.642
5	0.658	0.706	0.637	0.696	0.675	0.713	0.617	0.686
6	0.653	0.697	0.622	0.684	0.680	0.708	0.605	0.678
7	0.631	0.678	0.637	0.658	0.643	0.684	0.659	0.652
8	0.641	0.683	0.645	0.668	0.651	0.683	0.629	0.689

Table S8: Percent of correct selection of the true recommended treatment for the 8 scenarios under alternative prior distributions and utility functions.

	New prior				New utility 1				New utility 2			
	$\sigma = 2$		$\sigma = 10$		$\sigma = 2$		$\sigma = 10$		$\sigma = 2$		$\sigma = 10$	
	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1
scenario 1												
1	0.692	0.788	0.720	0.900	0.682	0.810	0.776	0.888	0.646	0.830	0.734	0.896
2	0.672	0.798	0.682	0.850	0.624	0.776	0.778	0.814	0.612	0.844	0.674	0.868
3	0.660	0.782	0.666	0.844	0.640	0.734	0.690	0.826	0.628	0.812	0.652	0.860
4	0.690	0.770	0.702	0.904	0.636	0.760	0.594	0.880	0.646	0.856	0.652	0.832
5	0.628	0.838	0.688	0.856	0.628	0.768	0.720	0.824	0.596	0.848	0.694	0.880
6	0.656	0.788	0.688	0.842	0.622	0.744	0.724	0.850	0.598	0.848	0.670	0.808
7	0.644	0.820	0.704	0.826	0.612	0.748	0.582	0.872	0.600	0.852	0.724	0.864
8	0.698	0.818	0.676	0.864	0.640	0.756	0.726	0.832	0.602	0.832	0.722	0.870
9	0.650	0.832	0.684	0.876	0.660	0.818	0.704	0.888	0.652	0.854	0.706	0.912
10	0.692	0.792	0.698	0.846	0.604	0.770	0.698	0.830	0.636	0.838	0.692	0.842
11	0.644	0.790	0.720	0.856	0.616	0.754	0.652	0.834	0.624	0.836	0.650	0.858
12	0.652	0.810	0.680	0.870	0.652	0.822	0.662	0.824	0.628	0.848	0.666	0.880
scenario 2												
1	0.746	0.740	0.758	0.748	0.724	0.718	0.760	0.826	0.680	0.706	0.754	0.762
2	0.732	0.682	0.720	0.704	0.732	0.700	0.696	0.774	0.644	0.696	0.686	0.722
3	0.714	0.658	0.736	0.738	0.704	0.650	0.706	0.750	0.680	0.706	0.714	0.730
4	0.764	0.642	0.724	0.710	0.738	0.682	0.744	0.774	0.706	0.738	0.750	0.742
5	0.712	0.734	0.722	0.682	0.744	0.704	0.736	0.780	0.676	0.750	0.688	0.736
6	0.720	0.724	0.714	0.658	0.714	0.642	0.668	0.682	0.618	0.708	0.684	0.684
7	0.716	0.690	0.704	0.702	0.750	0.652	0.710	0.716	0.624	0.666	0.674	0.728
8	0.736	0.688	0.752	0.726	0.710	0.680	0.690	0.728	0.668	0.690	0.636	0.752
9	0.692	0.728	0.682	0.698	0.744	0.712	0.818	0.700	0.654	0.696	0.740	0.728
10	0.722	0.688	0.708	0.740	0.732	0.674	0.818	0.674	0.646	0.680	0.750	0.726
11	0.752	0.698	0.728	0.718	0.750	0.676	0.790	0.722	0.678	0.714	0.690	0.724
12	0.724	0.698	0.750	0.746	0.748	0.724	0.710	0.750	0.676	0.698	0.714	0.762
scenario 3												
1	0.876	0.736	0.862	0.754	0.820	0.800	0.870	0.786	0.886	0.652	0.860	0.746
2	0.884	0.748	0.848	0.726	0.840	0.742	0.852	0.784	0.896	0.648	0.884	0.728
3	0.848	0.802	0.854	0.752	0.810	0.752	0.860	0.770	0.902	0.606	0.886	0.714
4	0.786	0.786	0.866	0.736	0.810	0.846	0.838	0.782	0.898	0.618	0.880	0.736
5	0.836	0.742	0.882	0.734	0.820	0.792	0.804	0.804	0.890	0.664	0.880	0.726
6	0.882	0.738	0.834	0.730	0.776	0.806	0.824	0.800	0.928	0.628	0.864	0.692
7	0.850	0.768	0.830	0.734	0.814	0.824	0.824	0.720	0.908	0.636	0.842	0.728
8	0.918	0.830	0.828	0.746	0.798	0.794	0.868	0.798	0.916	0.638	0.902	0.706
9	0.832	0.764	0.868	0.718	0.812	0.782	0.836	0.800	0.882	0.718	0.904	0.760
10	0.844	0.772	0.850	0.724	0.768	0.800	0.862	0.830	0.918	0.650	0.862	0.742
11	0.808	0.768	0.862	0.768	0.804	0.814	0.848	0.826	0.880	0.624	0.828	0.724
12	0.896	0.856	0.888	0.760	0.838	0.788	0.850	0.790	0.902	0.644	0.872	0.730
scenario 4												
1	0.714	0.608	0.740	0.562	0.696	0.642	0.784	0.698	0.754	0.642	0.772	0.718
2	0.686	0.584	0.740	0.644	0.628	0.644	0.762	0.684	0.682	0.614	0.750	0.676
3	0.622	0.562	0.754	0.590	0.652	0.626	0.740	0.636	0.672	0.590	0.742	0.628
4	0.716	0.538	0.816	0.714	0.658	0.656	0.774	0.678	0.684	0.586	0.764	0.606
5	0.700	0.580	0.748	0.644	0.670	0.608	0.792	0.678	0.706	0.632	0.784	0.680
6	0.594	0.584	0.804	0.562	0.642	0.550	0.726	0.630	0.632	0.596	0.782	0.614
7	0.646	0.590	0.762	0.662	0.594	0.604	0.754	0.660	0.684	0.554	0.746	0.630
8	0.642	0.584	0.738	0.612	0.682	0.620	0.786	0.662	0.664	0.564	0.772	0.590
9	0.714	0.592	0.770	0.646	0.696	0.602	0.768	0.694	0.676	0.600	0.846	0.720
10	0.634	0.566	0.756	0.646	0.654	0.600	0.752	0.662	0.696	0.546	0.782	0.626
11	0.658	0.554	0.794	0.684	0.632	0.614	0.762	0.658	0.668	0.552	0.746	0.668
12	0.706	0.588	0.772	0.678	0.698	0.670	0.748	0.688	0.720	0.596	0.762	0.644

Table S8 continued.

	New prior				New utility 1				New utility 2			
	$\sigma = 2$		$\sigma = 10$		$\sigma = 2$		$\sigma = 10$		$\sigma = 2$		$\sigma = 10$	
	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1	X_0	X_1
scenario 5												
1	0.684	0.696	0.756	0.714	0.696	0.774	0.744	0.762	0.696	0.742	0.674	0.716
2	0.650	0.710	0.784	0.746	0.732	0.784	0.752	0.770	0.620	0.678	0.722	0.742
3	0.648	0.688	0.676	0.774	0.724	0.736	0.764	0.780	0.650	0.672	0.716	0.746
4	0.712	0.684	0.736	0.748	0.702	0.796	0.738	0.772	0.658	0.704	0.722	0.776
5	0.700	0.728	0.744	0.756	0.728	0.742	0.720	0.800	0.660	0.684	0.712	0.680
6	0.638	0.712	0.700	0.766	0.724	0.778	0.740	0.800	0.622	0.656	0.654	0.718
7	0.654	0.716	0.700	0.730	0.726	0.760	0.672	0.780	0.588	0.622	0.698	0.770
8	0.668	0.712	0.688	0.768	0.666	0.740	0.740	0.712	0.650	0.684	0.732	0.748
9	0.720	0.774	0.692	0.728	0.706	0.750	0.708	0.754	0.718	0.736	0.682	0.724
10	0.658	0.702	0.662	0.754	0.732	0.692	0.776	0.754	0.648	0.708	0.700	0.760
11	0.678	0.750	0.744	0.760	0.714	0.768	0.718	0.748	0.652	0.684	0.722	0.740
12	0.686	0.718	0.750	0.830	0.712	0.732	0.736	0.726	0.642	0.674	0.706	0.742
scenario 6												
1	0.636	0.768	0.702	0.776	0.668	0.776	0.748	0.780	0.634	0.720	0.772	0.760
2	0.602	0.626	0.700	0.778	0.648	0.794	0.690	0.782	0.640	0.708	0.620	0.852
3	0.682	0.650	0.718	0.736	0.702	0.792	0.674	0.774	0.596	0.670	0.758	0.820
4	0.670	0.720	0.748	0.788	0.694	0.838	0.732	0.820	0.638	0.734	0.594	0.734
5	0.608	0.700	0.696	0.732	0.638	0.814	0.674	0.776	0.592	0.692	0.602	0.668
6	0.588	0.736	0.658	0.752	0.644	0.826	0.706	0.762	0.630	0.726	0.716	0.834
7	0.612	0.732	0.668	0.752	0.620	0.812	0.714	0.778	0.594	0.642	0.688	0.702
8	0.602	0.710	0.650	0.746	0.716	0.834	0.738	0.790	0.572	0.754	0.760	0.700
9	0.568	0.742	0.706	0.794	0.700	0.800	0.726	0.792	0.550	0.768	0.624	0.664
10	0.590	0.708	0.678	0.786	0.716	0.770	0.750	0.850	0.538	0.724	0.670	0.652
11	0.658	0.736	0.682	0.728	0.662	0.872	0.730	0.816	0.572	0.728	0.694	0.648
12	0.652	0.806	0.708	0.764	0.672	0.808	0.752	0.824	0.578	0.724	0.708	0.824
scenario 7												
1	0.656	0.766	0.740	0.810	0.714	0.716	0.696	0.848	0.704	0.832	0.680	0.756
2	0.660	0.720	0.730	0.840	0.638	0.758	0.714	0.820	0.712	0.802	0.686	0.748
3	0.660	0.732	0.722	0.832	0.678	0.776	0.690	0.784	0.736	0.780	0.730	0.718
4	0.716	0.786	0.722	0.828	0.690	0.656	0.738	0.814	0.728	0.784	0.700	0.730
5	0.614	0.750	0.698	0.822	0.692	0.732	0.730	0.774	0.722	0.790	0.726	0.818
6	0.674	0.748	0.712	0.812	0.700	0.708	0.690	0.750	0.688	0.802	0.682	0.742
7	0.686	0.776	0.684	0.780	0.740	0.738	0.676	0.814	0.704	0.758	0.670	0.718
8	0.690	0.806	0.712	0.776	0.732	0.764	0.732	0.822	0.708	0.784	0.688	0.774
9	0.646	0.742	0.722	0.770	0.652	0.714	0.702	0.832	0.736	0.786	0.682	0.780
10	0.634	0.734	0.722	0.746	0.706	0.714	0.692	0.800	0.730	0.786	0.708	0.738
11	0.670	0.744	0.690	0.724	0.680	0.680	0.698	0.816	0.698	0.804	0.682	0.756
12	0.666	0.776	0.662	0.770	0.746	0.792	0.730	0.820	0.720	0.808	0.742	0.810
scenario 8												
1	0.678	0.716	0.824	0.712	0.722	0.770	0.806	0.732	0.786	0.670	0.844	0.758
2	0.776	0.680	0.796	0.700	0.782	0.768	0.798	0.724	0.782	0.724	0.838	0.766
3	0.684	0.674	0.790	0.688	0.768	0.730	0.780	0.726	0.838	0.698	0.824	0.770
4	0.734	0.726	0.828	0.684	0.806	0.772	0.858	0.750	0.780	0.696	0.810	0.754
5	0.734	0.726	0.856	0.692	0.750	0.734	0.820	0.746	0.772	0.706	0.830	0.774
6	0.760	0.718	0.788	0.694	0.776	0.754	0.776	0.732	0.778	0.736	0.790	0.750
7	0.702	0.712	0.774	0.654	0.804	0.804	0.816	0.744	0.764	0.734	0.798	0.744
8	0.692	0.710	0.770	0.692	0.802	0.752	0.820	0.746	0.740	0.720	0.810	0.788
9	0.726	0.680	0.862	0.734	0.760	0.790	0.834	0.762	0.768	0.760	0.816	0.782
10	0.722	0.716	0.778	0.660	0.732	0.742	0.840	0.746	0.806	0.738	0.812	0.734
11	0.708	0.680	0.812	0.654	0.766	0.714	0.804	0.726	0.810	0.758	0.764	0.736
12	0.670	0.690	0.840	0.670	0.784	0.768	0.838	0.776	0.736	0.688	0.838	0.782

Table S9: PCS of the overall true recommended treatment for the two biomarker subgroups (PCS overall), average PCS of the region-specific true recommended treatment across the 24 combinations of region and biomarker status (PCS region) and PCTA for patients in the second stage of the trial (PCTA) when there is no spatial variation ($\theta_j = 0$) and when there is no spatial dependence (θ_j i.i.d. $N(0, 1)$).

Scenario	PCS overall for $X = 0$	PCS overall for $X = 1$	PCS region	PCTA
		$\theta_j = 0$		
1	0.652	0.904	0.781	0.649
2	0.626	0.744	0.685	0.668
3	0.948	0.822	0.885	0.762
4	0.708	0.598	0.649	0.599
5	0.666	0.696	0.685	0.613
		θ_j i.i.d. $N(0, 1)$		
1	0.606	0.808	0.723	0.635
2	0.692	0.702	0.704	0.629
3	0.830	0.776	0.794	0.698
4	0.620	0.532	0.630	0.571
5	0.678	0.708	0.710	0.655

Table S10: PCS of the overall true recommended treatment for the two biomarker subgroups (PCS overall), average PCS of the region-specific true recommended treatment across the 24 combinations of region and biomarker status (PCS region) and PCTA for patients in the second stage of the trial (PCTA) when there are 3 "islands" and regions 1, 2, 5, 12 each has only 1 patient.

Scenario	PCS overall for $X = 1$	PCS overall for $X = 0$	PCS region	PCTA
		$\sigma = 2$		
1	0.800	0.532	0.667	0.622
2	0.672	0.548	0.644	0.587
3	0.676	0.890	0.749	0.675
4	0.548	0.698	0.628	0.584
5	0.704	0.590	0.675	0.641
		$\sigma = 10$		
1	0.726	0.534	0.709	0.658
2	0.676	0.640	0.698	0.652
3	0.716	0.856	0.786	0.721
4	0.548	0.712	0.668	0.610
5	0.708	0.608	0.717	0.683

Table S11: True model parameters for the 6 scenarios with 2 biomarkers.

scenario	β_0	β_1	$\boldsymbol{\beta}_2$	$\boldsymbol{\beta}_3$	γ
1	0.1	0.2	(.6, -.5)	(.4, -.1)	1.5
2	0.3	0.5	(.3, .3)	(.2, .1)	1
3	0	0.3	(.1, -.2)	(-0.05, -0.1)	1
4	0.05	0.2	(.2, .2)	(.1, .1)	2.3
5	0.4	0.2	(-.7, .3)	(.3, .2)	1
6	0	0.5	(.1, .1)	(.05, .1)	1

Table S12: Average PCS of the overall true recommended treatment (PCS overall), average PCS of the region-specific true recommended treatment (PCS region), and percent of correct treatment assignment (PCTA) for patients in the second stage of the trial when there are two biomarkers.

	$\sigma = 2$			$\sigma = 10$		
Scenario	PCS overall	PCS region	PCTA	PCS overall	PCS region	PCTA
1	0.760	0.713	0.679	0.673	0.720	0.685
2	0.665	0.688	0.635	0.641	0.764	0.697
3	0.570	0.677	0.608	0.616	0.750	0.686
4	0.695	0.714	0.653	0.660	0.797	0.717
5	0.699	0.693	0.611	0.734	0.718	0.609
6	0.666	0.726	0.653	0.637	0.815	0.717

Posterior full conditionals

Let $\mathbf{y} = (y_{ij}, i = 1, \cdots, n_j, j = 1, \cdots, J)$, $\mathbf{w}_{ij} = (1, z_{ij}, \mathbf{x}_{ij}, z_{ij}\mathbf{x}_{ij})$ and W be the design matrix. Let the prior distribution for $\boldsymbol{\beta}$ be $N_{2+2q}(\xi, \Sigma_0)$. The posterior full conditionals are given below.

1. $[\boldsymbol{\beta}|.] \sim N_{2+2q}\Big((\Sigma_0^{-1} + W^T W)^{-1}(\Sigma_0^{-1}\xi + W^T(\mathbf{y}^* - \boldsymbol{\theta})), (\Sigma_0^{-1} + W^T W)^{-1}\Big)$

2. $[y_{ij}^*|.] \sim N(\mathbf{w}_{ij}\boldsymbol{\beta} + \theta_j, 1)$ truncated at the left (right) by γ_{k-1} (γ_k) if $y_{i,j} = k$

3. For region j that has occurred in the trial,

$$[\theta_j|.] \sim N\Big(\big(\sum_{i=1}^{n_j}(y_{ij}^* - \mathbf{w}_{ij}\boldsymbol{\beta}) + \sum_{j' \sim j}\theta_{j'}/\sigma\big)/(n_j + \kappa_j/\sigma), \frac{1}{n_j + \kappa_j/\sigma}\Big)$$

   For region j that has not occurred, $[\theta_j|.] \sim N\Big(\frac{1}{\kappa_j}\sum_{j' \sim j}\theta_{j'}, \frac{1}{\kappa_j/\sigma}\Big)$.
   To identify the intercept β_0, we can impose the sum-to-zero constraint $\sum_{j=1}^{J}\theta_j = 0$ by centering the θ samples about 0 (with equivalent adjustment to β_0) at the end of each Gibbs iteration (Best, et al., 1999; Eberly and Carlin, 2000).

4. $[\sigma|.] \sim \text{Inv-Gamma}(a + (J-1)/2, b + \frac{1}{2}\sum_{j \sim j'}(\theta_j - \theta_{j'})^2)$

5. $[\gamma_2|.] \sim \text{Unif}\Big[\max\Big\{\max\{y_{ij}^* : y_{ij} = 2\}, 0\Big\}, \min\Big\{\min\{y_{ij}^* : y_{ij} = 3\}, \infty\Big\}\Big]$