Additional Empirical Results

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	912	900	906	907	844	847
			$\rho_e = 0.5$	929	913	891	884	852	856
			$\rho_e = 0.9$	924	915	905	892	853	851
		$\sigma = 0.5$	$\rho_e = 0.1$	852	861	847	841	790	789
			$\rho_e = 0.5$	835	829	810	806	789	786
			$\rho_e = 0.9$	840	836	836	830	785	781
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	954	935	938	933	917	904
			$\rho_e = 0.5$	962	943	956	945	923	913
			$\rho_e = 0.9$	966	954	948	944	936	923
		$\sigma = 0.5$	$\rho_e = 0.1$	898	895	900	893	851	846
			$\rho_e = 0.5$	876	881	881	876	833	836
			$\rho_e = 0.9$	866	861	880	880	867	864
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	928	917	891	888	840	836
			$\rho_e = 0.5$	917	906	898	885	856	855
			$\rho_e = 0.9$	922	910	892	892	843	851
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	848	848	826	834	820	824
			$\rho_e = 0.5$	847	847	808	811	789	791
			$\rho_e = 0.9$	827	827	820	819	792	793
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	955	941	964	933	925	914
			$\rho_e = 0.5$	956	940	948	932	933	928
			$\rho_e = 0.9$	959	939	955	948	906	908
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	898	902	880	883	845	841
			$\rho_e = 0.5$	890	886	859	859	840	839
			$\rho_e = 0.9$	877	876	860	859	851	855

Supplementary Table 1: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Two treatments with two responses and $w_j = 1; j = 1, 2$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	945	860	951	886	918	870
			$\rho_e = 0.5$	956	896	930	856	902	836
			$\rho_e = 0.9$	941	888	934	884	925	872
		$\sigma = 0.5$	$\rho_e = 0.1$	797	784	751	747	748	739
			$\rho_e = 0.5$	780	775	761	751	747	735
			$\rho_e = 0.9$	752	752	765	760	722	713
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	964	897	964	900	944	887
			$\rho_e = 0.5$	967	904	966	898	968	890
			$\rho_e = 0.9$	956	902	970	904	954	912
		$\sigma = 0.5$	$\rho_e = 0.1$	820	816	803	794	771	765
			$\rho_e = 0.5$	821	815	794	786	818	804
			$\rho_e = 0.9$	823	803	794	776	783	787
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	946	879	927	865	911	847
			$\rho_e = 0.5$	937	876	941	879	927	876
			$\rho_e = 0.9$	943	882	942	874	903	840
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	790	778	784	776	747	736
			$\rho_e = 0.5$	790	779	750	745	736	722
			$\rho_e = 0.9$	780	770	765	756	765	754
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	973	887	967	897	957	891
			$\rho_e = 0.5$	963	901	971	893	954	879
			$\rho_e = 0.9$	958	889	955	888	950	891
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	824	817	799	789	815	803
			$\rho_e = 0.5$	836	820	819	798	785	778
			$\rho_e = 0.9$	829	806	791	783	822	812

Supplementary Table 2: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Two treatments with three responses and $w_j = 1; j = 1, ..., 3$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	948	859	928	817	906	829
			$\rho_e = 0.5$	950	864	942	851	922	875
			$\rho_e = 0.9$	957	891	930	846	918	842
		$\sigma = 0.5$	$\rho_e = 0.1$	809	807	761	740	754	757
			$\rho_e = 0.5$	803	785	751	747	733	727
			$\rho_e = 0.9$	759	742	712	692	712	702
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	968	902	954	871	941	876
			$\rho_e = 0.5$	958	894	958	883	945	880
			$\rho_e = 0.9$	958	880	963	890	945	892
		$\sigma = 0.5$	$\rho_e = 0.1$	799	786	779	777	777	771
			$\rho_e = 0.5$	804	792	768	770	761	754
			$\rho_e = 0.9$	809	809	772	765	750	734
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	945	873	931	839	930	854
			$\rho_e = 0.5$	928	877	949	847	904	846
			$\rho_e = 0.9$	949	875	930	848	920	859
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	786	779	753	744	746	731
			$\rho_e = 0.5$	787	789	749	735	748	738
			$\rho_e = 0.9$	763	764	752	734	727	724
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	962	886	954	865	945	865
			$\rho_e = 0.5$	954	884	960	873	960	882
			$\rho_e = 0.9$	968	878	947	875	945	872
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	819	797	792	793	784	784
			$\rho_e = 0.5$	817	805	795	777	771	761
			$\rho_e = 0.9$	830	810	764	752	785	776

Supplementary Table 3: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Two treatments with four responses and $w_j = 1; j = 1, ..., 4$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	713	642	660	599	634	583
			$\rho_e = 0.5$	670	643	669	628	646	592
			$\rho_e = 0.9$	668	633	644	583	636	595
		$\sigma = 0.5$	$\rho_e = 0.1$	519	494	470	482	488	499
			$\rho_e = 0.5$	484	481	481	487	437	449
			$\rho_e = 0.9$	478	485	508	514	464	470
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	755	675	748	669	730	662
			$\rho_e = 0.5$	779	697	746	686	714	658
			$\rho_e = 0.9$	784	698	732	652	721	680
		$\sigma = 0.5$	$\rho_e = 0.1$	520	536	481	485	506	522
			$\rho_e = 0.5$	501	504	518	518	528	508
			$\rho_e = 0.9$	528	525	494	499	499	510
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	686	620	687	641	623	579
			$\rho_e = 0.5$	707	643	659	624	635	612
			$\rho_e = 0.9$	683	634	659	603	634	590
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	508	505	528	511	474	462
			$\rho_e = 0.5$	505	510	469	474	452	441
			$\rho_e = 0.9$	503	496	477	489	492	489
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	753	691	760	680	718	659
			$\rho_e = 0.5$	729	661	758	662	695	670
			$\rho_e = 0.9$	759	695	754	671	713	669
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	556	551	507	506	533	525
			$\rho_e = 0.5$	531	533	520	521	524	521
			$\rho_e = 0.9$	526	536	532	517	508	506

Supplementary Table 4: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Three treatments with two responses and $w_j = 1; j = 1, 2$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	816	736	795	729	760	700
			$\rho_e = 0.5$	818	742	793	725	737	681
			$\rho_e = 0.9$	791	729	782	708	744	712
		$\sigma = 0.5$	$\rho_e = 0.1$	505	487	481	463	508	500
			$\rho_e = 0.5$	478	480	474	466	482	481
			$\rho_e = 0.9$	489	485	494	499	480	464
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	890	791	880	796	855	780
			$\rho_e = 0.5$	880	774	864	776	831	759
			$\rho_e = 0.9$	902	793	860	777	837	771
		$\sigma = 0.5$	$\rho_e = 0.1$	566	576	545	551	555	553
			$\rho_e = 0.5$	523	535	521	534	518	516
			$\rho_e = 0.9$	551	561	548	543	499	508
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	824	725	799	727	740	689
			$\rho_e = 0.5$	847	729	767	704	755	690
			$\rho_e = 0.9$	820	747	791	712	750	667
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	534	534	515	530	517	503
			$\rho_e = 0.5$	486	494	485	472	483	470
			$\rho_e = 0.9$	490	497	503	498	467	458
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	889	793	879	784	852	781
			$\rho_e = 0.5$	920	802	857	788	837	761
			$\rho_e = 0.9$	885	787	880	778	846	780
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	585	571	560	550	576	575
			$\rho_e = 0.5$	561	559	560	552	535	543
			$\rho_e = 0.9$	583	574	544	543	547	556

Supplementary Table 5: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Three treatments with three responses and $w_j = 1; j = 1, ..., 3$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	774	716	725	670	702	657
			$\rho_e = 0.5$	761	705	738	677	671	621
			$\rho_e = 0.9$	760	709	728	672	673	646
		$\sigma = 0.5$	$\rho_e = 0.1$	513	504	535	534	482	471
			$\rho_e = 0.5$	489	498	479	473	487	484
			$\rho_e = 0.9$	508	499	469	486	468	475
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	849	767	803	736	786	725
			$\rho_e = 0.5$	829	739	834	755	775	732
			$\rho_e = 0.9$	859	765	815	756	778	737
		$\sigma = 0.5$	$\rho_e = 0.1$	544	552	539	535	538	547
			$\rho_e = 0.5$	550	539	490	509	528	520
			$\rho_e = 0.9$	533	540	556	544	515	522
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	769	710	712	674	699	630
			$\rho_e = 0.5$	780	689	736	672	689	614
			$\rho_e = 0.9$	767	710	761	692	690	622
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	484	484	498	499	515	512
			$\rho_e = 0.5$	472	481	507	521	461	449
			$\rho_e = 0.9$	509	502	474	458	456	455
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	842	756	836	759	815	751
			$\rho_e = 0.5$	882	781	797	737	785	733
			$\rho_e = 0.9$	842	765	819	726	808	759
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	578	579	576	576	557	552
			$\rho_e = 0.5$	558	557	546	535	525	523
			$\rho_e = 0.9$	560	556	535	543	521	522

Supplementary Table 6: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Three treatments with three responses, using weights, $\omega_1 = 0.5$, $\omega_2 = 0.3$, and $\omega_3 = 0.2$, for responses 1, 2, and 3, respectively.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	786	695	749	655	733	675
			$\rho_e = 0.5$	792	686	767	687	725	681
			$\rho_e = 0.9$	788	677	769	679	714	632
		$\sigma = 0.5$	$\rho_e = 0.1$	514	519	491	494	484	477
			$\rho_e = 0.5$	459	452	512	493	468	469
			$\rho_e = 0.9$	485	471	429	445	439	425
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	822	740	850	744	799	731
			$\rho_e = 0.5$	853	758	820	722	824	753
			$\rho_e = 0.9$	882	755	831	752	813	731
		$\sigma = 0.5$	$\rho_e = 0.1$	550	549	514	525	519	531
			$\rho_e = 0.5$	521	530	513	517	521	512
			$\rho_e = 0.9$	493	497	505	498	506	495
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	783	702	749	683	694	644
			$\rho_e = 0.5$	796	686	751	699	706	645
			$\rho_e = 0.9$	787	718	752	671	700	643
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	507	518	480	521	504	512
			$\rho_e = 0.5$	526	503	524	494	474	470
			$\rho_e = 0.9$	522	512	479	454	479	472
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	869	749	838	726	784	734
			$\rho_e = 0.5$	865	749	813	738	793	732
			$\rho_e = 0.9$	836	738	826	725	789	724
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	536	560	528	534	534	558
			$\rho_e = 0.5$	541	536	530	513	516	512
			$\rho_e = 0.9$	552	520	554	545	543	511

Supplementary Table 7: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Three treatments with four responses and $w_j = 1; j = 1, ..., 4$.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates					
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
				Prob of dominance	Smooth means	Prob of dominance	Smooth means	Prob of dominance	Smooth means
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	797	735	771	731	703	649
			$\rho_e = 0.5$	825	747	761	702	688	677
			$\rho_e = 0.9$	797	710	755	692	678	640
		$\sigma = 0.5$	$\rho_e = 0.1$	516	508	465	475	478	465
			$\rho_e = 0.5$	482	472	475	478	422	410
			$\rho_e = 0.9$	504	508	465	469	451	445
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	880	819	858	790	821	765
			$\rho_e = 0.5$	858	788	840	749	800	748
			$\rho_e = 0.9$	864	793	843	764	802	738
		$\sigma = 0.5$	$\rho_e = 0.1$	579	588	550	549	514	515
			$\rho_e = 0.5$	519	522	531	513	517	503
			$\rho_e = 0.9$	523	527	514	510	491	490
				$\rho_c = 0.1$		$\rho_c = 0.5$		$\rho_c = 0.9$	
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	809	735	755	691	713	649
			$\rho_e = 0.5$	801	729	742	706	703	663
			$\rho_e = 0.9$	807	742	745	697	684	611
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	503	491	489	486	471	475
			$\rho_e = 0.5$	505	522	491	493	449	447
			$\rho_e = 0.9$	524	503	451	456	467	468
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	878	783	835	755	819	753
			$\rho_e = 0.5$	858	798	841	756	809	761
			$\rho_e = 0.9$	859	781	855	760	814	768
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	519	517	537	532	547	542
			$\rho_e = 0.5$	543	545	520	525	532	530
			$\rho_e = 0.9$	565	553	556	545	510	515

Supplementary Table 8: Frequencies of correct treatment assignments in 1000 test cases by the proposed method with simulation Setting-1. Three treatments with four responses, using weights $\omega_1 = 0.4$, $\omega_2 = 0.3$, $\omega_3 = 0.2$, and $\omega_4 = 0.1$, for responses 1, 2, 3, and 4, respectively.

Error dist.	Sample size per group	Error dist. parameter	Error correlation	Correlation between covariates		
				$\rho_c = 0.1$	$\rho_c = 0.5$	$\rho_c = 0.9$
Normal	$n = 100$	$\sigma = 0.1$	$\rho_e = 0.1$	669	621	621
			$\rho_e = 0.5$	661	642	578
			$\rho_e = 0.9$	655	641	589
		$\sigma = 0.5$	$\rho_e = 0.1$	459	491	431
			$\rho_e = 0.5$	441	430	454
			$\rho_e = 0.9$	445	425	430
	$n = 200$	$\sigma = 0.1$	$\rho_e = 0.1$	736	688	693
			$\rho_e = 0.5$	709	720	690
			$\rho_e = 0.9$	743	721	688
		$\sigma = 0.5$	$\rho_e = 0.1$	508	491	507
			$\rho_e = 0.5$	497	463	484
			$\rho_e = 0.9$	505	507	490
				$\rho_c = 0.1$	$\rho_c = 0.5$	$\rho_c = 0.9$
DE	$n = 100$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	667	619	588
			$\rho_e = 0.5$	656	641	578
			$\rho_e = 0.9$	655	641	587
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	436	442	470
			$\rho_e = 0.5$	425	463	411
			$\rho_e = 0.9$	453	415	414
	$n = 200$	$\sigma_{DE} = 0.1$	$\rho_e = 0.1$	726	734	718
			$\rho_e = 0.5$	762	687	703
			$\rho_e = 0.9$	737	693	718
		$\sigma_{DE} = 0.5$	$\rho_e = 0.1$	540	531	505
			$\rho_e = 0.5$	517	501	483
			$\rho_e = 0.9$	506	497	476

Supplementary Table 9: Frequencies of matched correct treatment assignments by both probability of dominance and smooth mean approaches in 1000 test cases, for three treatments with three responses, using weights, $\omega_1 = 0.5$, $\omega_2 = 0.3$, and $\omega_3 = 0.2$, for responses 1, 2, and 3, respectively. The study was conducted with simulation Setting-1.

Weights		Common Assignments			
ω_{CD4}	ω_{CD8}	Arm-0	Arm-1	Arm-2	Arm-3
1	0	4	602	252	151
0.8	0.2	4	602	252	151
0.6	0.4	4	636	164	112
0.5	0.5	77	585	114	58

Supplementary Table 10: Common treatment assignment by probability of dominance and smooth means concepts for ACTG-175 clinical trial data, using weights ω_{CD4} and ω_{CD8} for CD4 and CD8 counts, respectively.

Carotid Artery Atherosclerosis in Type-2 Diabetes: The PROLOGUE Randomized Controlled Trial

In this section, we provide another illustration of the proposed procedure using real data resulting from a randomized clinical trial conducted on type-2 diabetes patients.

It is well known that diabetes mellitus acts as a critical risk factor in the development of vascular complications (Rask-Madsen and King, 2013). Sitagliptin is an oral anti-diabetic drug that belongs to the family of dipeptidyl peptidase-4 inhibitors, which has been demonstrated to possess cardiovascular protective effects in recent studies (Sivertsen et al., 2012; Chrysant and Chrysant, 2012). PROLOGUE trial was a randomized controlled clinical trial conducted in type-2 diabetes mellitus patients to examine the effect of Sitagliptin added conventional therapy (i.e., diet, exercise, and/or drugs, except for incretin-related agents) on the intima-media thickness of the carotid artery (IMT) that is known to be a surrogate marker for the atherosclerotic cardiovascular disease (Oyama et al., 2016). We obtained the data set of this study from the Dryad Digital Repository.

In this study a total of 463 subjects aged 30 years and older with type-2 diabetes (i.e., $(6.2\% \leq \text{HbA1c} < 9.4\%)$ were randomized into either Sitagliptin or conventional therapy arms with 1:1 allocation. Among 463 patients, 232 were assigned to the Sitagliptin arm and 231 were assigned to conventional therapy. The primary endpoint of the trial was the percentage change in mean common carotid arteries (CCA) IMT from the baseline to

24 months after the randomization. Additionally, there were multiple outcome measures considered as secondary endpoints; few of them relating to cardiovascular risk, glycemic profiles, lipoprotein profiles and renal function. Outcome measures were obtained at baseline, at 12 months and at 24 months time points.

Among many available outcome measures, we choose CCA IMT, HbA1c, eGFR, and Creatinine level measured at 12 months after the randomization as responses for our illustration. There were a total of 296 subjects with list-wise complete observations for aforementioned responses at the 12 month time point (Sitagliptin-150, conventional therapy-146). Since our method is developed for complete data, we used the 12 month observation point instead of 24 months due to the large fraction of list-wise missingness detected in 24 month observation point. We used subjects' baseline details: age, CCA IMT, HbA1c, eGFR, Creatinine, and HDL cholesterol values as covariates. In our analysis, we considered negative CCA IMT, HbA1c, and Creatinine values at 12 months in the sense that higher values of these outcomes represent better treatment responses.

Similar to the previous demonstration using ACTG-175 trial data, our intention in this data analysis is to illustrate the estimated optimal treatment for a new patient by the proposed technique based on individualized characteristics. However, due to the limited number of data points, we followed a leave-one-out type approach as opposed to portioning the dataset into separate "Training" and "Testing" sets as in the ACTG-175 case. We estimated the optimal treatment for an individual in this data set using models obtained by eliminating the corresponding subject, one at a time.

Weights				Probability of Dominance		Smooth Means	
$\omega_{CCA-IMT}$	ω_{HbA1c}	ω_{eGFR}	$\omega_{creatinine}$	Arm-1	Arm-2	Arm-1	Arm-2
0.25	0.25	0.25	0.25	222	74	224	72
0.40	0.20	0.10	0.30	177	119	183	113
0.10	0.30	0.40	0.20	181	115	184	112
0.10	0.60	0.20	0.10	49	247	87	209

Supplementary Table 11: Treatment assignment summary for PROLOGUE Clinical Trial data, by the proposed method. Four outcomes: CCA IMT, HbA1c, eGFR, and creatinine selected as clinical responses, with weights $\omega_{CCA-IMT}$, ω_{HbA1c}, ω_{eGFR}, and $\omega_{creatinine}$, respectively.

In Supplementary Table 11 we provide proposed treatment assignments for all 296 patient with a few selected weight combinations for responses. For example, when we equally weighted all responses, we observed 222 and 74 patients were assigned to sitagliptin (Arm-1) and conventional therapy (Arm-2), respectively by the probability of dominance method. The corresponding assignments via smooth means were 224 and 74 for Arm-1 and Arm-2, respectively. Furthermore, parallel to the concept used in ACTG-175 application for calculating an overall gain in outcomes, an overall gain was calculated. As indicated in Supplementary Table 12, we clearly observed overall positive gains for each weight combination used.

Weights				Probability of Dominance					Smooth means				
$\omega_{CCA-IMT}$	ω_{HbA1c}	ω_{eGFR}	$\omega_{creatinine}$	$\hat{\Delta}^{CCA-IMT}$	$\hat{\Delta}^{HbA1c}$	$\hat{\Delta}^{eGFR}$	$\hat{\Delta}^{creatinine}$	$\hat{\Delta}$	$\hat{\Delta}^{CCA-IMT}$	$\hat{\Delta}^{HbA1c}$	$\hat{\Delta}^{eGFR}$	$\hat{\Delta}^{creatinine}$	$\hat{\Delta}$
0.25	0.25	0.25	0.25	0.1317	0.0581	0.1428	0.0304	0.0906	0.1131	0.0476	0.1310	0.0058	0.0744
0.40	0.20	0.10	0.30	0.1317	0.0570	0.1228	0.0162	0.0812	0.1220	0.0308	0.1030	-0.0087	0.0627
0.10	0.30	0.40	0.20	0.1134	0.0319	0.1566	0.0600	0.0956	0.0854	0.0260	0.1354	0.0240	0.0753
0.10	0.60	0.20	0.10	0.0572	0.0752	0.1370	0.0624	0.0845	0.0602	0.0739	0.1170	0.0433	0.0781

Supplementary Table 12: Estimated Δ values by the proposed method compared to the original assignment. Four outcomes: CCA IMT, HbA1c, eGFR, and creatinine selected as clinical responses, with weights $\omega_{CCA-IMT}$, ω_{HbA1c}, ω_{eGFR}, and $\omega_{creatinine}$, respectively.

Supplementary References

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