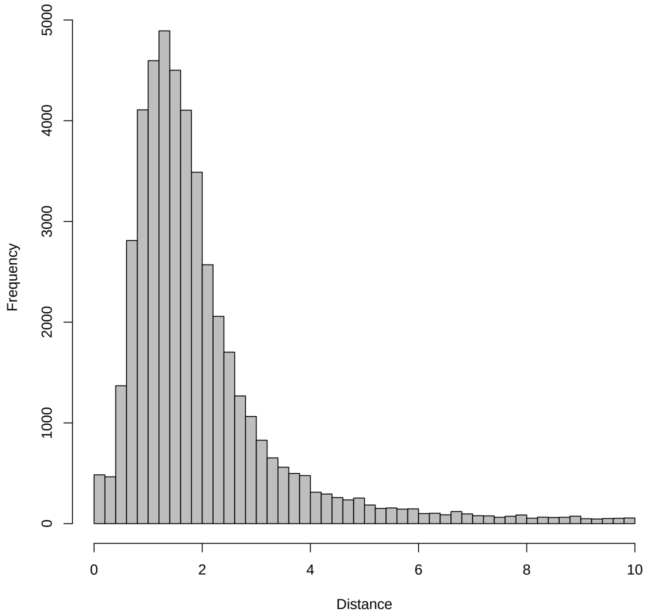

Figure S1. The distribution of human-chimpanzee sequence divergence for syntenic regions of humans and chimpanzees on human chromosome 21. Distance refers to the percentage of different bases across region between the two species.

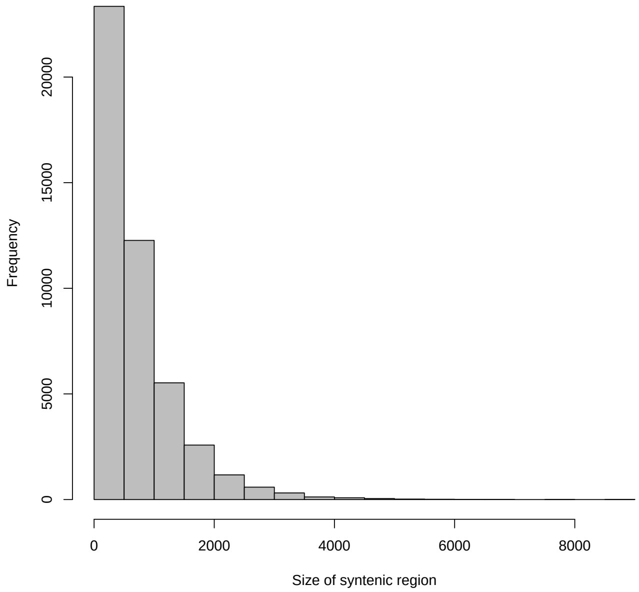

Figure S2. The distribution of the sizes (in bp) of syntenic regions of humans and chimpanzees on human chromosome 21.

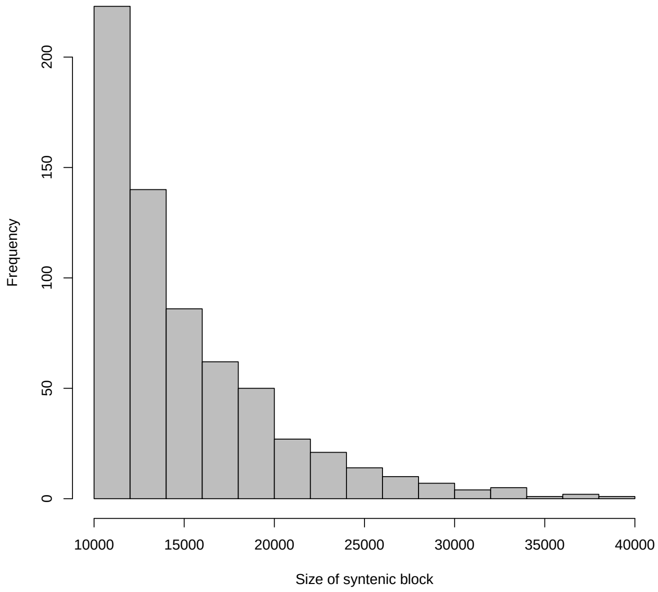

Figure S3. The distribution of the sizes (in bp) of syntenic blocks of humans and chimpanzees on human chromosome 21.

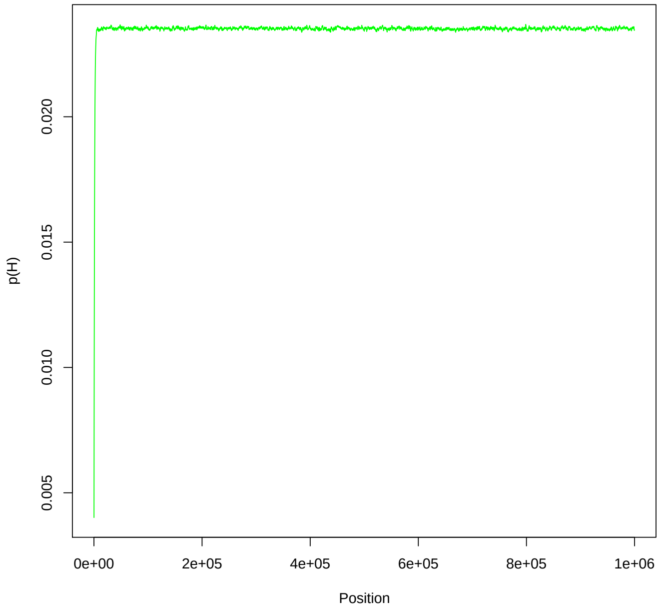

Figure S4. The prior probability of hotspot estimated from simulation. The parameters λ_1 and λ_2 were fixed to be $1/50000$ and $1/1000$, respectively.

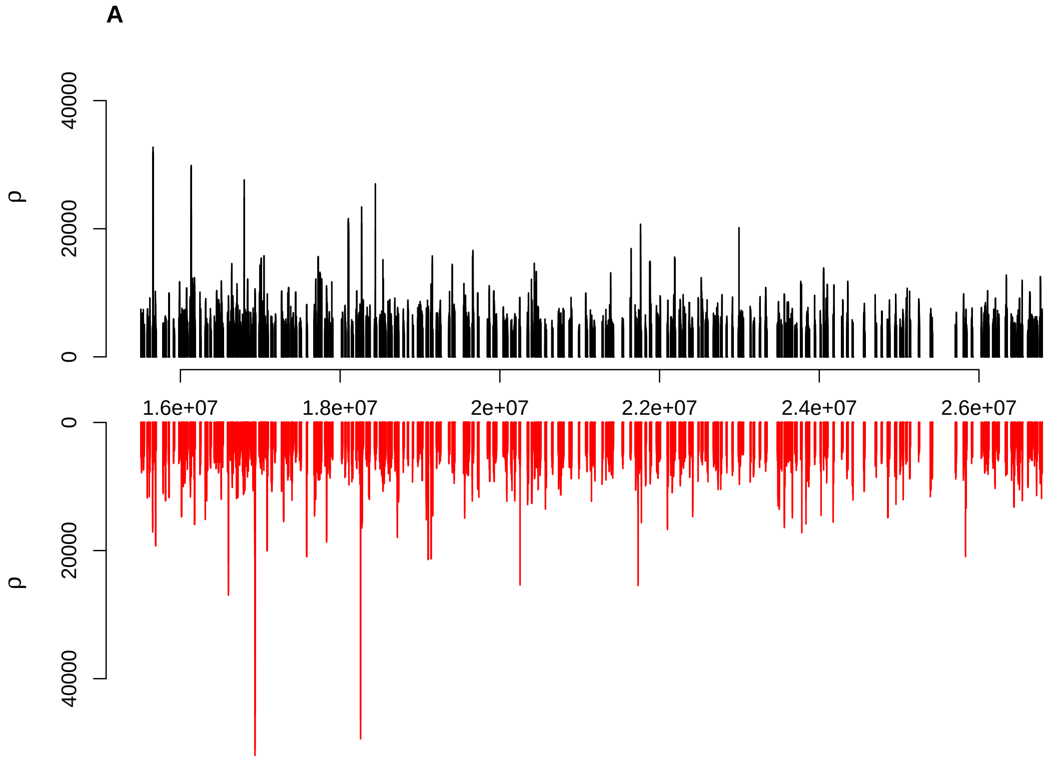

Figure S5A. The estimated recombination rates (ρ) from 15504000 to 26362000 bp on chromosome 21 for YRI (black lines) and chimpanzee (red lines).

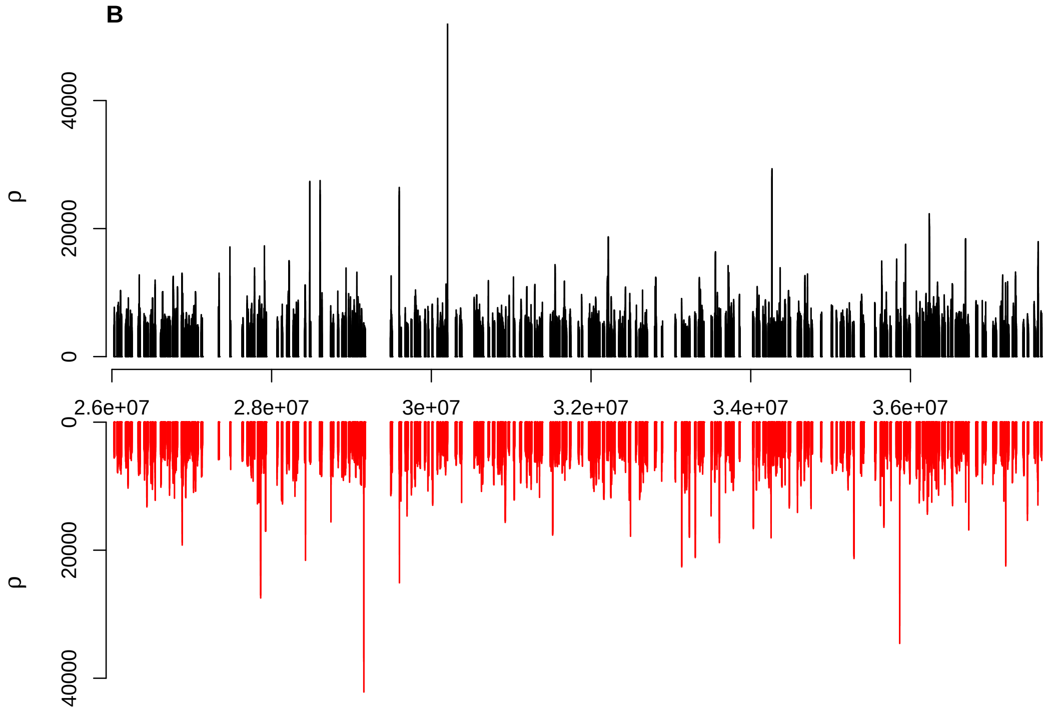

Figure S5B. The estimated recombination rates (ρ) from 26362000 to 37220000 bp on chromosome 21 for YRI (black lines) and chimpanzee (red lines).

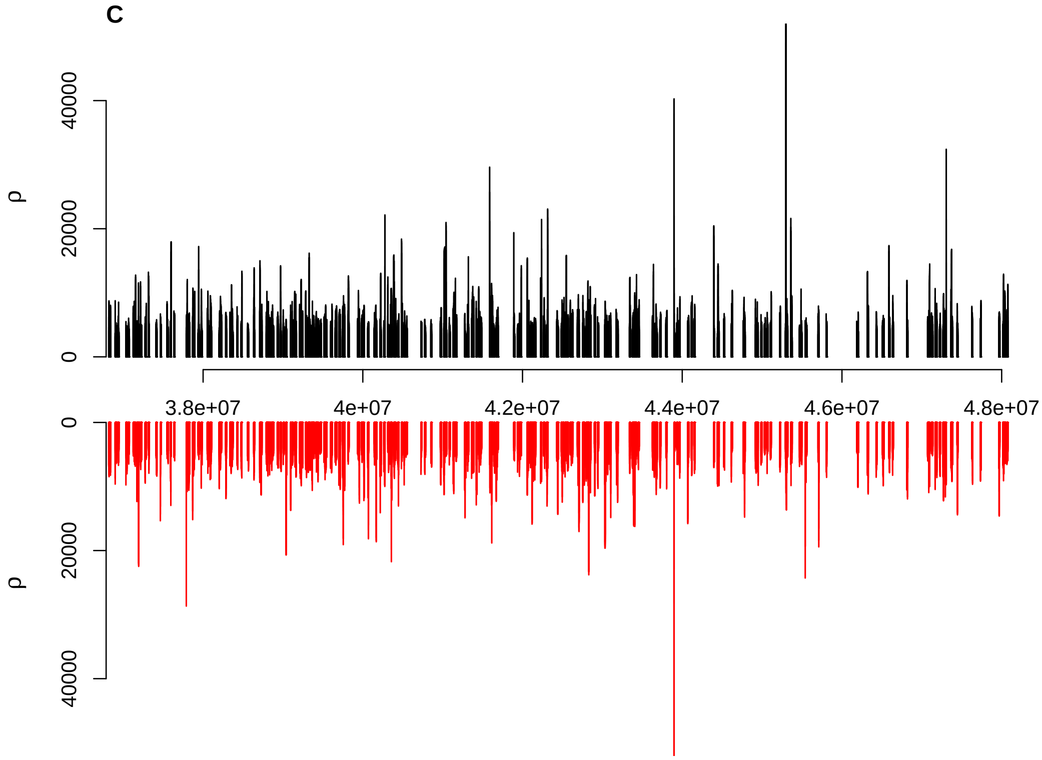

Figure S5C. The estimated recombination rates (ρ) from 37220000 to 48078000 bp on chromosome 21 for YRI (black lines) and chimpanzee (red lines).

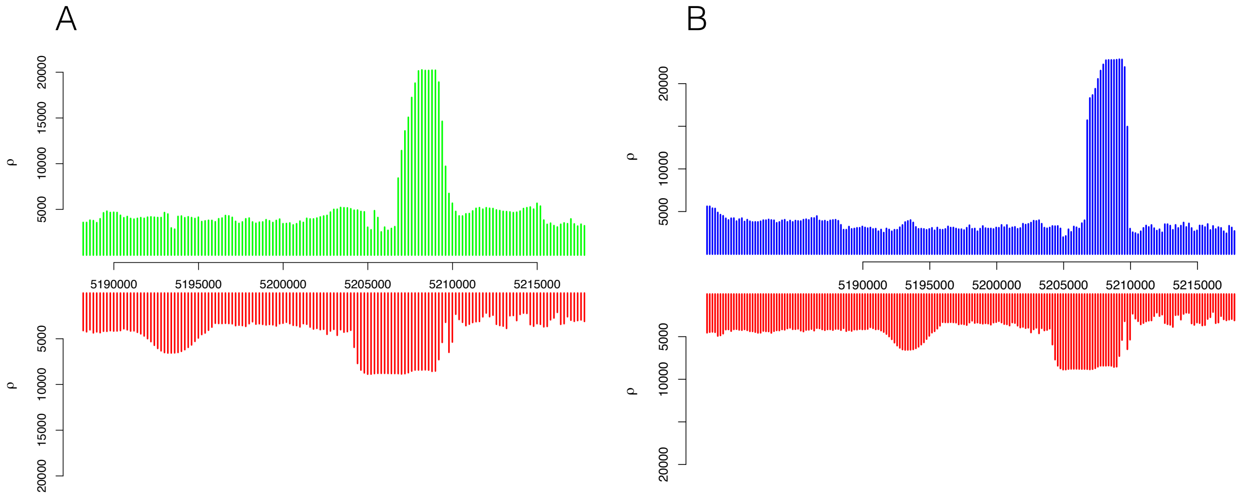

Figure S6. The estimated recombination rates (ρ) across β-globin region using samples of Beni (green) and Chimpanzee (red) **(A)** and samples of CEPH (blue) and Chimpanzee (red) **(B)**.

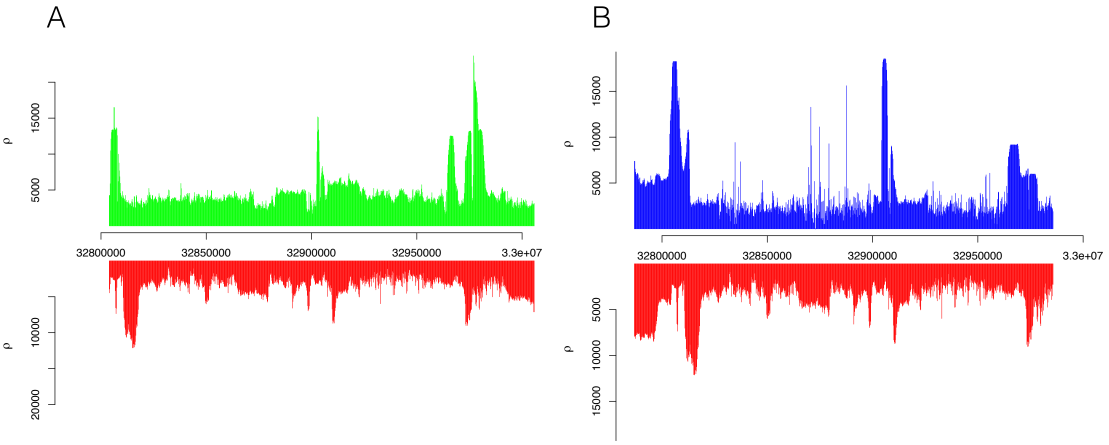

Figure S7. The estimated recombination rates (ρ) across HLA region using samples of Beni (green) and Chimpanzee (red) **(A)** and samples of CEPH (blue) and Chimpanzee (red) **B**.

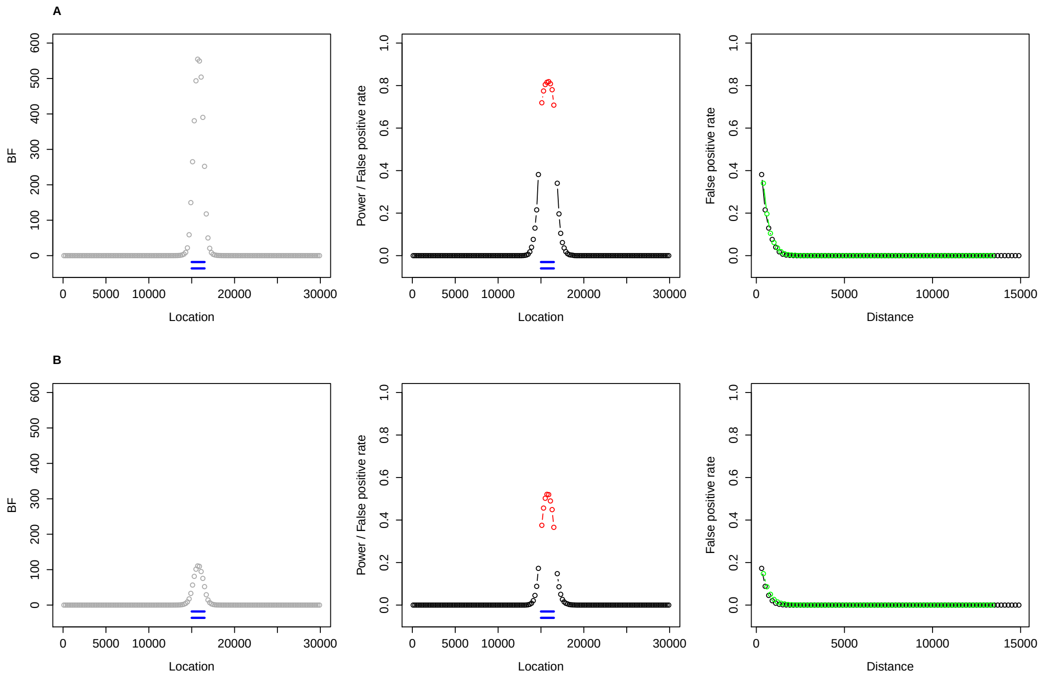

Figure S8. Simulation study results from set 1 **(A)** and results from set 2 **(B)**. The true hotspot was located between 15 kb and 16.5 kb and indicated by blue horizontal lines. Note that the locations of the hotspot for the two species are the same, so the shared hotspot is between 15 kb and 16.5 kb. **Left panel:** The 50% quantile of the BFs of shared hotspots over locations. **Middle panel**: Power (red) and false positive rate (black) of identifying shared hotspot estimated using the 4950 pairs across locations. **Right panel**: False positive rate of identifying shared hotspot as a function of distance to the left bound of the shared hotspot (15 kb) (black dots/line) and to the right bound of the shared hotspot (16.5 kb) (green dots/line)

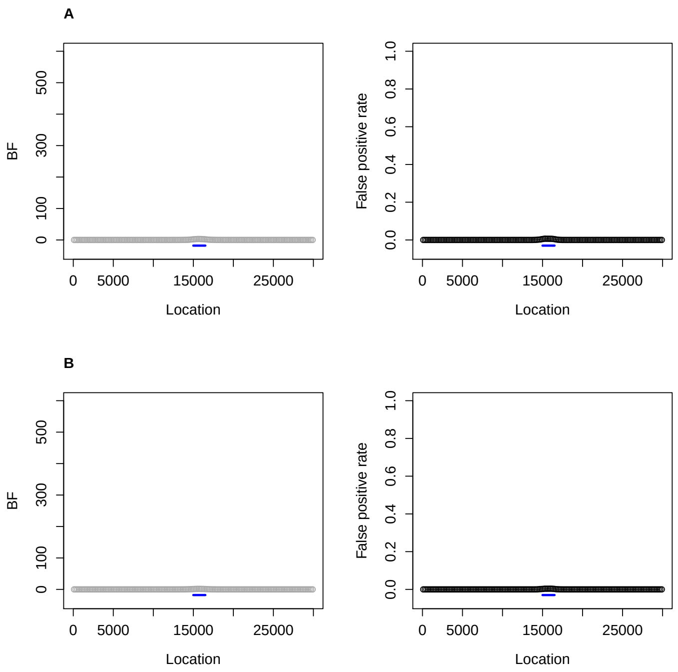

Figure S9. Simulation study results from set 3 **(A)** and results from set 4 **(B)**. The true hotspot from one species was located between 15 kb and 16.5 kb and indicated by a blue horizontal line. Note that only one species contains a hotspot, so the shared hotspot is absent. **Left panel:** The 50% quantile of the BFs of shared hotspots over locations. **Right panel**: False positive rate of identifying shared hotspot estimated using the 10000 pairs across locations.

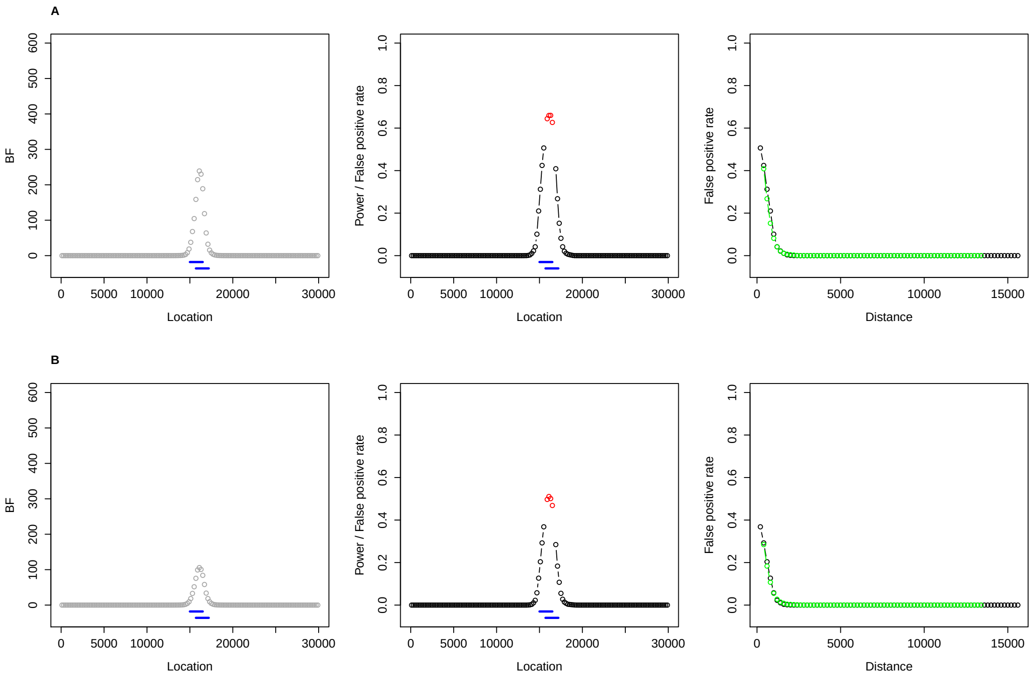

Figure S10. Simulation study results from set 5 **(A)** and results from set 6 **(B)**. The true hotspot was located between 15 kb and 16.5 kb for one species and was located between 15.7 kb and 17.2 kb for the other speices. The hotspots were indicated by blue horizontal lines. Note that the shared hotspot is between 15.7 kb and 16.5 kb. **Left panel:** The 50% quantile of the BFs of shared hotspots over locations. **Middle panel**: Power (red) and false positive rate (black) of identifying shared hotspot estimated using the 10000 pairs across locations. **Right panel**: False positive rate of identifying shared hotspot as a function of distance to the left bound of the shared hotspot (15.7 kb) (black dots/line) and to the right bound of the shared hotspot (16.5 kb) (green dots/line)

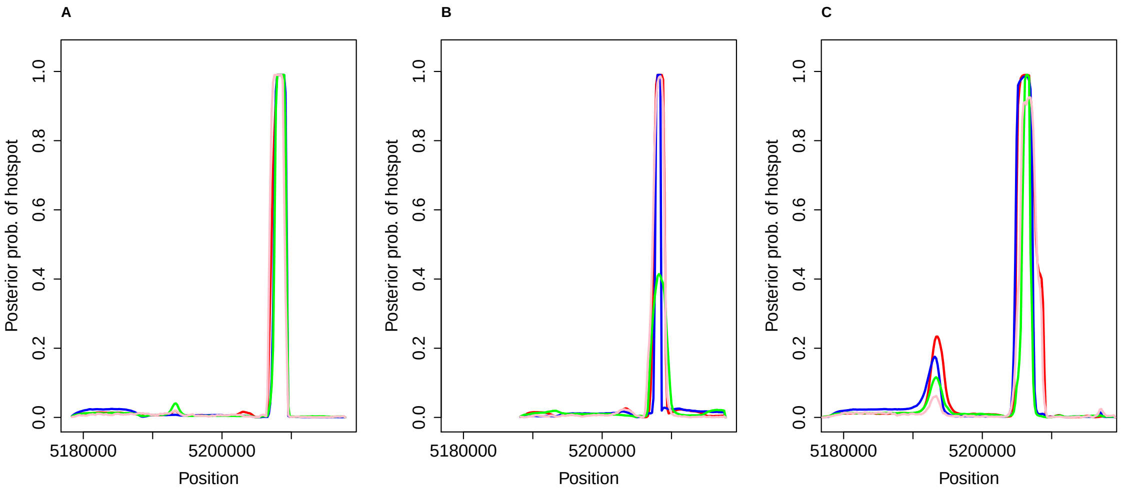

Figure S11. The posterior probability of hotspot across the region for CEU (A), BEN (B), Chimp (C) from four independent runs (red, blue, green, and pink lines).

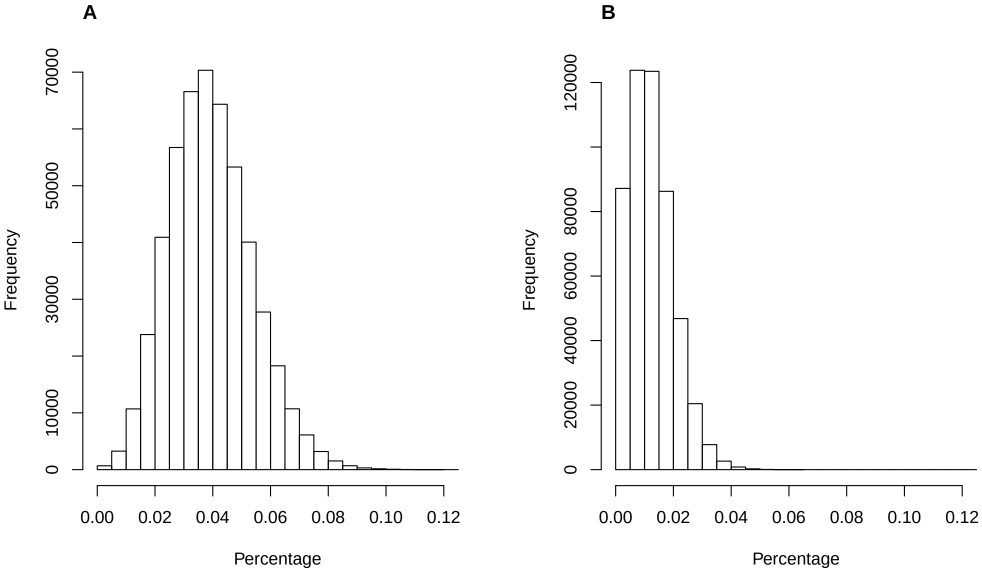

Figure S12. The percentage of hotspot overlapping between species calculated using simulated recombination hotspots based on the prior model used in the analysis. Either overlapping at least 1 bp (A) or 1000 bp (B) was assumed.

Table S1. Summary of the polymorphic data from humans and chimpanzees for the β-globin and HLA regions.

Region	Number of individuals			Number of SNPs		
	CEU	BEN	Chimp	CEU	BEN	Chimp
β-globin	48	47	38	26	30	39
HLA	48	47	37	111	98	114

Table S2. Positions of human recombination hotspots identified from sperm typing studies for the β-globin (HOLLOWAY *et al.*, 2006) and the HLA regions (JEFFREYS *et al.*, 2001) indicated in Figures 2 and 3 in the main text. The coordinates are given in both hg15 and hg19.

		hg15		hg19	
Hotspot	chr	start	end	start	end
β-globin	chr11	5207738	5208938	5248701	5249901
DNA1	chr6	32977952	32979852	32976505	32978405
DNA2	chr6	32974244	32975544	32972797	32974097
DNA3	chr6	32966323	32967522	32964870	32966070
DMB1	chr6	32904007	32905807	32902527	32904327
DMB2	chr6	32901655	32901657	32900176	32900178
TAP2	chr6	32805677	32806677	32804157	32805157

Table S3A. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within chromosome 21 with BF of shared hotspot for YRI and chimpanzee that is $\geq$ 100. Note that the bin size was set to be 200 bp in the analysis.

		Posterior prob.			ρ per kb	
Location	BF of shared hotspot	YRI	Chimp	Prior prob.	YRI	Chimp
15656560	285.494	0.870	0.156	0.023	31539.316	6929.126
15656760	164.886	0.908	0.092	0.023	31667.729	5494.949
15656960	111.596	0.971	0.059	0.023	31866.629	4600.050
16176300	183.542	0.231	0.398	0.023	10007.385	14574.489
16176500	213.912	0.191	0.552	0.023	10033.589	15936.120
16176700	177.297	0.159	0.562	0.023	10029.131	15885.957
16176900	140.780	0.131	0.553	0.024	9983.577	15879.444
16177100	100.458	0.108	0.485	0.023	9964.658	15440.234
16512113	147.039	0.232	0.324	0.023	10857.111	10928.991
17725644	184.334	0.486	0.190	0.024	15400.158	8741.137
17725844	188.580	0.481	0.196	0.023	15453.427	8987.934
17726044	176.494	0.476	0.186	0.023	15535.003	8718.583
17726244	159.890	0.472	0.171	0.023	15649.587	8516.929
17726444	109.519	0.446	0.127	0.023	15632.720	8274.600
17742085	101.937	0.018	0.618	0.011	6775.410	8969.137
17742285	110.475	0.024	0.751	0.013	6825.274	8778.151
17742485	108.812	0.029	0.813	0.015	6790.138	8620.067
17742685	100.120	0.031	0.857	0.016	6876.244	8548.510
18441284	227.144	0.841	0.133	0.024	27012.989	7350.433
19138301	121.491	0.061	0.990	0.023	10145.817	21274.234
19138501	228.562	0.110	0.990	0.023	11359.481	21274.234
19138701	236.943	0.114	0.990	0.023	11330.807	21290.425
19254018	138.807	0.266	0.268	0.024	5237.969	6057.802
19254218	208.283	0.411	0.251	0.023	5847.392	5937.443
19254418	176.956	0.656	0.135	0.023	6985.160	5191.916
19254618	110.026	0.899	0.064	0.023	8421.662	4404.301
19926150	134.071	0.856	0.081	0.023	9786.664	8080.429
19926350	130.642	0.611	0.110	0.023	8873.195	8718.400
19926550	109.032	0.445	0.128	0.023	8420.547	8935.445
20763118	117.891	0.062	0.980	0.023	4821.258	11329.398
20763318	167.235	0.087	0.975	0.024	5221.899	11306.070
20763518	208.727	0.117	0.883	0.024	5596.319	11051.005
20763718	196.094	0.144	0.680	0.023	5869.359	10940.450
20763918	110.488	0.179	0.320	0.023	6464.270	9175.157
24783846	188.423	0.931	0.102	0.024	7063.042	5412.213
24784046	288.036	0.939	0.147	0.024	7095.379	6348.382
24784246	301.998	0.955	0.150	0.024	7127.590	6090.196
24784446	220.955	0.955	0.114	0.023	7127.887	4819.261
24784646	154.536	0.945	0.083	0.023	7102.932	3928.361
24784846	105.676	0.809	0.068	0.023	6834.772	3726.665

Table S3B. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within chromosome 21 with BF of shared hotspot for YRI and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

Location	BF of shared hotspot	Posterior prob.		Prior prob.	ρ per kb	
		YRI	Chimp		YRI	Chimp
27777974	188.311	0.736	0.128	0.023	6599.743	5083.321
27778174	253.744	0.738	0.166	0.023	6599.454	5188.921
27778374	284.893	0.735	0.184	0.023	6608.043	5106.888
27778574	303.014	0.729	0.196	0.023	6616.955	4807.713
27778774	337.623	0.709	0.220	0.023	6638.771	4821.803
27778974	403.944	0.677	0.268	0.023	6689.960	5069.792
27779174	420.534	0.611	0.308	0.023	6642.483	5422.041
27779374	329.147	0.496	0.309	0.023	6305.686	5689.206
27779574	232.713	0.399	0.285	0.024	6051.800	5714.347
27779774	135.506	0.303	0.230	0.023	5892.818	5261.390
32802712	106.588	0.706	0.079	0.023	10935.955	3665.847
32802912	163.649	0.585	0.142	0.023	10672.446	4579.081
32803112	101.419	0.307	0.172	0.023	10012.219	4888.483
32810512	107.456	0.990	0.057	0.024	12253.264	7098.364
32810712	100.499	0.990	0.053	0.024	12241.436	7030.004
33231354	126.159	0.763	0.085	0.023	6002.980	17892.281
33231554	160.735	0.773	0.105	0.023	5999.274	17992.985
33231754	177.498	0.777	0.115	0.024	6002.654	17483.822
33231954	175.287	0.782	0.113	0.023	6030.923	15835.609
33232154	149.576	0.790	0.097	0.023	6093.150	13010.088
33232354	105.112	0.798	0.069	0.023	6181.327	8416.882
36526950	161.245	0.094	0.872	0.024	5689.540	12675.394
36527150	192.922	0.115	0.840	0.024	7023.180	13048.529
38639126	211.700	0.111	0.943	0.023	6955.501	7719.173
38639326	640.579	0.272	0.958	0.023	13896.870	7722.063
38639526	644.525	0.273	0.963	0.023	13650.934	7721.398
38639726	468.696	0.218	0.945	0.024	11312.170	7696.826
38639926	229.270	0.165	0.683	0.023	9802.986	7655.443
39039063	211.825	0.241	0.420	0.023	5590.545	17544.685
39039263	532.540	0.331	0.670	0.023	5842.511	19470.258
39039463	774.496	0.355	0.830	0.023	5846.362	20047.953
39039663	900.318	0.331	0.990	0.023	5515.199	20643.148
39039863	832.826	0.315	0.990	0.023	5368.431	20658.812
39040063	239.249	0.304	0.381	0.023	5355.595	20690.915

Table S3C. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within chromosome 21 with BF of shared hotspot for YRI and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

Location	BF of shared hotspot	Posterior prob.		Prior prob.	ρ per kb	
		YRI	Chimp		YRI	Chimp
40014559	129.356	0.078	0.857	0.024	5695.848	11674.009
40014759	183.894	0.108	0.855	0.024	6243.054	11712.068
40014959	239.070	0.137	0.855	0.024	6727.649	11733.253
40015159	270.714	0.154	0.848	0.024	6943.860	11781.198
40015359	287.940	0.168	0.822	0.024	7660.602	11845.215
40015559	166.870	0.160	0.527	0.024	7913.520	10115.673
40276752	168.105	0.172	0.493	0.023	14171.093	8830.327
40276952	528.521	0.737	0.307	0.024	22147.608	8162.475
40277152	297.215	0.775	0.183	0.024	22035.319	7650.460
40316392	133.867	0.117	0.573	0.023	3102.026	4172.360
40316592	159.642	0.136	0.581	0.023	3226.749	4225.450
40316792	184.309	0.152	0.597	0.023	3354.056	4403.064
40316992	198.542	0.163	0.597	0.023	3442.941	4415.224
40317192	204.654	0.171	0.591	0.023	3471.018	4379.222
40317392	199.521	0.181	0.548	0.023	3512.845	4147.033
40317592	188.951	0.195	0.483	0.023	3608.689	4063.566
40317792	181.629	0.216	0.421	0.023	4183.590	4049.927
40317992	168.738	0.238	0.358	0.023	4987.293	4058.472
40318192	137.340	0.248	0.285	0.024	5112.354	4012.951
41143825	181.261	0.462	0.198	0.024	6220.698	3541.143
41144025	210.568	0.526	0.199	0.024	6247.228	3489.888
41144225	244.985	0.591	0.202	0.024	6446.650	3453.253
41144425	262.282	0.617	0.206	0.024	6570.222	3451.275
41144625	251.811	0.584	0.210	0.024	6439.340	3465.952
41144825	220.723	0.513	0.212	0.024	6291.991	3475.548
41145025	205.815	0.477	0.214	0.024	6201.248	3479.447
41145225	205.056	0.476	0.214	0.023	6370.582	3472.832
41145425	199.117	0.461	0.214	0.023	6433.713	3477.599
41145625	167.788	0.394	0.215	0.023	6270.621	3481.081
41277919	209.166	0.177	0.477	0.021	6037.182	10536.394
41278119	321.375	0.252	0.514	0.021	6771.420	10607.349
41278319	321.469	0.256	0.523	0.022	6729.899	10593.630
41278519	295.549	0.245	0.519	0.022	6383.708	10598.074
41278719	250.905	0.227	0.494	0.022	5954.922	10656.032
41278919	170.159	0.192	0.416	0.023	5525.400	10736.870
41383598	121.176	0.190	0.330	0.023	7128.685	6481.764
41383798	217.252	0.234	0.457	0.023	8032.590	6753.986
41383998	301.386	0.214	0.666	0.023	7475.461	7357.192
41384198	268.828	0.183	0.710	0.024	6950.994	7398.506
41384398	222.401	0.147	0.746	0.024	6662.363	7435.505
41384598	153.612	0.103	0.761	0.024	6467.212	7450.173
41612186	104.358	0.074	0.736	0.023	11466.139	12251.212

Table S3D. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within chromosome 21 with BF of shared hotspot for YRI and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

	BF of	Posterior prob.			ρ per kb	
Location	shared hotspot	YRI	Chimp	Prior prob.	YRI	Chimp
42059206	135.427	0.209	0.139	0.015	12562.039	11208.861
42059406	131.325	0.211	0.163	0.016	13694.442	11318.255
42226149	626.224	0.920	0.011	0.004	12325.392	5020.142
42226349	410.638	0.972	0.024	0.008	12264.831	5103.089
42226549	481.869	0.986	0.052	0.011	12222.542	5750.803
42226749	596.665	0.983	0.092	0.013	12158.181	8700.793
42226949	655.856	0.979	0.129	0.015	12129.305	9504.365
42227149	501.579	0.775	0.155	0.016	12079.859	9233.073
42227349	168.123	0.289	0.174	0.018	10833.864	9022.659
42238349	107.716	0.735	0.076	0.023	21446.246	8928.534
42570781	115.065	0.310	0.192	0.023	6233.344	7506.878
42570981	108.709	0.324	0.175	0.024	6480.774	6740.126
42571181	107.410	0.307	0.183	0.024	6578.037	6684.103
42571381	104.378	0.249	0.220	0.024	6368.259	7095.729
42819800	105.549	0.970	0.056	0.023	11806.235	5158.828
42820000	292.836	0.958	0.145	0.023	11831.413	7030.569
42820200	356.870	0.521	0.315	0.023	9029.626	9422.601
42820400	225.951	0.312	0.355	0.023	6618.535	9853.427
42820600	180.871	0.259	0.351	0.023	6419.125	9837.760
43897282	3060835.838	0.990	0.990	0.004	40191.718	90686.510
43897482	150708.119	0.957	0.938	0.008	40266.913	89782.656
43897682	561.031	0.430	0.137	0.011	37978.474	28271.525
46327614	191.394	0.232	0.412	0.023	6406.955	10933.605
46327814	1020.907	0.443	0.812	0.023	7173.002	11046.233
46328014	2208.526	0.610	0.899	0.023	7994.535	11116.588
46328214	2598.796	0.644	0.912	0.023	8039.030	11142.919
46328414	2488.649	0.650	0.889	0.023	8014.472	11157.102
46328614	1481.975	0.642	0.700	0.023	8010.726	10980.290
46328814	362.140	0.623	0.267	0.023	7975.626	9450.552
46329014	132.833	0.614	0.111	0.024	7968.658	8636.293
46813401	282.342	0.247	0.427	0.020	8419.912	9646.114
46813601	2236.206	0.842	0.590	0.021	11898.599	10162.635
46813801	2676.036	0.885	0.625	0.021	11932.661	10520.865
46814001	1655.596	0.736	0.602	0.022	11264.752	10452.088
46814201	284.072	0.326	0.376	0.022	8426.337	9852.642
47272127	111.177	0.383	0.151	0.023	9433.282	11739.240
47305828	247.356	0.161	0.745	0.023	21436.346	9604.348
47306028	1960.835	0.952	0.545	0.023	32402.412	9181.073

Table S4. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within β-globin region with BF of shared hotspot for Beni and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

	BF of	Posterior prob.		Prior prob.		ρ per kb	
Location	shared hotspot	Beni	Chimp	Beni	Chimp	Beni	Chimp
5207191	135.56	0.08	0.89	0.02	0.02	13586.45	8816.91
5207391	355.93	0.21	0.79	0.02	0.02	15075.34	8714.64
5207591	842.27	0.50	0.64	0.02	0.02	17242.87	8537.15
5207791	1274.07	0.81	0.51	0.02	0.02	18809.18	8420.40
5207991	1350.57	0.96	0.45	0.02	0.02	20149.54	8419.20
5208191	1286.51	0.99	0.42	0.02	0.02	20258.55	8418.88
5208391	1241.97	0.99	0.41	0.02	0.02	20194.92	8400.70
5208591	1180.78	0.99	0.40	0.02	0.02	20197.72	8427.60
5208791	884.80	0.99	0.33	0.02	0.02	20227.12	8566.47
5208991	290.92	0.98	0.14	0.02	0.02	20220.12	8529.29

Table S5. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within β-globin region with BF of shared hotspot for CEPH and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

	BF of	Posterior prob.		Prior prob.		ρ per kb	
Location	shared hotspot	CEPH	Chimp	CEPH	Chimp	CEPH	Chimp
5206961	371.22	0.18	0.93	0.02	0.02	18326.23	8852.13
5207161	839.78	0.36	0.89	0.02	0.02	18673.54	8816.91
5207361	1331.00	0.54	0.79	0.02	0.02	19411.68	8714.64
5207561	1511.18	0.71	0.64	0.02	0.02	20566.67	8537.15
5207761	1328.14	0.83	0.51	0.02	0.02	21541.59	8420.40
5207961	1256.48	0.92	0.45	0.02	0.02	22266.50	8419.20
5208161	1286.98	0.99	0.42	0.02	0.02	22760.68	8418.88
5208361	1243.76	0.99	0.41	0.02	0.02	22787.70	8400.70
5208561	1180.72	0.99	0.40	0.02	0.02	22788.52	8427.60
5208761	883.43	0.99	0.33	0.02	0.02	22787.79	8566.47
5208961	295.27	0.99	0.14	0.02	0.02	22814.71	8529.29

Table S6. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within HLA region with BF of shared hotspot for Beni and chimpanzee that is $\geq$ 100. Note that the bin size was set to be 200 bp in the analysis.

Location	BF of shared hotspot	Posterior prob.		Prior prob.		ρ per kb	
		Beni	Chimp	Beni	Chimp	Beni	Chimp
32806970	143.693	0.485	0.146	0.022	0.024	13405.120	6546.155
32807170	148.140	0.449	0.163	0.023	0.024	13494.462	7360.673

Table S7. The location, BF of shared hotspot, posterior and prior probabilities of hotspot, and recombination rate for the locations within HLA region with BF of shared hotspot for CEPH and chimpanzee that is ≥ 100. Note that the bin size was set to be 200 bp in the analysis.

Location	BF of shared hotspot	Posterior prob.		Prior prob.		ρ per kb	
		CEPH	Chimp	CEPH	Chimp	CEPH	Chimp
32806899	168.752	0.990	0.086	0.024	0.024	18246.979	4179.673
32807099	245.422	0.823	0.146	0.024	0.024	17367.281	6546.155
32807299	239.016	0.718	0.163	0.024	0.024	15555.192	7360.673
32807499	167.397	0.634	0.134	0.023	0.024	13960.294	6622.008
32902299	100.630	0.629	0.084	0.024	0.024	3603.851	3096.905
32902499	108.641	0.604	0.094	0.024	0.024	3584.889	3095.336

References

HOLLOWAY, K., V. E. LAWSON, and A. J. JEFFREYS, 2006 Allelic recombination and de novo deletions in sperm in the human beta-globin gene region. Human Molecular Genetics **15**: 1099–1111.

JEFFREYS, A. J., L. KAUPPI, and R. NEUMANN, 2001 Intensely punctate meiotic recombination in the class ii region of the major histocompatibility complex. Nature Genetics **29**: 217–222.