

SUPPLEMENTAL MATERIALS

Comparison of HLA Allelic Imputation Programs

Jason H Karnes^{1,2}, Christian M Shaffer², Lisa Bastarache³, Silvana Gaudieri^{4,5,6}, Andrew M Glazer², Heidi E Steiner¹, Jonathan D Mosley², Simon Mallal⁷, Joshua C Denny³, Elizabeth J Phillips^{2,4,6}, Dan M Roden^{2,3,8*}

- 1) Department of Pharmacy Practice and Science, University of Arizona College of Pharmacy, Tucson, AZ
- 2) Division of Clinical Pharmacology, Department of Medicine, Vanderbilt University Medical Center, Nashville, TN
- 3) Department of Biomedical Informatics, Vanderbilt University School of Medicine, Nashville, TN
- 4) Division of Infectious Diseases, Department of Medicine, Vanderbilt University Medical Center, Nashville, TN
- 5) School of Anatomy, Physiology and Human Biology, University of Western Australia, Nedlands, Western Australia, Australia
- 6) Institute for Immunology & Infectious Diseases, Murdoch University, Murdoch, Western Australia, Australia
- 7) Department of Pathology, Microbiology and Immunology, Vanderbilt University School of Medicine, Nashville, TN
- 8) Department of Pharmacology, Vanderbilt University School of Medicine, Nashville, TN

***Corresponding Author:**

Email: dan.roden@vanderbilt.edu

Table S1: HLA imputation programs evaluation for all HLA alleles and posterior probability ratio greater than 1.5

Race/Ethnicity	Imputation Program	Concordance Rate	Call Rate	Predicted Alleles (n)
European Americans (n=2,947) ¹	SNP2HLA	0.976	0.995	210
	HLA*IMP:02	0.945	0.970	140
	HIBAG	0.981	0.954	175
African Americans (n=318) ²	SNP2HLA	0.912	1.00	174
	HLA*IMP:02	0.681	0.887	134
	HIBAG	0.954	0.471	131

Concordance and call rates generated from imputed alleles versus sequenced alleles after combining data for HumanOmni1-QUAD and HumanOmni5-QUAD platforms by race/ethnicity. HLA allele calls are restricted to posterior probability > 0.5 and posterior probability ratio > 1.5. Posterior probability ratio was calculated as the ratio of highest and second highest posterior probability for an individual sample.

- 1) Based on sequencing, 325 distinct four digit alleles were present in the European American population.
- 2) Based on sequencing, 219 distinct four digit alleles were present in the African American population.

Table S2: Concordance rate and call rate for each imputation program by HLA locus and posterior probability ratio greater than 1.5

Allele	Imputation Program	European Americans		African Americans	
		Concordance Rate	Call Rate	Concordance Rate	Call Rate
<i>HLA-A</i>	SNP2HLA	0.984	0.997	0.978	0.991
	HLA*IMP:02	0.964	0.991	0.547	0.862
	HIBAG	0.986	0.989	0.970	0.726
<i>HLA-B</i>	SNP2HLA	0.973	0.989	0.886	0.989
	HLA*IMP:02	0.955	0.966	0.547	0.862
	HIBAG	0.982	0.943	0.969	0.305
<i>HLA-C</i>	SNP2HLA	0.987	0.998	0.842	1.00
	HLA*IMP:02	0.984	0.994	0.807	0.931
	HIBAG	0.988	0.987	0.979	0.516
<i>HLA-DPB1</i>	SNP2HLA	0.961	0.989	0.944	1.00
	HLA*IMP:02	0.844	0.942	0.607	0.772
	HIBAG	0.962	0.951	0.867	0.343
<i>HLA-DQB1</i>	SNP2HLA	0.989	0.999	0.907	0.995
	HLA*IMP:02	0.984	0.992	0.866	0.918
	HIBAG	0.991	0.977	0.947	0.472
<i>HLA-DRB1</i>	SNP2HLA	0.959	0.997	0.919	0.994
	HLA*IMP:02	0.932	0.936	0.515	0.892
	HIBAG	0.972	0.875	0.966	0.462

Concordance and call rates generated from imputed alleles versus sequenced alleles

after combining data for HumanOmni1-QUAD and HumanOmni5-QUAD platforms by

HLA locus and race/ethnicity. HLA allele calls are restricted to posterior probability >

0.5 and posterior probability ratio>1.5. Posterior probability ratio was calculated as the

ratio of highest and second highest posterior probability for an individual sample.

Table S3: Frequencies and concordance rates for HLA alleles by imputation program and race/ethnicity^{1,2}

HLA allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
A*01:01	0.156	0.998	0.998	0.998	0.039	0.960	0.750	0.800
A*01:02	0.000	NA	NA	NA	0.008	0.800	NA	NA
A*01:03	0.000	1.000	NA	NA	0.000	NA	NA	NA
A*02:01	0.286	0.993	0.990	0.983	0.095	0.983	0.980	0.983
A*02:02	0.001	0.750	1.000	NA	0.047	0.967	1.000	NA
A*02:03	0.001	0.000	NA	NA	0.000	NA	NA	NA
A*02:05	0.008	1.000	1.000	1.000	0.013	1.000	0.800	0.250
A*02:06	0.003	0.850	0.929	0.000	0.000	NA	NA	NA
A*02:07	0.000	0.000	NA	NA	0.000	NA	NA	NA
A*02:11	0.000	0.000	NA	NA	0.000	NA	NA	NA
A*03:01	0.144	0.995	0.979	0.978	0.095	0.983	1.000	0.902
A*03:02	0.002	0.929	NA	NA	0.000	NA	NA	NA
A*11:01	0.065	0.995	0.992	0.995	0.025	0.938	1.000	0.929
A*23:01	0.018	1.000	1.000	0.991	0.115	1.000	1.000	1.000
A*24:02	0.079	0.985	0.985	0.976	0.011	1.000	1.000	0.368
A*24:03	0.000	NA	NA	0.000	0.000	NA	NA	NA
A*24:07	0.000	0.000	NA	NA	0.000	NA	NA	NA
A*24:10	0.001	0.000	NA	NA	0.000	NA	NA	NA
A*25:01	0.021	0.857	0.882	0.758	0.003	0.500	NA	0.167
A*26:01	0.022	0.858	0.895	0.851	0.013	0.875	0.429	0.545
A*29:01	0.003	1.000	1.000	NA	0.000	NA	NA	NA
A*29:02	0.041	0.996	1.000	0.937	0.036	1.000	1.000	0.955
A*30:01	0.013	1.000	1.000	0.988	0.081	1.000	1.000	0.980
A*30:02	0.011	1.000	1.000	1.000	0.068	1.000	1.000	1.000
A*30:04	0.001	1.000	1.000	1.000	0.000	NA	NA	1.000
A*31:01	0.033	0.984	0.995	0.990	0.019	0.667	1.000	0.389
A*32:01	0.032	0.995	0.995	0.974	0.009	1.000	1.000	0.159
A*33:00	0.000	NA	NA	0.000	0.000	NA	NA	0.000
A*33:01	0.007	0.854	0.854	NA	0.019	1.000	1.000	NA
A*33:03	0.003	0.933	1.000	NA	0.066	1.000	1.000	NA
A*34:02	0.001	1.000	1.000	0.571	0.032	1.000	1.000	1.000
A*36:01	0.000	NA	NA	NA	0.016	1.000	0.769	NA
A*43:86	0.000	NA	NA	0.000	0.000	NA	NA	NA
A*66:01	0.003	1.000	1.000	NA	0.011	1.000	NA	NA
A*66:02	0.000	NA	NA	NA	0.000	NA	1.000	NA
A*68:01	0.037	0.991	0.995	0.973	0.044	1.000	1.000	0.596

Table S3 (continued)

Allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
A*68:02	0.010	0.983	1.000	0.891	0.062	1.000	1.000	0.972
A*68:03	0.000	0.000	NA	NA	0.000	NA	NA	NA
A*69:01	0.001	1.000	1.000	NA	0.000	NA	NA	NA
A*74:01	0.001	0.200	NA	NA	0.070	0.886	0.943	NA
A*74:03	0.000	NA	1.000	NA	0.000	NA	NA	NA
A*80:01	0.000	NA	NA	NA	0.000	1.000	1.000	NA
B*07:02	0.140	0.993	0.994	0.989	0.077	0.939	0.897	0.882
B*07:05	0.002	0.846	0.917	0.818	0.022	0.643	NA	0.273
B*08:01	0.116	0.994	0.993	0.994	0.047	0.967	1.000	0.885
B*13:01	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*13:02	0.025	1.000	0.993	0.966	0.008	1.000	NA	0.444
B*14:01	0.011	0.984	1.000	0.984	0.006	1.000	NA	0.500
B*14:02	0.025	1.000	1.000	0.979	0.019	1.000	1.000	1.000
B*15:01	0.062	0.970	0.964	0.926	0.013	0.750	NA	0.217
B*15:03	0.003	1.000	1.000	0.833	0.064	1.000	1.000	1.000
B*15:10	0.001	1.000	1.000	NA	0.025	0.938	1.000	0.500
B*15:16	0.001	1.000	1.000	0.500	0.019	1.000	1.000	0.667
B*15:17	0.003	0.941	0.938	0.577	0.006	1.000	NA	0.800
B*15:18	0.003	0.938	0.929	0.933	0.002	1.000	NA	1.000
B*15:25	0.000	0.000	NA	NA	0.005	0.000	NA	NA
B*18:01	0.041	0.946	0.953	0.943	0.027	0.941	1.000	0.786
B*18:03	0.000	NA	NA	0.000	0.000	NA	NA	0.000
B*27:02	0.002	0.600	1.000	NA	0.000	NA	NA	0.000
B*27:05	0.039	0.948	0.965	0.940	0.009	0.667	NA	0.333
B*27:07	0.000	0.500	NA	NA	0.000	NA	NA	NA
B*35:01	0.054	0.966	0.974	0.894	0.069	0.886	0.944	0.366
B*35:02	0.007	0.854	0.878	0.917	0.000	NA	NA	NA
B*35:03	0.013	0.924	0.955	0.877	0.003	0.500	NA	0.200
B*35:08	0.003	0.667	0.864	NA	0.000	NA	NA	0.000
B*35:12	0.000	0.000	NA	NA	0.000	NA	NA	NA
B*35:17	0.000	NA	NA	NA	0.000	NA	NA	0.000
B*37:01	0.013	1.000	1.000	0.949	0.006	1.000	NA	0.750
B*38:01	0.012	0.944	0.983	0.900	0.000	NA	NA	0.000
B*38:02	0.001	0.500	NA	NA	0.000	NA	NA	NA
B*39:01	0.010	0.842	0.836	0.788	0.011	0.286	NA	0.167
B*39:06	0.005	0.903	0.950	0.727	0.002	1.000	1.000	0.000

Table S3 (continued)

Allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
B*39:09	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*39:10	0.000	0.000	NA	0.000	0.006	1.000	1.000	NA
B*39:24	0.000	NA	1.000	0.000	0.000	NA	NA	0.000
B*40:01	0.067	1.000	0.997	0.992	0.009	1.000	NA	1.000
B*40:02	0.013	0.935	0.947	0.910	0.002	1.000	NA	1.000
B*40:06	0.001	0.167	1.000	NA	0.000	NA	NA	NA
B*41:01	0.002	1.000	1.000	0.632	0.008	0.400	NA	0.061
B*41:02	0.003	0.895	0.895	0.895	0.000	NA	NA	0.250
B*42:01	0.001	1.000	NA	NA	0.038	1.000	1.000	NA
B*42:02	0.000	NA	NA	NA	0.017	0.455	1.000	NA
B*44:02	0.098	0.993	0.993	0.990	0.016	0.700	NA	0.467
B*44:03	0.050	0.966	0.960	0.949	0.067	0.953	0.846	0.642
B*44:04	0.001	0.333	NA	0.000	0.002	0.000	NA	NA
B*44:05	0.002	0.857	0.857	0.923	0.000	NA	NA	0.000
B*45:01	0.008	0.960	0.979	0.955	0.036	0.957	1.000	0.900
B*46:01	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*47:01	0.002	1.000	1.000	1.000	0.002	1.000	NA	1.000
B*48:01	0.000	0.500	NA	NA	0.000	NA	NA	NA
B*49:01	0.015	0.989	0.977	0.977	0.041	0.962	1.000	0.727
B*50:01	0.010	0.915	0.946	0.898	0.003	0.500	NA	0.333
B*51:01	0.048	0.950	0.957	0.941	0.038	0.458	0.500	0.357
B*51:05	0.000	NA	NA	NA	0.003	0.000	NA	NA
B*51:08	0.001	0.250	1.000	NA	0.002	0.000	NA	0.000
B*52:01	0.007	0.952	1.000	0.976	0.005	0.333	0.500	NA
B*53:01	0.005	1.000	1.000	1.000	0.118	1.000	0.976	0.971
B*54:01	0.000	1.000	NA	NA	0.000	NA	NA	NA
B*55:01	0.019	0.945	0.971	0.951	0.005	0.667	NA	1.000
B*56:01	0.007	0.881	0.947	0.761	0.003	1.000	NA	1.000
B*56:03	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*56:04	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*57:01	0.040	0.996	0.991	0.978	0.003	1.000	NA	0.118
B*57:02	0.000	NA	NA	NA	0.002	1.000	NA	NA
B*57:03	0.001	0.571	NA	NA	0.038	1.000	0.917	1.000
B*58:01	0.005	1.000	1.000	1.000	0.033	0.857	1.000	0.621
B*58:02	0.001	1.000	NA	NA	0.047	0.967	0.957	NA
B*73:01	0.000	1.000	1.000	NA	0.000	NA	NA	NA

Table S3 (continued)

European Americans					African Americans			
Allele	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
B*78:01	0.000	NA	NA	NA	0.002	0.000	NA	NA
B*81:01	0.000	NA	NA	NA	0.011	1.000	NA	NA
C*01:02	0.037	0.982	0.986	0.982	0.009	0.833	NA	0.714
C*02:02	0.040	0.962	0.970	0.954	0.082	0.127	0.385	0.125
C*02:06	0.000	NA	NA	NA	0.001	0.000	NA	NA
C*02:10	0.000	NA	1.000	NA	0.000	NA	1.000	NA
C*03:02	0.001	0.875	0.833	NA	0.019	0.923	1.000	NA
C*03:03	0.058	0.994	0.969	0.985	0.021	0.929	NA	0.471
C*03:04	0.089	0.987	0.986	0.970	0.049	0.970	0.933	0.500
C*03:05	0.000	NA	NA	NA	0.001	0.000	NA	NA
C*03:06	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*04:01	0.095	0.989	0.991	0.991	0.198	0.955	0.962	0.953
C*04:03	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*04:04	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*04:07	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*04:09	0.000	NA	NA	NA	0.000	NA	NA	0.000
C*04:10	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*05:01	0.099	0.976	0.978	0.971	0.024	0.938	1.000	0.600
C*06:02	0.097	0.991	0.991	0.991	0.088	0.949	1.000	0.966
C*07:01	0.153	0.990	0.991	0.991	0.129	0.977	0.966	0.973
C*07:02	0.149	0.998	0.999	0.999	0.063	0.976	1.000	0.953
C*07:04	0.015	0.989	1.000	1.000	0.007	0.800	1.000	1.000
C*07:26	0.000	0.000	NA	NA	0.003	0.000	NA	NA
C*08:01	0.001	0.333	NA	NA	0.006	0.000	NA	NA
C*08:02	0.035	0.980	0.985	0.966	0.039	0.808	1.000	0.808
C*08:04	0.000	NA	NA	NA	0.000	NA	1.000	NA
C*12:02	0.007	0.976	1.000	1.000	0.001	0.000	NA	NA
C*12:03	0.036	0.991	1.000	1.000	0.016	0.909	1.000	0.846
C*12:04	0.000	0.000	NA	NA	0.001	0.000	NA	NA
C*14:02	0.012	0.973	1.000	0.985	0.027	0.667	0.889	0.375
C*14:03	0.000	NA	1.000	NA	0.000	NA	NA	NA
C*15:02	0.021	0.960	0.967	0.952	0.004	0.667	NA	0.286
C*15:04	0.000	0.000	NA	NA	0.003	0.000	NA	NA
C*15:05	0.003	0.867	1.000	1.000	0.027	0.944	1.000	1.000
C*16:01	0.038	0.969	0.973	0.940	0.072	0.979	1.000	1.000
C*16:02	0.003	0.947	1.000	1.000	0.001	0.000	NA	NA

Table S3 (continued)

Allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
C*16:04	0.001	0.571	1.000	NA	0.003	0.000	NA	NA
C*17:01	0.006	0.972	1.000	1.000	0.058	0.949	1.000	0.974
C*18:01	0.000	0.667	NA	NA	0.034	0.913	0.923	NA
DPB1*01:01	0.058	0.991	0.991	0.601	0.295	1.000	0.986	0.880
DPB1*02:01	0.127	0.940	0.954	0.903	0.118	1.000	0.950	0.540
DPB1*02:02	0.007	0.886	1.000	0.000	0.000	NA	NA	NA
DPB1*03:01	0.112	0.879	1.000	0.756	0.062	0.950	1.000	0.882
DPB1*04:01	0.424	0.981	0.961	0.960	0.127	0.902	1.000	0.822
DPB1*04:02	0.113	0.982	0.986	0.944	0.115	0.932	NA	0.882
DPB1*05:01	0.022	0.992	1.000	0.520	0.003	1.000	NA	0.167
DPB1*05:02	0.000	NA	NA	0.000	0.000	NA	NA	0.000
DPB1*06:01	0.019	0.737	0.827	NA	0.003	1.000	NA	NA
DPB1*06:02	0.000	NA	NA	0.000	0.000	NA	0.000	NA
DPB1*09:01	0.005	0.806	0.793	0.018	0.001	1.000	NA	0.000
DPB1*10:01	0.021	0.960	1.000	0.089	0.006	0.500	NA	0.000
DPB1*10:40	0.000	NA	0.000	NA	0.000	NA	0.000	NA
DPB1*11:01	0.024	0.993	0.992	0.858	0.031	0.800	1.000	0.684
DPB1*13:01	0.020	1.000	1.000	0.812	0.051	0.697	1.000	0.600
DPB1*14:01	0.011	0.954	0.919	NA	0.005	1.000	NA	NA
DPB1*15:01	0.007	1.000	1.000	NA	0.002	1.000	NA	NA
DPB1*16:01	0.007	0.976	0.976	NA	0.002	1.000	NA	NA
DPB1*17:01	0.014	0.938	1.000	0.237	0.067	0.837	1.000	1.000
DPB1*18:01	0.001	1.000	NA	NA	0.076	1.000	1.000	NA
DPB1*19:01	0.007	1.000	0.976	NA	0.003	1.000	NA	NA
DPB1*20:01	0.001	0.750	1.000	NA	0.000	NA	NA	NA
DPB1*23:01	0.001	0.333	NA	0.000	0.000	NA	NA	NA
DPB1*26:01	0.000	1.000	NA	NA	0.000	NA	NA	NA
DPB1*28:01	0.000	NA	NA	NA	0.002	1.000	NA	NA
DPB1*33:01	0.000	NA	NA	NA	0.002	0.000	NA	NA
DPB1*40:01	0.000	NA	NA	NA	0.019	0.917	NA	NA
DPB1*85:01	0.000	NA	NA	NA	0.011	1.000	NA	NA
DQB1*02:01	0.127	0.980	0.997	0.997	0.134	0.518	0.727	0.953
DQB1*02:02	0.098	0.993	0.995	0.991	0.080	1.000	0.905	1.000
DQB1*03:01	0.188	0.980	0.982	0.972	0.160	0.971	1.000	0.758
DQB1*03:02	0.107	0.992	0.994	0.994	0.038	1.000	1.000	0.923
DQB1*03:03	0.049	0.990	1.000	0.997	0.016	1.000	NA	1.000
DQB1*03:04	0.001	0.667	1.000	NA	0.000	NA	NA	NA

Table S3 (continued):

Allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
DQB1*03:05	0.000	0.000	NA	NA	0.000	NA	NA	NA
DQB1*03:19	0.000	NA	0.000	NA	0.000	NA	0.000	NA
DQB1*04:01	0.001	0.667	NA	NA	0.000	NA	NA	NA
DQB1*04:02	0.026	1.000	0.987	0.974	0.072	1.000	1.000	0.978
DQB1*05:01	0.122	0.992	0.993	0.992	0.164	1.000	1.000	1.000
DQB1*05:02	0.011	0.970	0.984	0.984	0.031	0.950	1.000	0.857
DQB1*05:03	0.026	0.987	1.000	1.000	0.017	1.000	NA	1.000
DQB1*05:04	0.002	0.909	1.000	NA	0.000	NA	NA	NA
DQB1*06:01	0.006	0.972	1.000	0.971	0.000	NA	NA	0.000
DQB1*06:02	0.136	0.986	0.981	0.967	0.206	0.954	0.936	0.926
DQB1*06:03	0.054	0.972	0.960	0.962	0.031	0.750	1.000	0.600
DQB1*06:04	0.037	0.991	1.000	0.391	0.017	0.909	1.000	0.391
DQB1*06:09	0.009	0.982	0.982	1.000	0.033	0.905	1.000	0.615
DRB1*01:01	0.092	0.975	0.937	0.886	0.019	0.667	0.714	0.727
DRB1*01:02	0.009	0.964	1.000	1.000	0.050	1.000	1.000	1.000
DRB1*01:03	0.016	0.958	0.984	0.966	0.000	NA	NA	1.000
DRB1*03:01	0.124	0.983	0.986	0.979	0.069	0.932	0.920	0.591
DRB1*03:02	0.001	0.750	1.000	NA	0.063	1.000	1.000	NA
DRB1*03:04	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*04:01	0.106	0.951	0.956	0.869	0.014	0.889	NA	0.172
DRB1*04:02	0.007	0.825	0.875	0.826	0.002	0.000	NA	NA
DRB1*04:03	0.003	0.778	0.818	0.100	0.000	NA	0.000	NA
DRB1*04:04	0.044	0.921	0.922	0.833	0.009	1.000	NA	0.875
DRB1*04:05	0.007	0.897	1.000	1.000	0.019	0.750	NA	1.000
DRB1*04:06	0.000	0.000	0.000	NA	0.000	NA	NA	NA
DRB1*04:07	0.013	0.880	0.839	0.980	0.002	0.000	NA	NA
DRB1*04:08	0.003	0.850	1.000	NA	0.002	1.000	NA	NA
DRB1*04:09	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*04:10	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*04:11	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*04:37	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*07:01	0.135	0.996	0.992	0.989	0.101	0.984	1.000	0.806
DRB1*08:01	0.023	0.978	0.977	0.881	0.003	1.000	NA	0.200
DRB1*08:02	0.002	0.556	NA	NA	0.000	NA	NA	NA
DRB1*08:03	0.003	0.813	1.000	0.500	0.002	1.000	NA	0.000
DRB1*08:04	0.002	0.600	1.000	1.000	0.057	0.917	1.000	0.870

Table S3 (continued):

Allele	European Americans				African Americans			
	FREQ	SNP2HLA	HIBAG	HLA*IMP	FREQ	SNP2HLA	HIBAG	HLA*IMP
DRB1*08:06	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*08:10	0.000	NA	1.000	NA	0.000	NA	NA	NA
DRB1*09:01	0.013	0.974	1.000	1.000	0.022	1.000	0.778	1.000
DRB1*10:01	0.009	0.962	1.000	1.000	0.025	1.000	1.000	1.000
DRB1*11:01	0.055	0.860	0.790	0.721	0.093	0.847	1.000	0.211
DRB1*11:02	0.002	0.583	0.833	NA	0.046	0.690	0.591	0.000
DRB1*11:03	0.008	0.532	0.000	0.600	0.002	1.000	NA	0.000
DRB1*11:04	0.017	0.875	0.899	0.865	0.003	0.500	1.000	0.091
DRB1*11:06	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*11:08	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*12:01	0.016	0.979	1.000	0.957	0.052	0.879	1.000	0.632
DRB1*12:02	0.000	0.000	NA	NA	0.002	1.000	NA	NA
DRB1*13:01	0.053	0.978	0.980	0.942	0.053	1.000	0.944	0.778
DRB1*13:02	0.045	0.985	0.992	0.982	0.075	0.875	0.938	0.800
DRB1*13:03	0.010	0.967	1.000	1.000	0.025	1.000	1.000	0.833
DRB1*13:04	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*13:05	0.001	0.333	NA	NA	0.000	NA	NA	NA
DRB1*14:01	0.025	0.947	0.966	0.948	0.020	0.923	NA	0.600
DRB1*14:02	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*14:04	0.001	0.143	1.000	NA	0.000	NA	NA	0.000
DRB1*14:05	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*14:06	0.001	0.333	NA	NA	0.000	NA	NA	NA
DRB1*14:07	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*14:15	0.000	0.000	NA	NA	0.000	NA	NA	NA
DRB1*15:01	0.133	0.986	0.977	0.976	0.031	0.800	1.000	0.162
DRB1*15:02	0.007	0.949	1.000	0.972	0.003	1.000	NA	0.167
DRB1*15:03	0.002	0.667	NA	NA	0.123	1.000	0.982	NA
DRB1*16:01	0.010	0.898	0.981	0.897	0.000	NA	NA	0.000
DRB1*16:02	0.001	0.500	1.000	NA	0.014	1.000	1.000	NA

HLA indicates human leukocyte antigen; NA, not applicable.

- 1) NA indicates that the imputation program did not impute the allele
- 2) Concordance rates were generated using OMNI1 and OMNI5 combined SNP-level data and posterior probability>0.50 for each imputation program