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References

Supplementary Table 1 SNPs analyzed in this study

Chromosome	SNP	Position (BP)[a]	Genes	References
2	rs116071925	219646701	*CYP27A1*	
4	rs17467825	72605517	*GC*	(Wang et al. 2010)
	rs2282679	72608383	*GC*	(Wang et al. 2010)
	rs3755967	72609398	*GC*	(Wang et al. 2010)
	rs2298850	72614267	*GC*	(Wang et al. 2010)
	rs7041	72618334	*GC*	(Ahn et al. 2010; Wang et al. 2010)
	rs1155563	72643488	*GC*	(Ahn et al. 2010; Wang et al. 2010)
	rs3733359	72649774	*GC*	
	rs16847024	72650679	*GC*	
	rs115316390	72651159	*GC*	
7	rs2740574	99382096	*CYP3A4*	
11	rs1993116	14910234	*CYP2R1*	(Ahn et al. 2010; Wang et al. 2010)
	rs12794714	14913575	*CYP2R1*	(Wang et al. 2010)
	rs114050796	14914653	*CYP2R1*	
	rs10741657	14914878	*CYP2R1*	(Wang et al. 2010)
	rs2060793	14915310	*CYP2R1*	(Ahn et al. 2010; Wang et al. 2010)
	rs7944926	71165625	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs12785878	71167449	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs4944957	71168035	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs12800438	71171003	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs3794060	71187679	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs3829251	71194559	*DHCR7/NADSYN1*	(Ahn et al. 2010)
	rs4945008	71221248	*DHCR7/NADSYN1*	(Wang et al. 2010)
	rs11234027	71234107	*DHCR7/NADSYN1*	(Ahn et al. 2010)
12	rs11574143	48234917	*VDR*	
	rs731236 (*Taq*I)	48238757	*VDR*	
	rs1544410 (*Bsm*I)	48239835	*VDR*	
	rs2228570 (*Fok*I)	48272895	*VDR*	

	rs11574038	48277153	*VDR*	
	rs1989969	48278010	*VDR*	
	rs11568820 (*Cdx*2)	48302545	*VDR*	
	rs4646537	58157281	*CYP27B1*	
	rs10877012	58162085	*CYP27B1*	
20	rs6013897	52742479	*CYP24A1*	(Wang et al. 2010)
	rs6022990	52775532	*CYP24A1*	
	rs73913755	52790194	*CYP24A1*	
	rs73913757	52790518	*CYP24A1*	
	rs2248359	52791518	*CYP24A1*	
	rs2248461	52792202	*CYP24A1*	

[a] Base pair position on the chromosome is based on GRCh37/hg19

Supplementary Table 2 Results of linear regression analysis of biological and environmental modifiers of serum 25(OH)D levels

	African Americans		European Americans	
	β	*P*	*β*	*P*
Age	0.000	0.86	0.003	0.006
Total Vitamin D Intake (≥400 IU/day vs <400 IU/day)	0.165	<0.001	0.160	<0.001
Season of Blood Draw (UV high seasons vs. low season)	0.117	<0.001	0.066	<0.001
Study Site (Chicago vs. Washington, D.C.)	0.110	<0.001	NA	NA
UVR Exposure (high vs. medium and low exposure	0.031	0.21	0.046	0.06
Body Mass Index	0.001	0.09	-0.007	<0.001
M-Index	-0.002	0.14	0.000	0.95
Education (≤high school vs. > high school)	0.012	0.54	0.023	0.32
West African Ancestry	0.005	0.96	NA	NA
European Ancestry	NA	NA	0.049	0.67

Supplementary Table 3 Results of linear regression analysis in African Americans

				Model 1[a] (n=652)				Model 2[b] (n=557)			
Chromosome	SNPs	MA[d]	MAF[e]	β	*P*	EMP1[f]	EMP2[g]	β	*P*	EMP1[f]	EMP2[g]
2	rs116071925	A	0.017	-0.03	0.59	0.59	1.00	-0.04	0.34	0.34	0.99
4	rs17467825	G	0.111	-0.02	0.25			-0.01	0.62		
	rs2282679	C	0.102	-0.03	0.13			-0.01	0.68		
	rs3755967	A	0.110	-0.04	0.06			-0.02	0.30		
	rs2298850	G	0.090	-0.04	0.06			-0.01	0.65		
	rs7041	G	0.189	0.00	0.81			0.01	0.57		
	rs1155563	C	0.091	-0.04	0.09			-0.04	**0.048**		
	rs3733359	T	0.238	-0.01	0.33	0.33	1.00	-0.01	0.29	0.29	0.99
	rs16847024	T	0.085	-0.02	0.43	0.42	1.00	-0.01	0.54	0.54	1.00
	rs115316390	A	0.007	0.09	0.25	0.24	0.99	0.17	**0.03**	**0.03**	0.33
7	rs2740574	A	0.403	-0.01	0.40	0.40	1.00	-0.01	0.68	0.68	1.00
11	rs1993116	T	0.276	0.02	0.08			0.03	**0.02**		
	rs12794714	A	0.161	-0.03	0.05			-0.04	**0.01**		
	rs114050796	T	0.062	0.01	0.57	0.40	1.00	0.03	0.20	0.19	0.96
	rs10741657	A	0.273	0.03	**0.04**			0.04	**0.01**		
	rs2060793	A	0.358	0.03	0.07			0.03	**0.02**		
	rs7944926	G	0.267	0.00	0.88			-0.02	0.25		
	rs12785878	T	0.271	0.00	0.90			-0.02	0.26		
	rs4944957	G	0.493	0.03	**0.02**			0.02	0.21		
	rs12800438	A	0.392	0.04	**0.002**			0.02	0.07		
	rs3794060	T	0.245	0.00	0.82			-0.01	0.60		
	rs3829251	A	0.230	-0.01	0.45			0.00	0.89		
	rs4945008	G	0.245	0.00	0.83			-0.01	0.65		
	rs11234027	A	0.290	0.01	0.36			0.02	0.12		
12	rs11574143	A	0.092	-0.02	0.30	0.30	1.00	-0.02	0.43	0.45	1.00
	rs731236	C	0.277	-0.02	0.09	0.09	0.77	-0.02	0.14	0.14	0.88
	rs1544410	A	0.285	-0.02	0.24	0.24	0.99	-0.02	0.16	0.16	0.92

	rs11574038	A	0.032	-0.01	0.79	0.78	1.00	-0.01	0.88	0.87	1.00
	rs4646537	C	0.088	0.02	0.33	0.33	1.00	0.01	0.77	0.76	1.00
	rs10877012	T	0.145	-0.03	0.11	0.11	0.82	-0.01	0.53	0.52	1.00
20	rs6013897	A	0.259	0.00	0.96			0.00	0.87		
	rs6022990	G	0.086	0.00	0.93	0.93	1.00	0.03	0.13	0.14	0.88
	rs73913755	A	0.179	0.00	0.81	0.81	1.00	0.01	0.56	0.56	1.00
	rs73913757	T	0.145	0.00	0.99	0.99	1.00	0.00	0.99	0.99	1.00
	rs2248359	C	0.362	-0.02	0.18	0.18	0.96	-0.02	0.22	0.21	0.97
	rs2248461	G	0.366	-0.01	0.39	0.39	1.00	-0.01	0.43	0.42	1.00

[a] Adjusted for age, WAA, and study site
[b] Adjusted for age, WAA, study site, total vitamin D intake, and season of blood draw
[c] Base pair position on the chromosome is based on GRCh37/hg19
[d] Minor Allele
[e] Minor Allele Frequency
[f] Pointwise empirical *P*-values obtained using max(T) permutation procedure (10,000 permutations)
[g] Empirical *P*-values correcting for multiple testing

Supplementary Table 4 Results of linear regression analysis in European Americans

				Model 1[a] (n=405)				Model 2[b] (n=385)			
Chromosome	SNPs	MA[d]	MAF[e]	β	*P*	EMP1[f]	EMP2[g]	β	*P*	EMP1[f]	EMP2[f]
4	rs17467825	G	0.266	-0.05	**0.004**			-0.04	**0.003**		
	rs2282679	C	0.265	-0.05	**0.0014**			-0.05	**0.0014**		
	rs3755967	A	0.268	-0.04	**0.005**			-0.04	**0.002**		
	rs2298850	G	0.244	-0.03	0.08			-0.03	**0.039**		
	rs7041	T	0.418	-0.04	**0.009**			-0.04	**0.0007**		
	rs1155563	C	0.206	-0.03	0.13			-0.02	0.31		
	rs3733359	T	0.077	0.04	0.11	0.12	0.99	0.01	0.80	0.80	1.00
	rs16847024	T	0.007	-0.02	0.75	0.75	1.00	-0.03	0.60	0.58	1.00
	rs115316390	A	0.005	-0.02	0.87	0.87	1.00	0.07	0.44	0.44	1.00
7	rs2740574	G	0.064	-0.04	0.11	0.10	0.99	-0.03	0.26	0.25	1.00
11	rs1993116	T	0.382	0.05	**0.0005**			0.04	**0.0006**		
	rs12794714	A	0.432	-0.04	**0.004**			-0.04	**0.005**		
	rs114050796	T	0.014	-0.03	0.62	0.62	1.00	-0.01	0.86	0.86	1.00
	rs10741657	A	0.375	0.05	**0.002**			0.04	**0.003**		
	rs2060793	A	0.385	0.04	**0.002**			0.04	**0.005**		
	rs7944926	A	0.301	-0.02	0.22			-0.01	0.45		
	rs12785878	G	0.297	-0.02	0.20			-0.01	0.51		
	rs4944957	A	0.283	-0.02	0.26			-0.01	0.52		
	rs12800438	G	0.293	-0.02	0.26			-0.01	0.53		
	rs3794060	C	0.299	-0.02	0.27			-0.01	0.53		
	rs3829251	A	0.149	0.00	0.95			0.02	0.29		
	rs4945008	A	0.300	-0.02	0.23			-0.01	0.46		
	rs11234027	A	0.150	0.00	0.97			0.02	0.34		
12	rs11574143	A	0.111	0.03	0.17	0.17	0.99	0.01	0.49	0.50	1.00
	rs731236	C	0.384	0.00	0.98	0.98	1.00	0.00	0.75	0.75	1.00
	rs1544410	A	0.369	0.00	0.89	0.88	1.00	0.01	0.46	0.46	1.00
	rs11574038	A	0.002	0.13	0.36	0.34	0.99	0.03	0.80	0.80	1.00

	rs11568820	A	0.248	-0.03	0.13	0.14	0.84	-0.02	0.25	0.25	0.98
	rs4646537	C	0.069	0.00	0.86	0.86	1.00	-0.03	0.32	0.32	1.00
	rs10877012	T	0.316	0.00	0.92	0.92	1.00	0.00	0.93	0.93	1.00
20	rs6013897	A	0.201	0.00	0.98			0.00	0.75		
	rs6022990	G	0.011	0.08	0.25	0.25	0.97	0.03	0.60	0.59	1.00
	rs73913755	A	0.067	-0.01	0.68	0.68	1.00	-0.03	0.20	0.20	0.97
	rs73913757	T	0.014	-0.11	**0.04**	**0.04**	0.47	-0.09	**0.04**	**0.04**	0.49
	rs2248359	T	0.435	0.01	0.55	0.55	1.00	0.00	0.79	0.79	1.00
	rs2248461	A	0.420	0.01	0.61	0.60	1.00	0.00	0.89	0.88	1.00

[a] Adjusted for age
[b] Adjusted for age, total vitamin D intake, and season of blood draw, BMI, and UV exposure
[c] Base pair position on the chromosome is based on GRCh37/hg19
[d] Minor Allele
[e] Minor Allele Frequency
[f] Pointwise empirical *P*-values obtained using max(T) permutation procedure (10,000 permutations)
[g] Empirical *P*-values correcting for multiple testing

Supplementary Table 5 Summary of genome wide association studies identified variants association tests (*P*-values)

Gene	SNPs	MA in CEU[a]	Wang et al. 2010	Ahn et al. 2010	EAs in this study[b]		AAs in this study[c]		MA in YRI[d]
					β	*P*	*β*	*P*	
GC	rs17467825	G	6.8×10^{-74}		-0.04	**0.003**	-0.01	0.62	G
	rs2282679	C	1.9×10^{-109}	1.8×10^{-49}	-0.05	**0.0014**	-0.01	0.68	C
	rs3755967	A	2.4×10^{-75}		-0.04	**0.002**	-0.02	0.30	A
	rs2298850	G	2.0×10^{-71}		-0.03	**0.04**	-0.01	0.65	G
	rs7041	T	6.3×10^{-59}		-0.02	**0.0007**	0.01	0.57	T
	rs1155563	C	2.4×10^{-73}		-0.02	0.31	-0.04	**0.048**	C
CYP2R1	rs1993116	A	6.3×10^{-11}	2.9×10^{-17}	0.04	**0.0006**	0.03	**0.02**	A
	rs12794714	A	2.7×10^{-9}		-0.04	**0.005**	-0.4	**0.01**	A
	rs10741657	A	3.3×10^{-20}		0.04	**0.003**	0.04	**0.01**	A
	rs2060793	A	1.7×10^{-11}	1.4×10^{-5}	0.04	**0.005**	0.03	**0.02**	A
DHCR7/NADSYN1	rs7944926	A	9.0×10^{-16}		-0.01	0.45	-0.02	0.25	G
	rs12785878	G	2.1×10^{-27}		-0.01	0.51	-0.02	0.26	T
	rs4944957	A	8.7×10^{-15}		-0.01	0.52	0.02	0.21	G
	rs12800438	G	2.5×10^{-15}		-0.01	0.53	0.02	**0.07**[e]	A
	rs3794060	C	3.4×10^{-15}		-0.01	0.53	-0.01	0.60	T
	rs3829251	A		8.8×10^{-7}	0.02	0.29	0.00	0.89	A
	rs4945008	A	4.6×10^{-15}		-0.01	0.46	-0.01	0.65	G
	rs11234027	A		3.4×10^{-9}	0.02	0.34	0.02	0.12	A
CYP24A1	rs6013897	A	6.0×10^{-10}		0.00	0.75	0.00	0.87	A

[a] Minor Allele Frequency in 1000 Genomes Project CEU (Phase I May 2011 release)

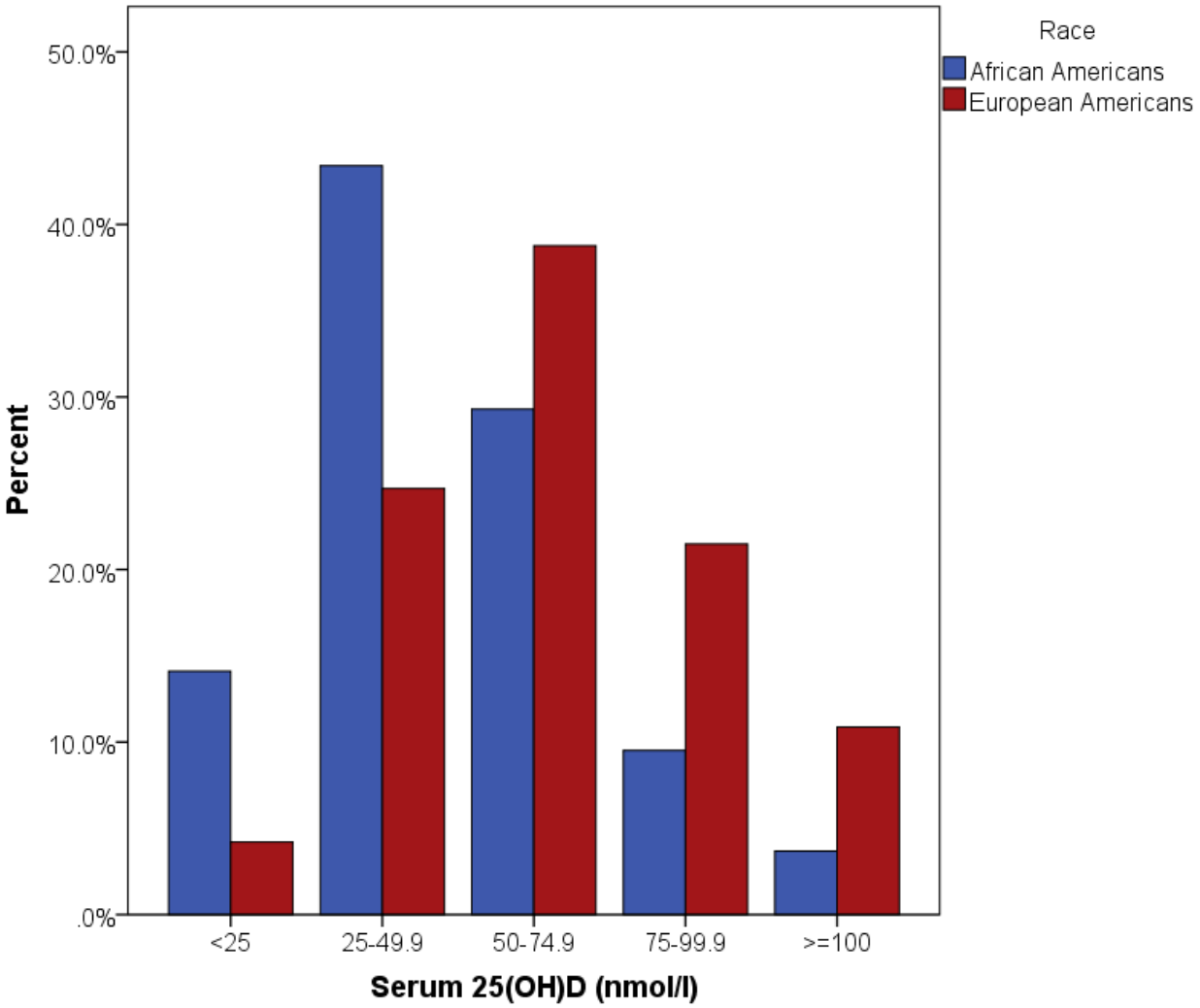
[b] Linear regression adjusted for age, total vitamin D intake, and season of blood draw, BMI, and UVR exposure (Model 2)

[c] Linear regression adjusted for age, WAA, study site, total vitamin D intake, and season of blood draw (Model 2)

[d] Minor Allele Frequency in 1000 Genomes Project YRI (Phase I May 2011 release)

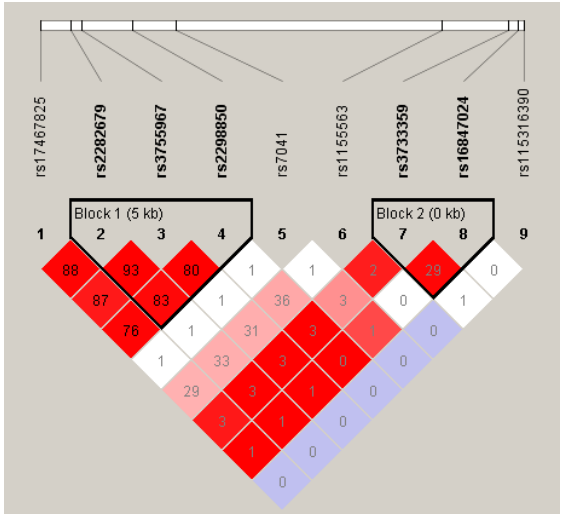
[e] rs12800438 was significantly associated with vitamin D deficiency (*P*=0.04) in logistic regression analysis adjusted for age, WAA, study site, total vitamin D intake, and season of blood draw.

Supplemental Figure 1 Distribution of serum 25(OH)D levels in African Americans and European Americans showing higher prevalence of vitamin D deficiency in African Americans compared to European Americans



Supplemental Figure 2 LD plots of three gene regions (*GC*, *CYP2R1*, and *DHCR7/NADSYN1*) in AAs and EAs

AAs *GC*



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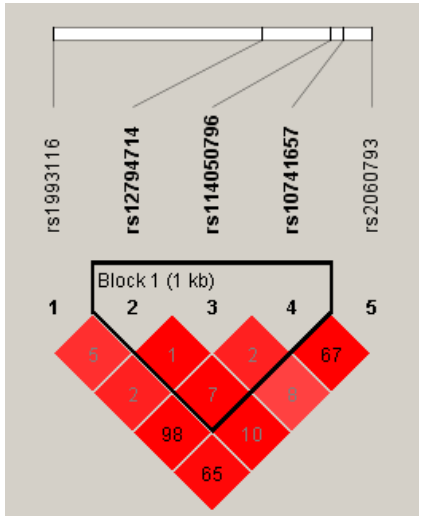
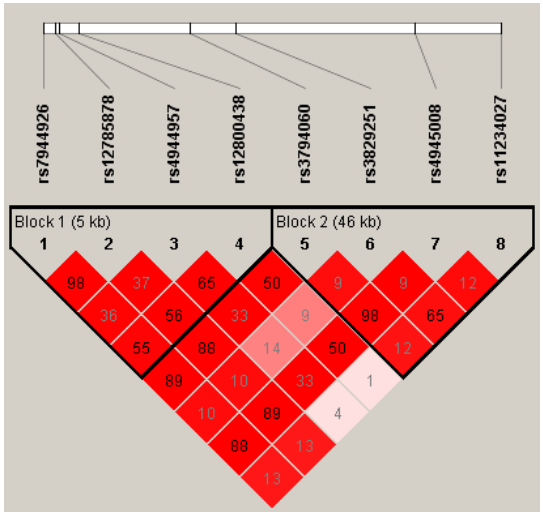
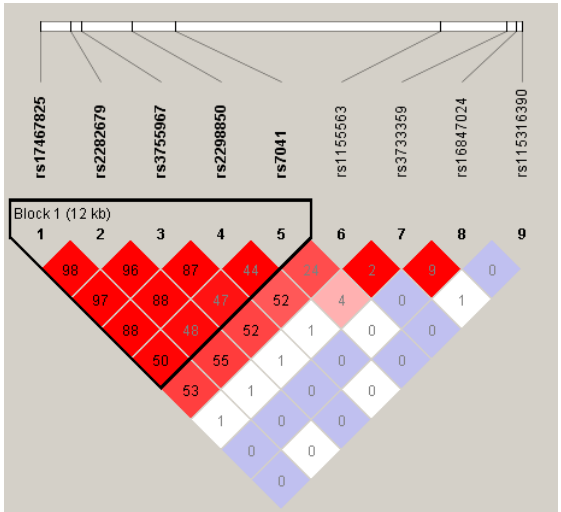


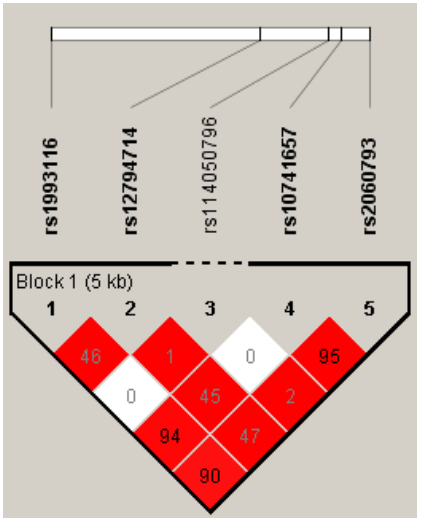
DHCR7/NADSYN1



EAs *GC*



CYP2R1



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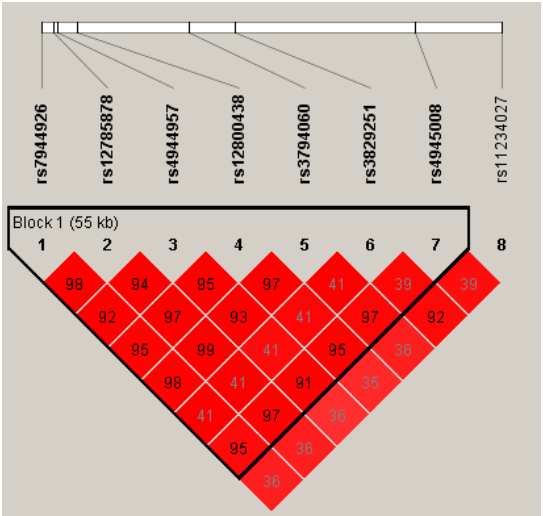

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