Figure S1: Evolutionary relationships between Papillomaviruses. HPVs comprise five evolutionary groups with different epithelial tropisms and disease associations. The AlphaPVs are divided into cutaneous (blue) and mucosal types, and the mucosal types are further subdivided into HPVs that cause genital warts (yellow) and HPVs that cause other mucosal lesions (red). BetaPVs (green) and GammaPVs (light green) include asymptomatic cutaneous HPVs, certain BetaPVs have been implicated in the development of non-melanoma skin cancer (NMSC). MuPVs (esmerald) and NuPVs (light blue) cause proliferative cutaneous lesions. In grey, PVs that non-human hosts. The image shows the best-known maximum likelihood phylogenetic tree for the E1E2L1L2 genes of 263 PVs. The sequences were aligned at the amino acid level with MUSCLE, filtered with GBLOCKS, and the corresponding codon sequences concatenated. Phylogenetic inference was performed with RAxML including three partitions per gene, one per codon, using the GTR+G4 model.

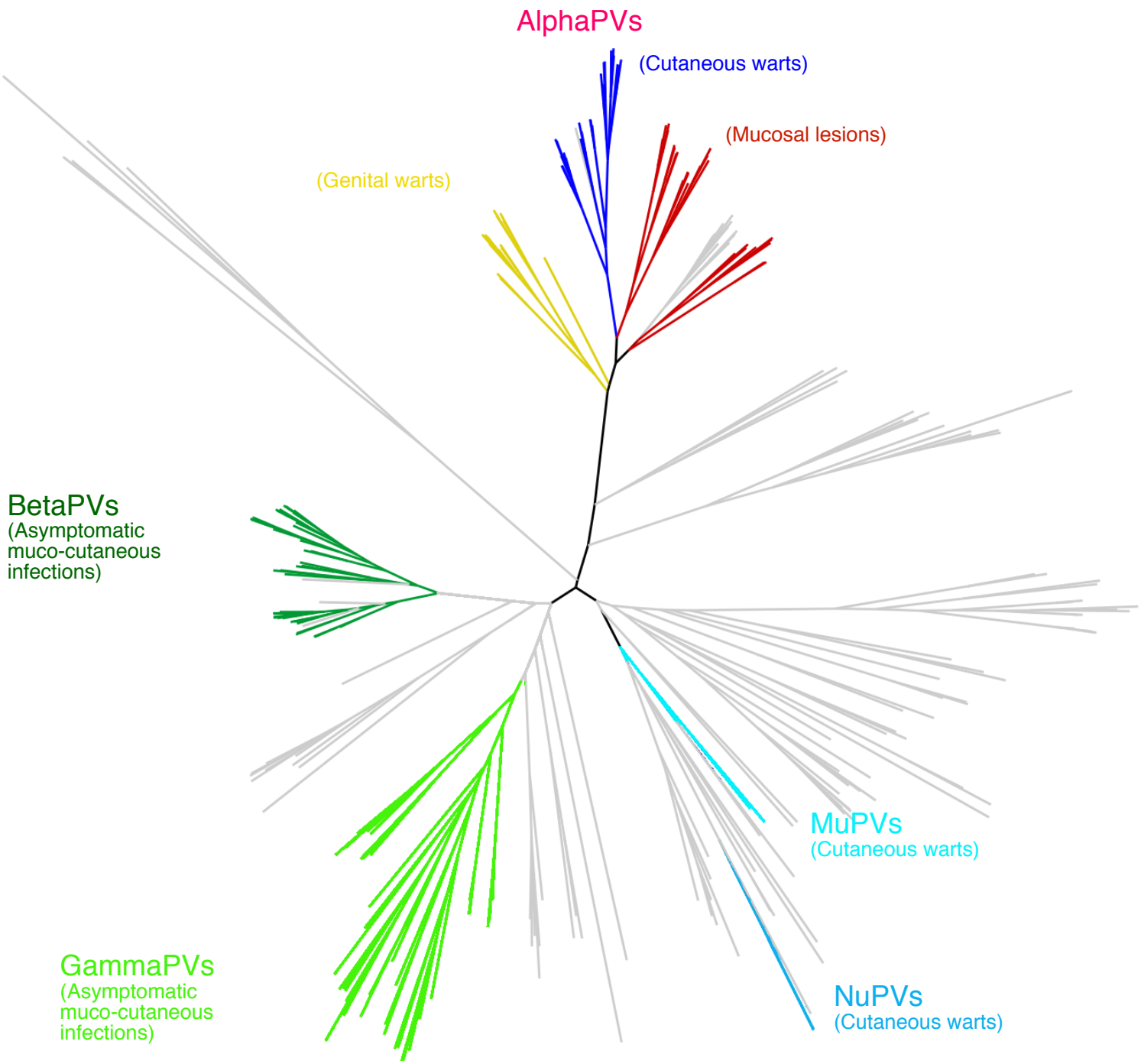

Figure S2: Cumulative frequency plot showing the distribution of CAI values for the entire human gene dataset and the subset of human genes expressed in the epithelium.
Overexpressed epithelial genes (821 genes) were retrieved from the UCSC browser (Kent et al. 2002) filtering skin genes with an expression ranged from 1 to 5 (log_2(tissue/reference) with values ranging from -5 to 5). Underexpressed genes (3812 genes) were retrieved from the UCSC browser (Kent et al. 2002) filtering skin genes with an expression ranged from -5 to -1.

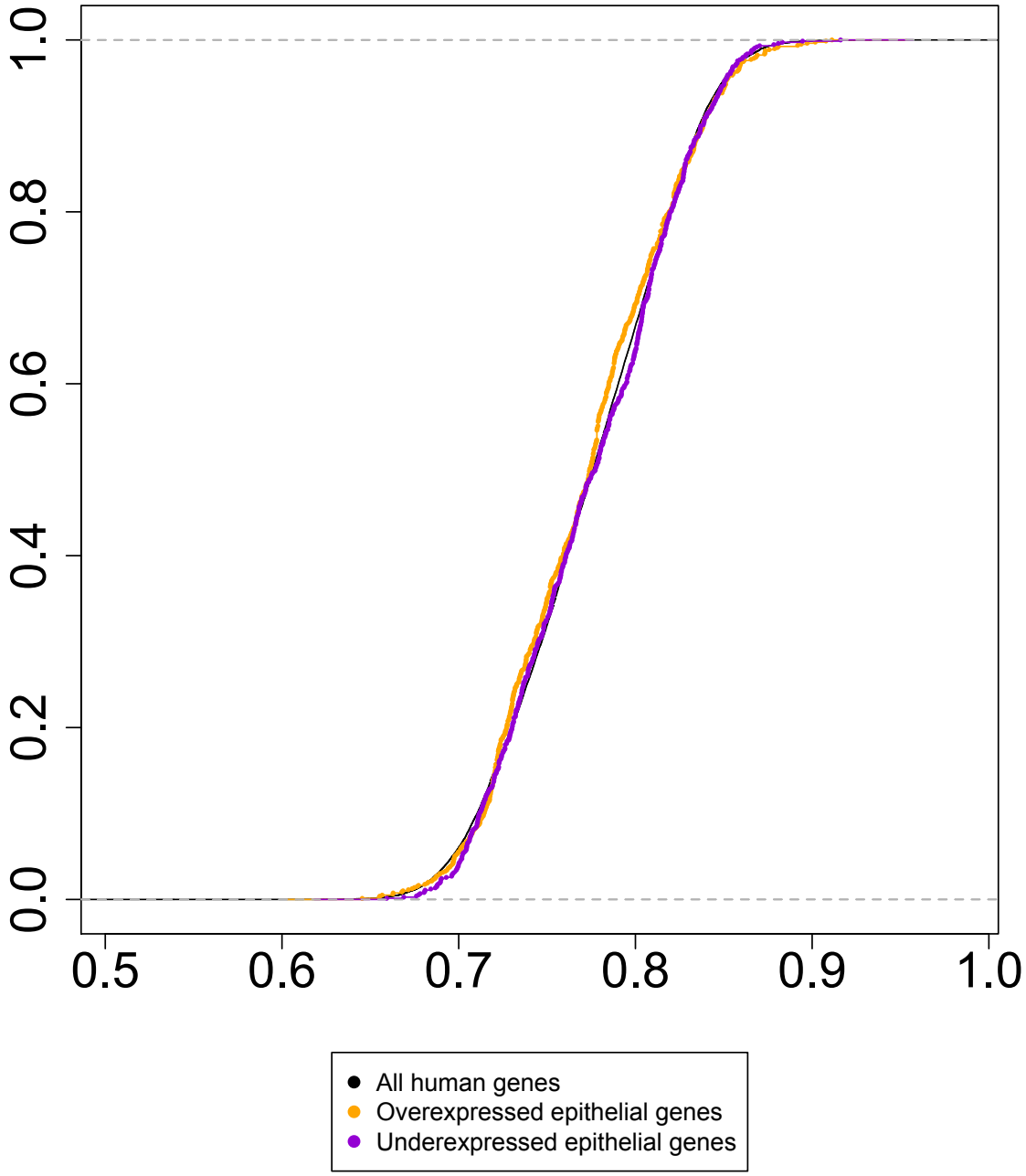

Figure S3: Cumulative frequency plot of CAI values for human and HPV genes for each clinical manifestation. CAI values of each HPV gene were computed on the basis of codon usage preferences in human genes. Code for genes: green, E6; Dark green, E7; Red, E1; Orange, E2; Brown, E4; Dark blue, L2; and, Blue, L1.

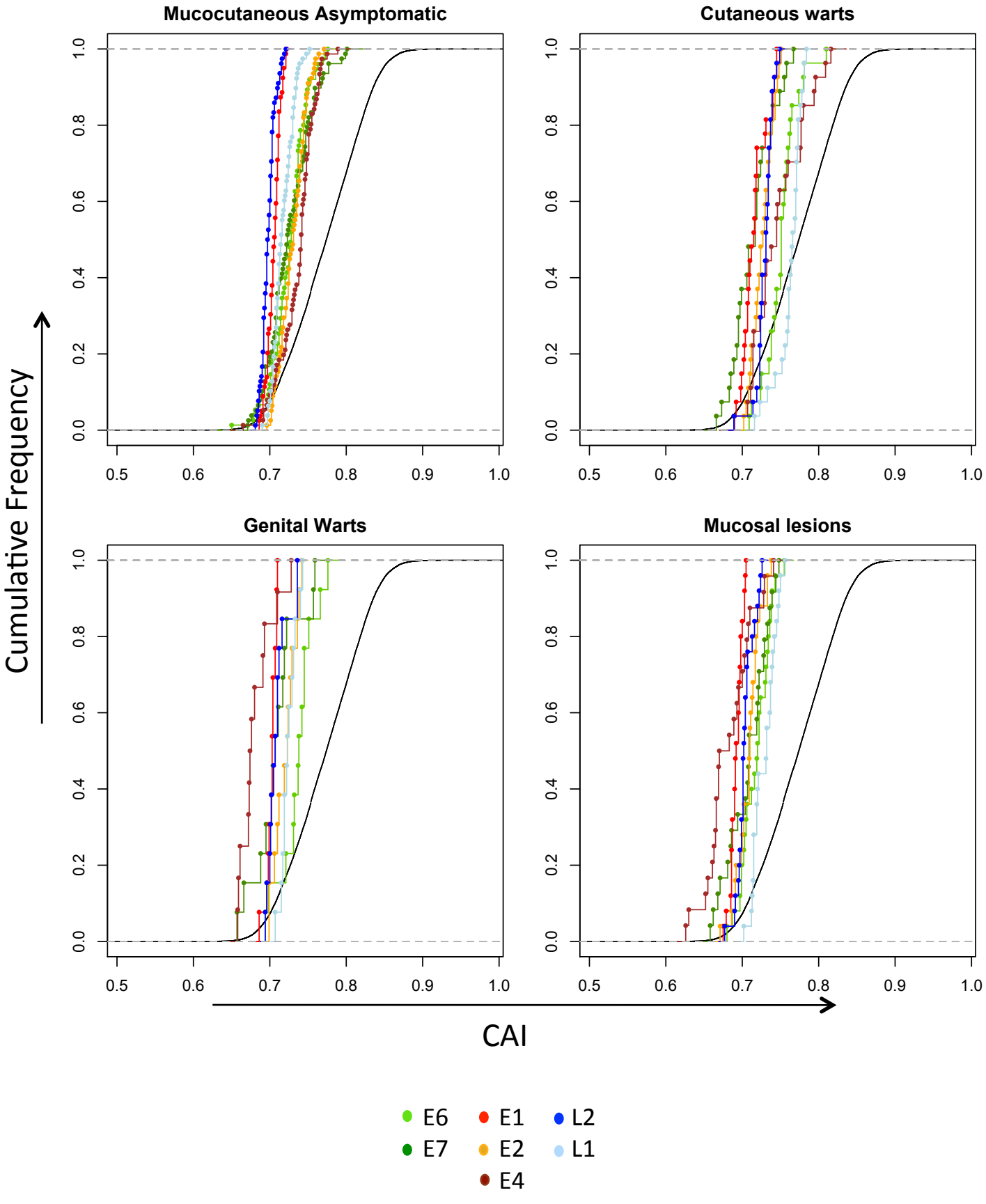

Fig.S4: Cumulative frequency plot of E2 and E4 genes, and the overlapping and non-overlapping region of both genes stratified by clinical manifestation. CAI values of each HPV gene were computed on the basis of codon usage preferences in human genes. Code for genes: green: Orange, E2; Brown, E4; Violet, E2 hinge region; and, Green, E2 non-overlapping region with E4.

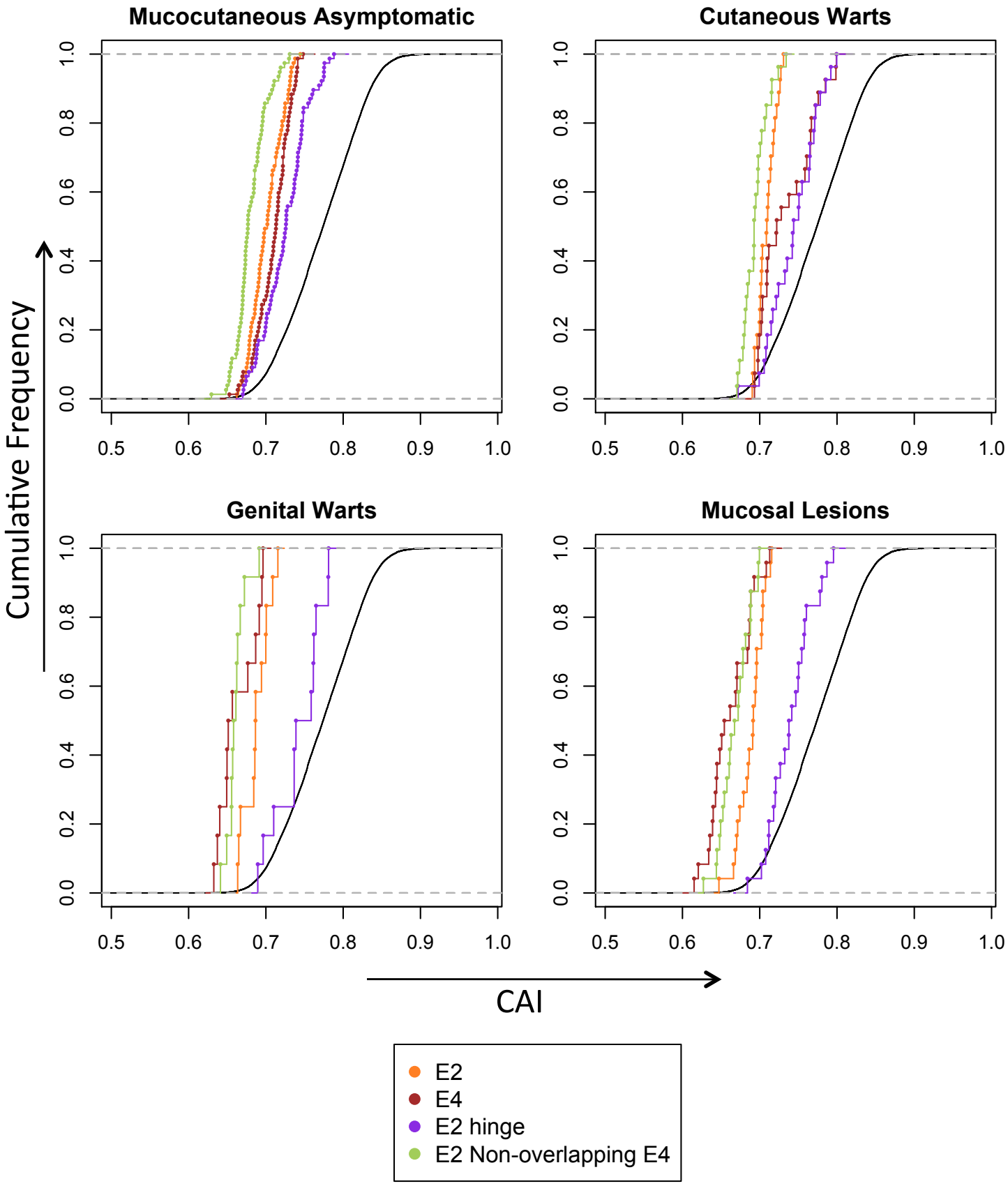

Figure S5: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for E1 (red: g/c at third codon position, blue a/t at third codon position).

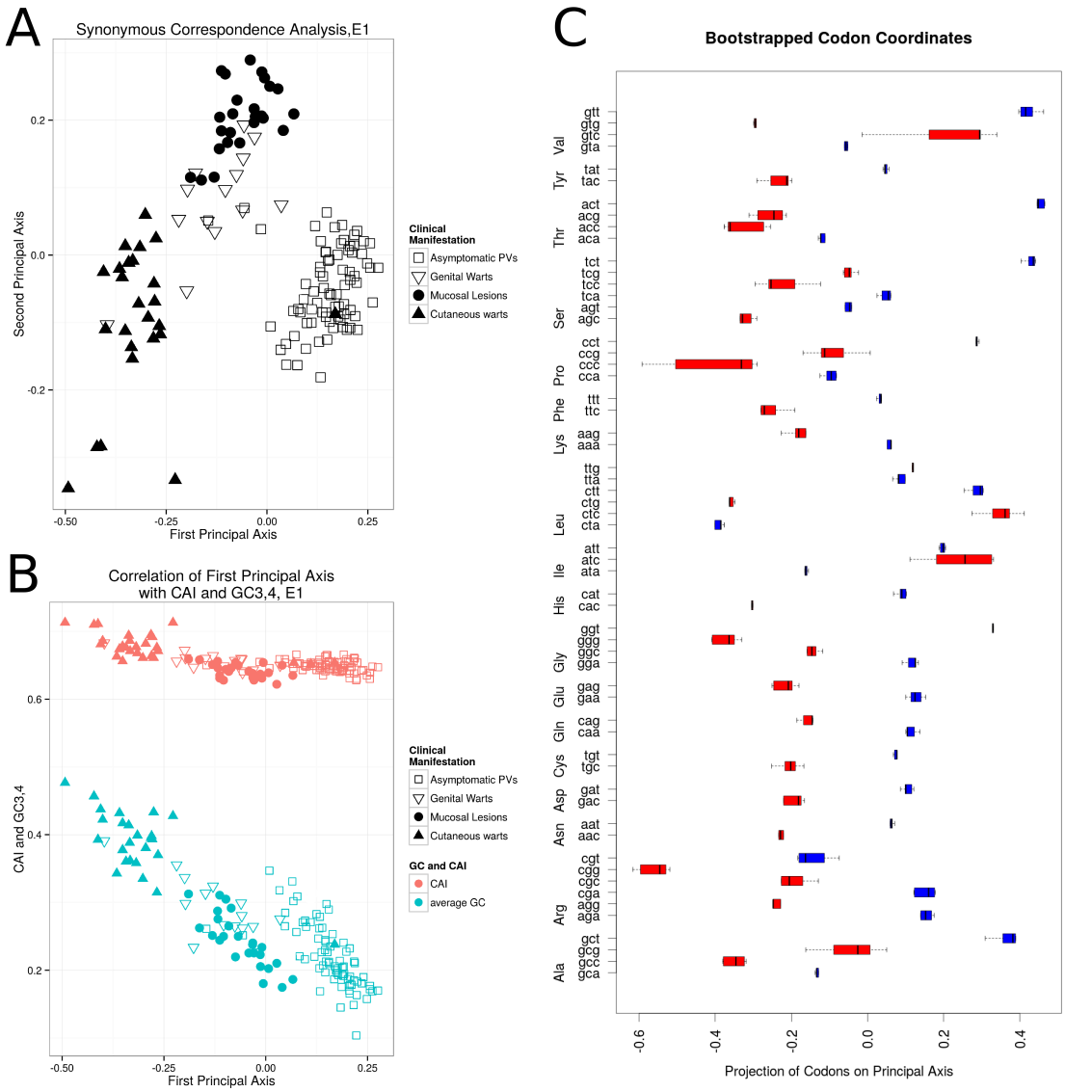

Figure S6: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for E2 (red: g/c at third codon position, blue a/t at third codon position).

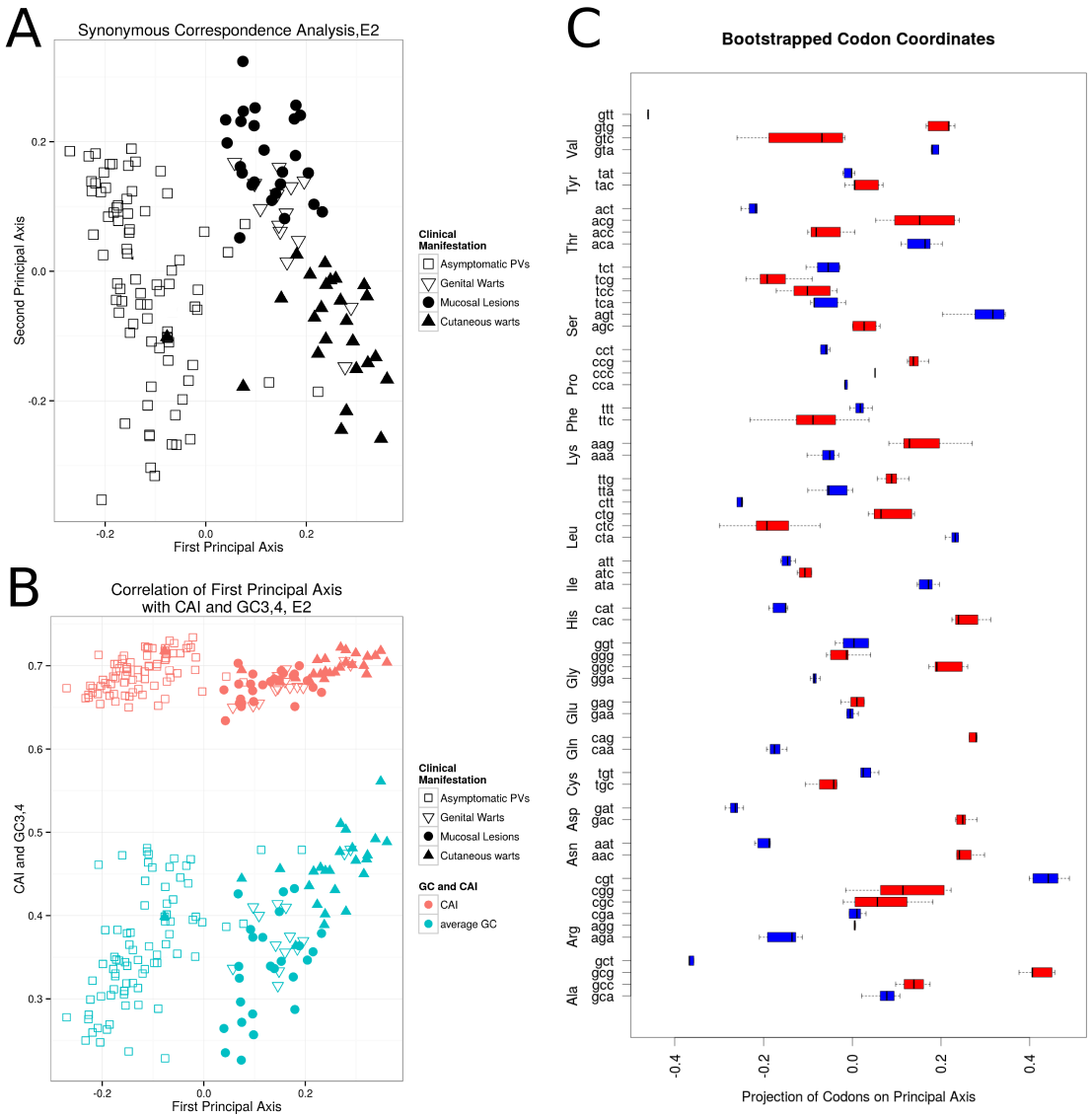

Figure S7: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for E4 (red: g/c at third codon position, blue a/t at third codon position).

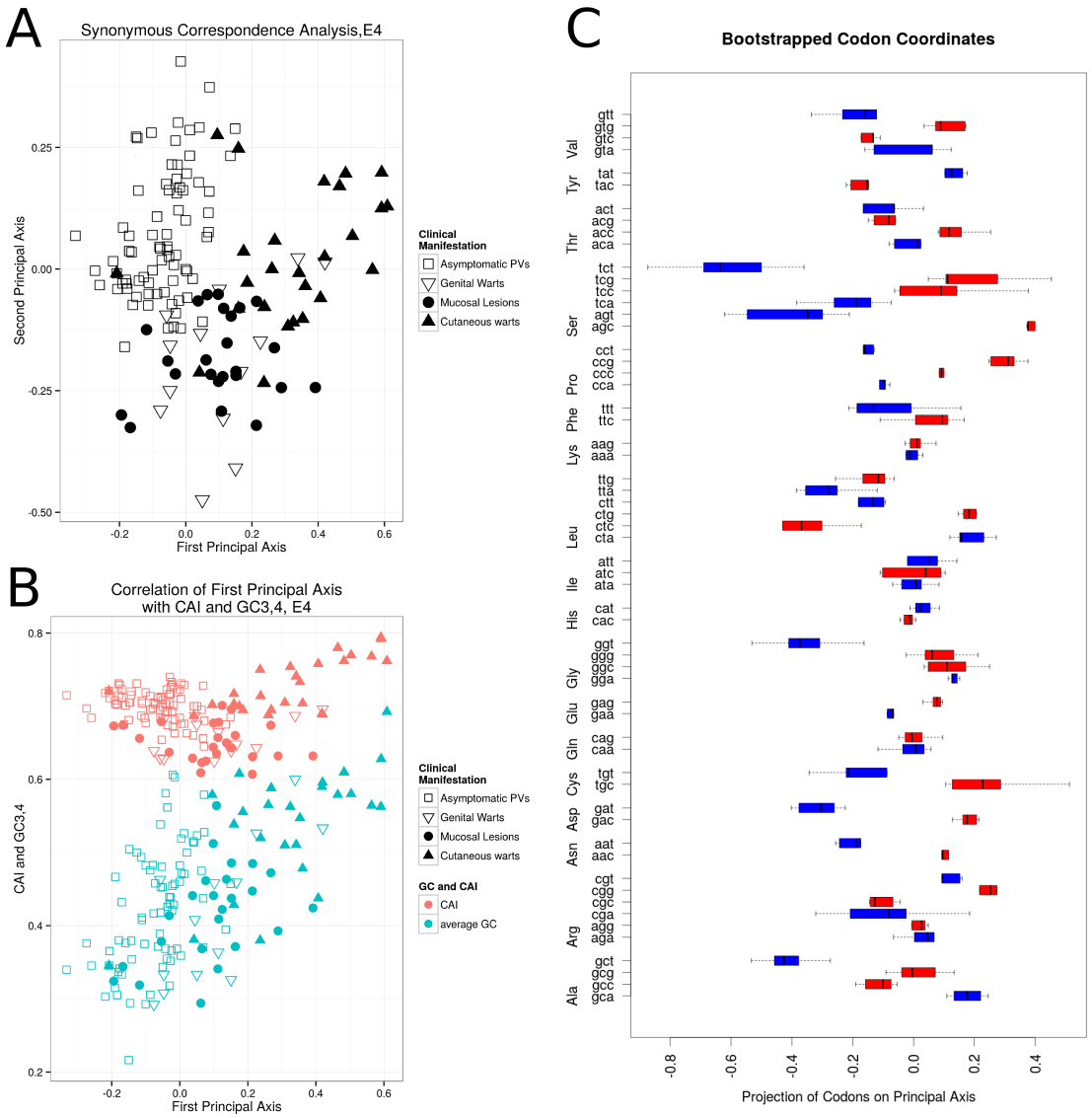

Figure S8: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for E6 (red: g/c at third codon position, blue a/t at third codon position).

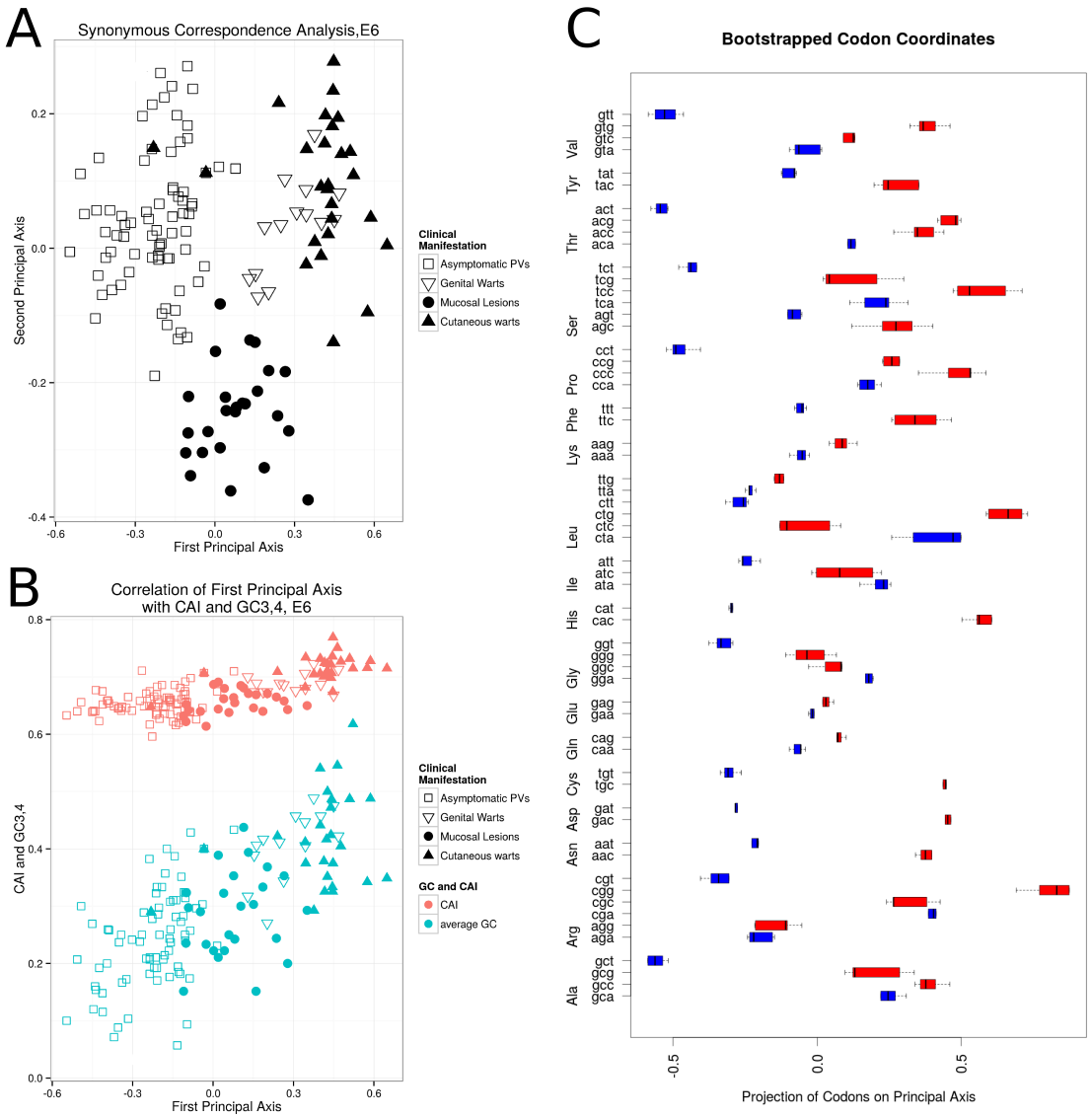

Figure S9: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for E7 (red: g/c at third codon position, blue a/t at third codon position).

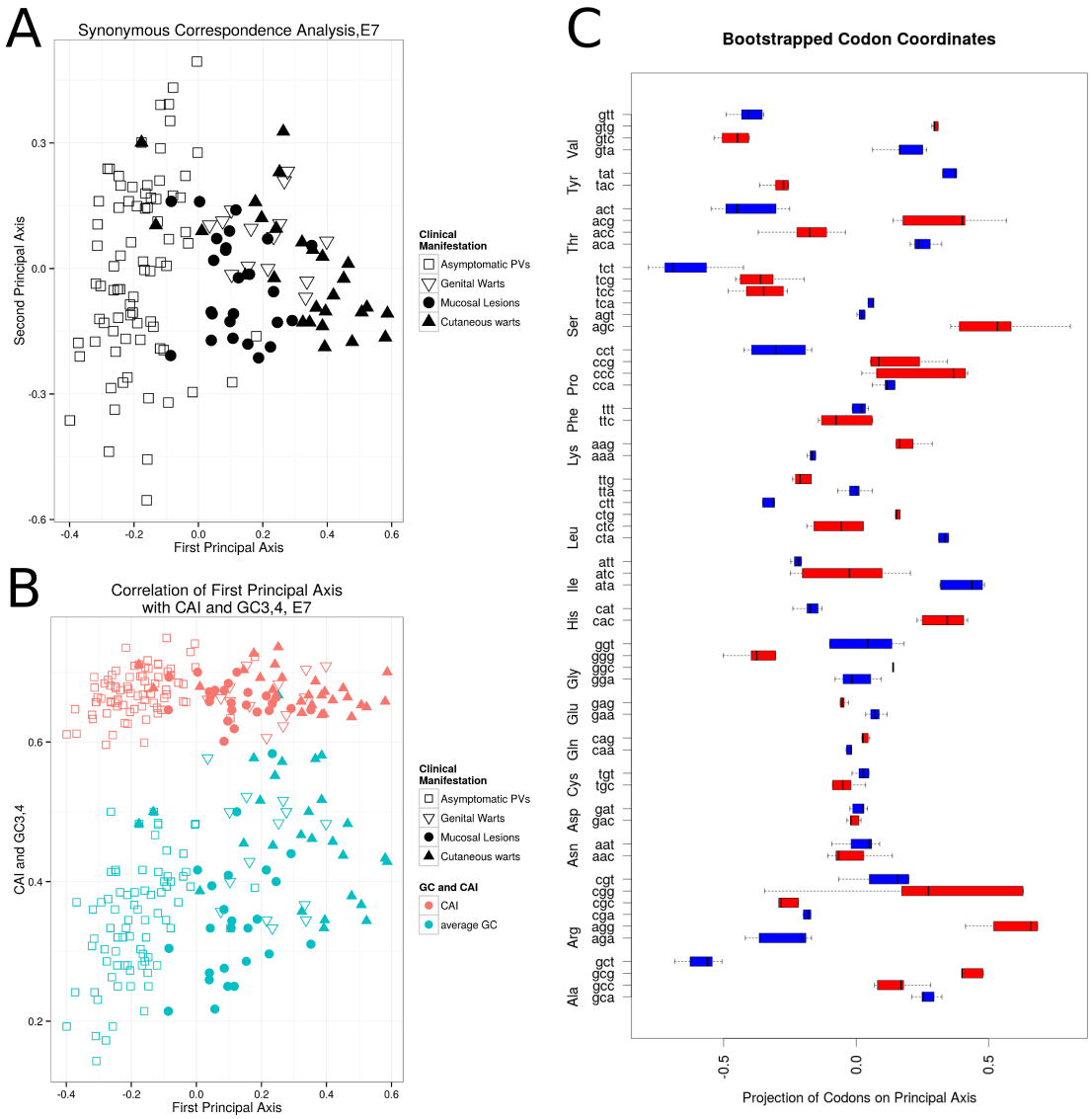

Figure S10: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for L1 (red: g/c at third codon position, blue a/t at third codon position).

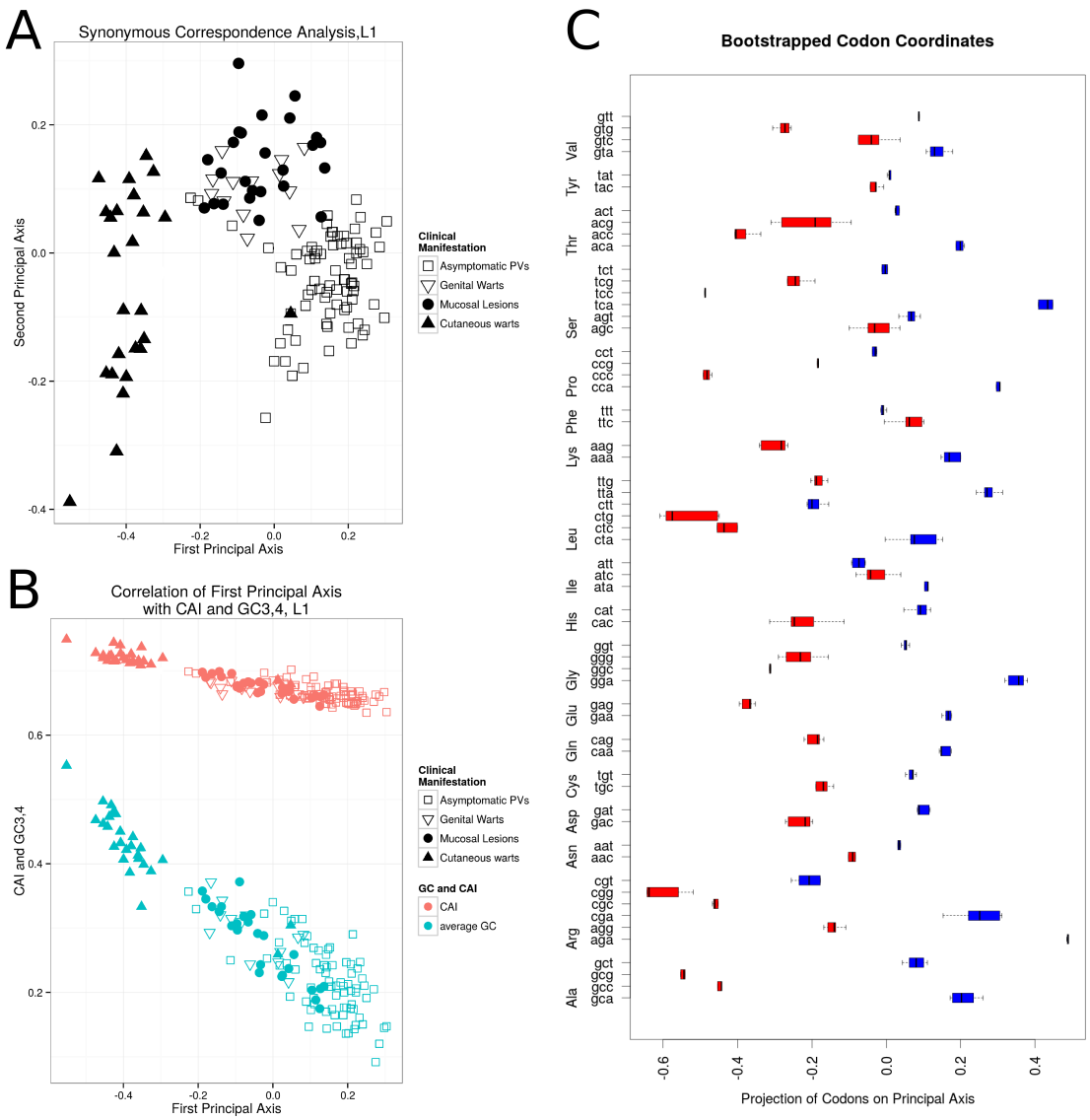

Figure S11: Synonymous Correspondence Analysis, correlation of first axis with CAI and GC content at the third position of codons codifying for amino acids encoded by 4 codons (GC3,4) and bootstrapped projections of codons on first axis for L2 (red: g/c at third codon position, blue a/t at third codon position).

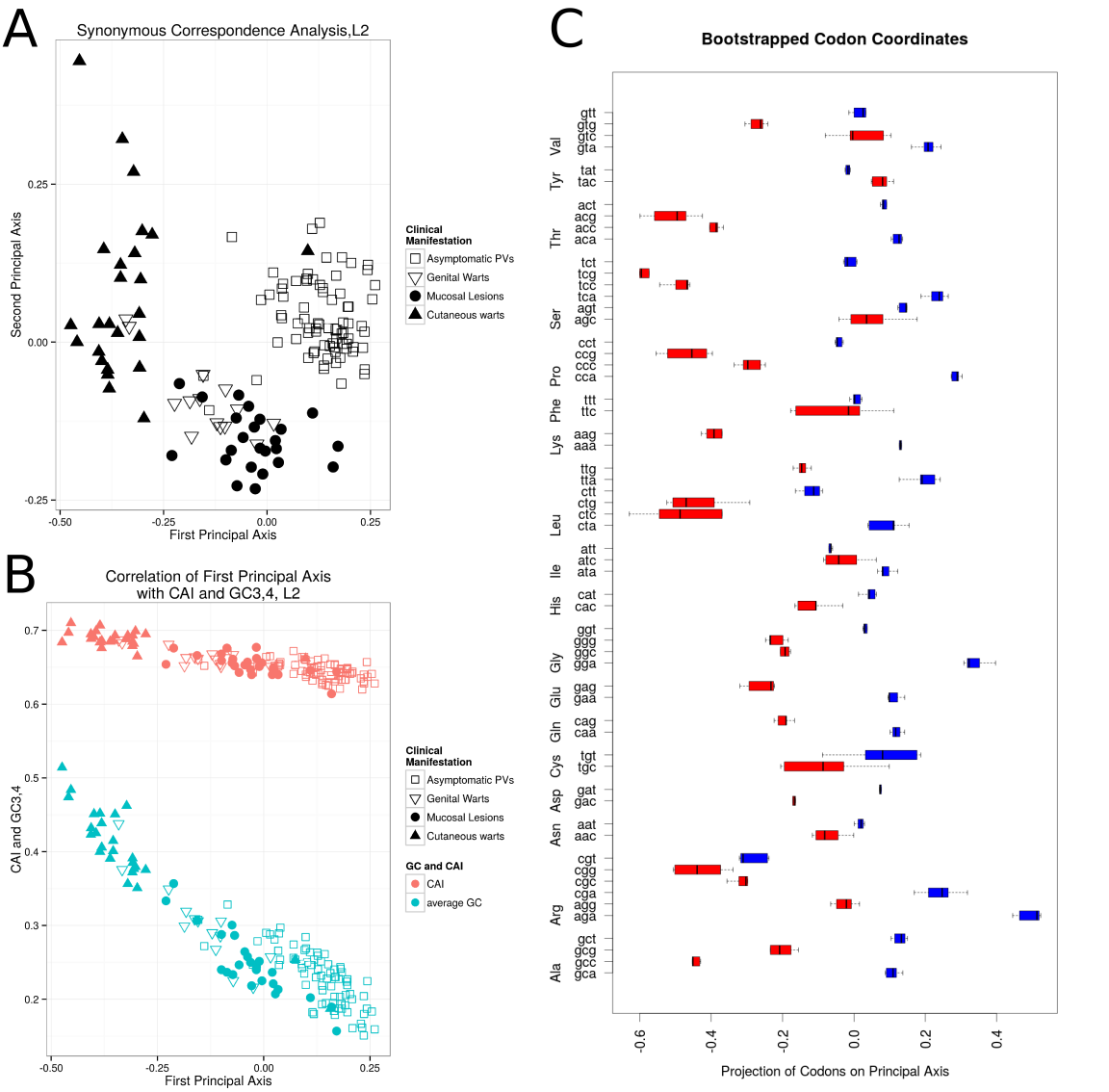

Figure S12: Scatter plot of the evolutionary and the codon usage based intra-genera distances for HPV genes. In X-axis, evolutionary pair-wise distances obtained from RAxML for each of the genes analysed. In Y-axis, Euclidean codon usage based distances derived from the MDS analysis.. Pair-wise distances are colored in blue (intra-Alpha), green (intra-Beta) and red (intra-gamma). The correlation coefficient (R^2) and the P-value (P) obtained from Pearson's analysis are reported for each bivariate analysis

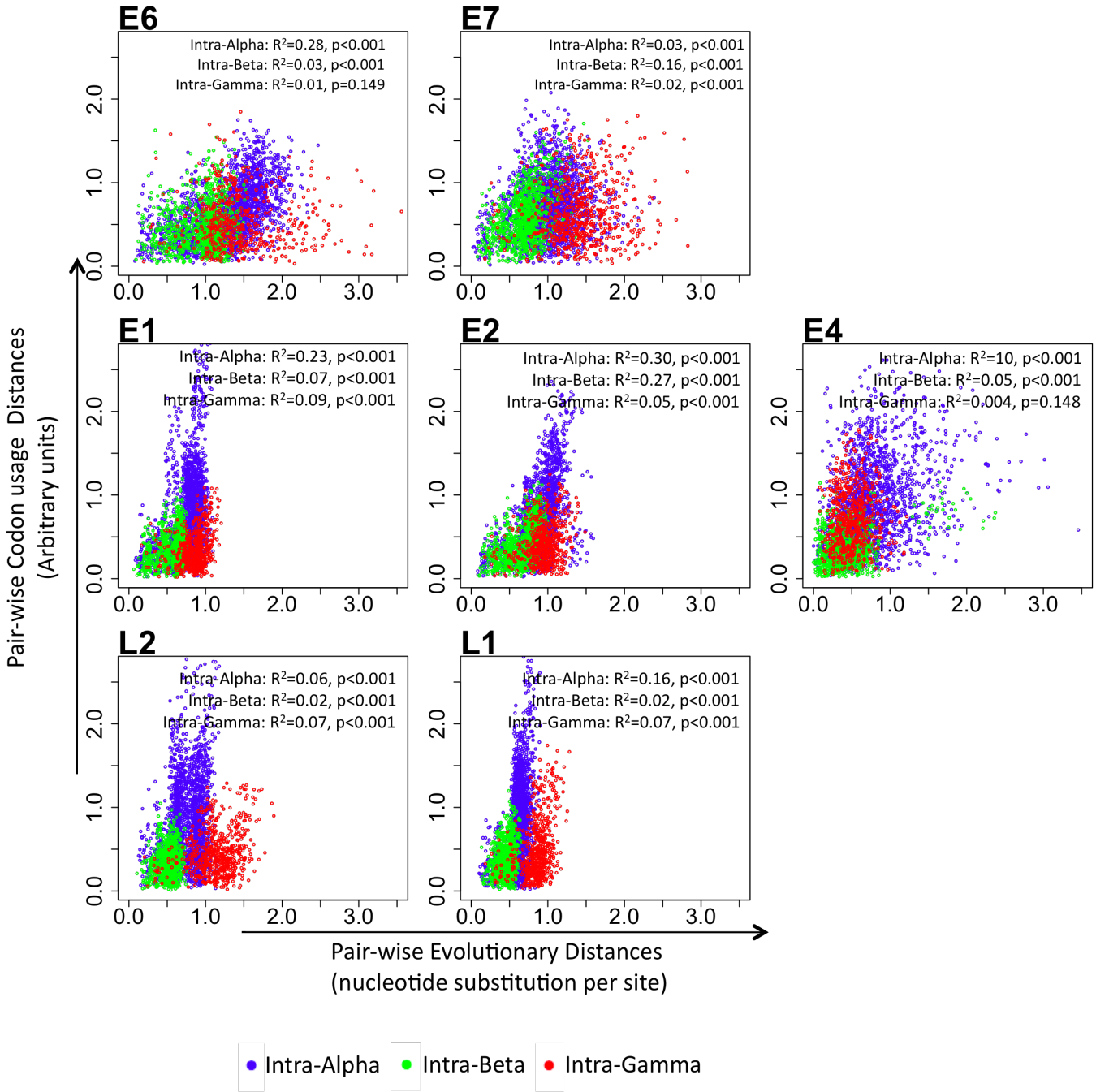

Table S1: Complete list of HPV types used for the codon usage analysis.

Virus	Species Name	Accession number	Reference	Clinical presentation
HPV1	Mupapillomavirus 1	V01116	Danos et al., 1982	Cutaneous Warts
HPV2	Alphapapillomavirus 4	X55964	Hirsch-Behnam et al., 1990	Cutaneous warts
HPV3	Alphapapillomavirus 2	X74462	Delius and Hoffman 1994	Cutaneous warts
HPV4	Gammapapillomavirus 1	X70827	Egawa et al., 1993	Muco-Cutaneous Asymptomatic
HPV5	Betapapillomavirus 1	M17463	Zachow et al., 1987	Muco-Cutaneous Asymptomatic
HPV6	Alphapapillomavirus 10	X00203	Schwarz et al., 1983	Genital warts
HPV7	Alphapapillomavirus 8	X74463	Delius and Hoffman 1995	Genital warts
HPV8	Betapapillomavirus 1	M12737	Fuchs et al., 1986	Muco-Cutaneous Asymptomatic
HPV9	Betapapillomavirus 2	X74464	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV10	Alphapapillomavirus 2	X74465	Delius and Hoffman 1994	Cutaneous warts
HPV11	Alphapapillomavirus 10	M14119	Dartmann et al., 1986	Genital warts
HPV12	Betapapillomavirus 1	X74466	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV13	Alphapapillomavirus 10	X62843	Van Ranst et al., 1992	Genital warts
HPV14	Betapapillomavirus 1	X74467	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV15	Betapapillomavirus 2	X74468	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV16	Alphapapillomavirus 9	K02718	Seedorf et al., 1985	Mucosal lesions
HPV17	Betapapillomavirus 2	X74469	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV18	Alphapapillomavirus 7	X05015	Cole and Danos 1987	Mucosal lesions
HPV19	Betapapillomavirus 1	X74470	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV20	Betapapillomavirus 1	U31778	Kremsdorf et al., 1984	Muco-Cutaneous Asymptomatic
HPV21	Betapapillomavirus 1	U31779	Kremsdorf et al., 1984	Muco-Cutaneous Asymptomatic
HPV22	Betapapillomavirus 2	U31780	Kremsdorf et al., 1984	Muco-Cutaneous Asymptomatic
HPV23	Betapapillomavirus 2	U31781	Kremsdorf et al., 1984	Muco-Cutaneous Asymptomatic
HPV24	Betapapillomavirus 1	U31782	Kremsdorf et al., 1984	Muco-Cutaneous Asymptomatic
HPV25	Betapapillomavirus 1	X74471	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV26	Alphapapillomavirus 5	X74472	Delius and Hoffman 1994	Mucosal lesions
HPV27	Alphapapillomavirus 4	X74473	Delius and Hoffman 1994	Cutaneous warts
HPV28	Alphapapillomavirus 2	U31783	Delius and Hoffman 1994	Cutaneous warts
HPV29	Alphapapillomavirus 2	U31784	Delius and Hoffman 1994	Cutaneous warts
HPV30	Alphapapillomavirus 6	X74474	Delius and Hoffman 1994	Mucosal lesions
HPV31	Alphapapillomavirus 9	J04353	Goldsborough et al., 1989	Mucosal lesions
HPV32	Alphapapillomavirus 1	X74475	Delius and Hoffman 1994	Genital warts
HPV33	Alphapapillomavirus 9	M12732	Cole and Streek 1986	Mucosal lesions
HPV34	Alphapapillomavirus 11	X74476	Delius and Hoffman 1994	Mucosal lesions
HPV35	Alphapapillomavirus 9	X74477	Marich et al., 1992	Mucosal lesions
HPV36	Betapapillomavirus 1	U31785	Kawashima et al., 1986	Muco-Cutaneous Asymptomatic
HPV37	Betapapillomavirus 2	U31786	Scheulen et al., 1986	Muco-Cutaneous Asymptomatic
HPV38	Betapapillomavirus 2	U31787	Scheulen et al., 1986	Muco-Cutaneous Asymptomatic
HPV39	Alphapapillomavirus 7	M62849	Volpers and Streek 1991	Mucosal lesions
HPV40	Alphapapillomavirus 8	X74478	Delius and Hoffman 1994	Genital warts
HPV41	Nupapillomavirus 1	X56147	Hirt et al., 1991	Cutaneous warts
HPV42	Alphapapillomavirus 1	M73236	Phillip et al., 1992	Genital warts
HPV43	Alphapapillomavirus 8	AJ620205	Lorincz et al., 1989	Genital warts
HPV44	Alphapapillomavirus 10	U31788	Delius and Hoffman 1994	Genital warts

HPV45	Alphapapillomavirus 7	X74479	Delius and Hoffman 1994	Mucosal lesions
HPV47	Betapapillomavirus 1	M32305	Kiyono et al., 1990	Muco-Cutaneous Asymptomatic
HPV48	Gammapapillomavirus 2	U31789	Muller et al., 1989	Muco-Cutaneous Asymptomatic
HPV49	Betapapillomavirus 3	X74480	Delius and Hoffman 1994	Muco-Cutaneous Asymptomatic
HPV50	Gammapapillomavirus 3	U31790	Favre et al., 1989	Muco-Cutaneous Asymptomatic
HPV51	Alphapapillomavirus 5	M62877	Lungu et al., 1991	Mucosal lesions
HPV52	Alphapapillomavirus 9	X74481	Delius and Hoffman 1994	Mucosal lesions
HPV53	Alphapapillomavirus 6	X74482	Delius and Hoffman 1994	Mucosal lesions
HPV54	Alphapapillomavirus 13	AF436129	Delius and Hoffman 1994	Genital warts
HPV56	Alphapapillomavirus 6	X74483	Delius and Hoffman 1994	Mucosal lesions
HPV57	Alphapapillomavirus 4	X55965	Hirsch-Behnam et al., 1990	Cutaneous warts
HPV58	Alphapapillomavirus 9	D90400	Kirii et al., 1991	Mucosal lesions
HPV59	Alphapapillomavirus 7	X77858	Rho et al., 1994	Mucosal lesions
HPV60	Gammapapillomavirus 4	U31792	Matsukura et al., 1992	Muco-Cutaneous Asymptomatic
HPV61	Alphapapillomavirus 3	U31793	Delius and Hoffman 1994	Cutaneous warts
HPV62	Alphapapillomavirus 3	AY395706	Fu et al., 2004	Cutaneous warts
HPV63	Mupapillomavirus 2	X70828	Egawa et al., 1993	Cutaneous Warts
HPV65	Gammapapillomavirus 1	X70829	Egawa et al., 1993	Muco-Cutaneous Asymptomatic
HPV66	Alphapapillomavirus 6	U31794	Delius et al., unpublished	Mucosal lesions
HPV67	Alphapapillomavirus 9	D21208	Kirii and Matsukuru 1998	Mucosal lesions
HPV68	Alphapapillomavirus 7	DQ080079	Wu et al., 2009	Mucosal lesions
HPV69	Alphapapillomavirus 5	AB027020	Kino et al., 2000	Mucosal lesions
HPV70	Alphapapillomavirus 7	U21941	Forslund and Hansson 1996	Mucosal lesions
HPV71	Alphapapillomavirus 14	AB040456	Matsukura and Sugase 2001	Cutaneous warts
HPV72	Alphapapillomavirus 3	X94164	Volter et al., 1996	Cutaneous warts
HPV73	Alphapapillomavirus 11	X94165	Volter et al., 1996	Mucosal lesions
HPV74	Alphapapillomavirus 10	AF436130	Terai and Burk unpublished	Genital warts
HPV75	Betapapillomavirus 3	Y15173	Delius et al., 1998	Muco-Cutaneous Asymptomatic
HPV76	Betapapillomavirus 3	Y15174	Delius et al., 1998	Muco-Cutaneous Asymptomatic
HPV77	Alphapapillomavirus 2	Y15175	Delius et al., 1998	Cutaneous warts
HPV78	Alphapapillomavirus 2	KC138720	Siling et al., Unpublished	Cutaneous warts
HPV80	Betapapillomavirus 2	Y15176	Delius et al., 1998	Muco-Cutaneous Asymptomatic
HPV81	Alphapapillomavirus 3	AJ620209	Delius et al., unpublished	Cutaneous warts
HPV82	Alphapapillomavirus 5	AB027021	Kino et al., 2000	Mucosal lesions
HPV83	Alphapapillomavirus 3	AF151983	Brown et al., 1999	Cutaneous warts
HPV84	Alphapapillomavirus 3	AF293960	Terai and Burk 2001	Cutaneous warts
HPV85	Alphapapillomavirus 7	AF131950	Chow and Leong 1999	Mucosal lesions
HPV86	Alphapapillomavirus 3	AF349909	Terai and Burk 2001	Cutaneous warts
HPV87	Alphapapillomavirus 3	AJ400628	Menzo et al., 2001	Cutaneous warts
HPV88	Gammapapillomavirus 5	EF467176	Kullander et al., 2008	Muco-Cutaneous Asymptomatic
HPV89	Alphapapillomavirus 3	AF436128	Terai and Burk 2002	Cutaneous warts
HPV90	Alphapapillomavirus 14	AY057438	Terai and Burk 2002	Cutaneous warts
HPV91	Alphapapillomavirus 8	AF419318	Terai and Burk 2002	Genital warts
HPV92	Betapapillomavirus 4	AF531420	Forslund et al., 2003	Muco-Cutaneous Asymptomatic
HPV93	Betapapillomavirus 1	AY382778	Vasiljevic et al., 2007	Muco-Cutaneous Asymptomatic
HPV94	Alphapapillomavirus 2	AJ620211	de Villiers and Gunst 2009	Cutaneous warts
HPV95	Gammapapillomavirus 1	AJ620210	Egawa Cop and de Villiers unpublished	Muco-Cutaneous Asymptomatic

HPV96	Betapapillomavirus 5	AY382779	Vasiljevic et al., 2007	Muco-Cutaneous Asymptomatic
HPV97	Alphapapillomavirus 7	DQ080080	Chen et al., 2007	Mucosal lesions
HPV98	Betapapillomavirus 1	FM955837	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV99	Betapapillomavirus 1	FM955838	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV100	Betapapillomavirus 2	FM955839	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV101	Gammapapillomavirus 6	DQ080081	Chen et al., 2007	Muco-Cutaneous Asymptomatic
HPV102	Alphapapillomavirus 3	DQ080083	Chen et al., 2007	Cutaneous warts
HPV103	Gammapapillomavirus 6	DQ080078	Chen et al., 2007	Muco-Cutaneous Asymptomatic
HPV104	Betapapillomavirus 2	FM955840	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV105	Betapapillomavirus 1	FM955841	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV106	Alphapapillomavirus 14	DQ080082	Chen et al., 2007	Cutaneous warts
HPV107	Betapapillomavirus 2	EF422221	Vasiljevic et al., 2008	Muco-Cutaneous Asymptomatic
HPV108	Gammapapillomavirus 6	FM212639	Nobre et al., 2008	Muco-Cutaneous Asymptomatic
HPV109	Gammapapillomavirus 7	EU541441	Ekstrom et al., 2010	Muco-Cutaneous Asymptomatic
HPV110	Betapapillomavirus 2	EU410348	Vasiljevic et al., 2008	Muco-Cutaneous Asymptomatic
HPV111	Betapapillomavirus 2	EU410349	Vasiljevic et al., 2008	Muco-Cutaneous Asymptomatic
HPV112	Gammapapillomavirus 8	EU541442	Ekstrom et al., 2010	Muco-Cutaneous Asymptomatic
HPV113	Betapapillomavirus 2	FM955842	de Villiers and Gunst 2009	Muco-Cutaneous Asymptomatic
HPV114	Alphapapillomavirus 3	GQ244463	Ekstrom et al., 2010	Cutaneous warts
HPV115	Betapapillomavirus 3	FJ947080	Chouhy et al., 2010	Muco-Cutaneous Asymptomatic
HPV116	Gammapapillomavirus 9	FJ804072	Li et al., 2009	Muco-Cutaneous Asymptomatic
HPV117	Alphapapillomavirus 2	GQ246950	Kohler et al., 2010	Cutaneous warts
HPV118	Betapapillomavirus 1	GQ246951	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV119	Gammapapillomavirus 8	GQ845441	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV120	Betapapillomavirus 2	GQ845442	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV121	Gammapapillomavirus 10	GQ845443	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV122	Betapapillomavirus 2	GQ845444	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV123	Gammapapillomavirus 7	GQ845445	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV124	Betapapillomavirus 1	GQ845446	Bernard et al., 2010	Muco-Cutaneous Asymptomatic
HPV125	Alphapapillomavirus 2	FN547152	Kovanda et al., 2011	Cutaneous warts
HPV126	Gammapapillomavirus 11	AB646346	Egawa et al., 2011	Muco-Cutaneous Asymptomatic
HPV127	Gammapapillomavirus 12	HM011570	Schowalter et al., 2010	Muco-Cutaneous Asymptomatic
HPV128	Gammapapillomavirus 13	GU225708	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV129	Gammapapillomavirus 9	GU233853	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV130	Gammapapillomavirus 10	GU117630	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV131	Gammapapillomavirus 14	GU117631	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV132	Gammapapillomavirus 12	GU117632	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV133	Gammapapillomavirus 10	GU117633	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV134	Gammapapillomavirus 7	GU117634	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV135	Gammapapillomavirus 15	HM999987	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV136	Gammapapillomavirus 11	HM999988	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV137	Gammapapillomavirus 16	HM999989	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV140	Gammapapillomavirus 11	HM999992	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV141	Gammapapillomavirus 11	HM999993	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV142	Gammapapillomavirus 10	HM999994	Chen et al., Unpublished	Muco-Cutaneous Asymptomatic
HPV143	Betapapillomavirus 1	HM999995	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV144	Gammapapillomavirus 17	HM999996	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic
HPV145	Betapapillomavirus 2	HM999997	Bottalico et al., 2011	Muco-Cutaneous Asymptomatic

HPV148	Gammapapillomavirus 12	GU129016	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV149	Gammapapillomavirus 7	GU117629	Kohler et al., 2011	Muco-Cutaneous Asymptomatic
HPV150	Betapapillomavirus 5	FN677755	Kocjan et al., 2005	Muco-Cutaneous Asymptomatic
HPV151	Betapapillomavirus 2	FN677756	Kocjan et al., 2005	Muco-Cutaneous Asymptomatic
HPV152	Betapapillomavirus 1	JF304768		Muco-Cutaneous Asymptomatic
HPV153	Gammapapillomavirus 13	JN171845	Sturegard et al., Unpublished	Muco-Cutaneous Asymptomatic
HPV155	Gammapapillomavirus 7	JF906559	Ekstrom et al., 2011	Muco-Cutaneous Asymptomatic
HPV156	Gammapapillomavirus 18	JX429973	Chouhy et al., 2013	Muco-Cutaneous Asymptomatic
HPV159	Betapapillomavirus 2	HE963025	Kocjan et al., 2013	Muco-Cutaneous Asymptomatic
HPV161	Gammapapillomavirus 19	JX413109	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV162	Gammapapillomavirus 19	JX413108	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV163	Gammapapillomavirus 20	JX413107	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV164	Gammapapillomavirus 8	JX413106	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV165	Gammapapillomavirus 12	JX444072	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV166	Gammapapillomavirus 19	JX413104	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV169	Gammapapillomavirus 11	JX413105	Li et al., 2012	Muco-Cutaneous Asymptomatic
HPV170	Gammapapillomavirus 7	JX413110	Li et al., 2012	Muco-Cutaneous Asymptomatic

Table S2: Mean values of CAI for HPVs genes stratified by clinical presentation. CAI values for all human PV genes were significantly lower than those of the average human epithelial genes, exceñt for the L1 genes of human PVs causing cutaneous warts (labelled in grey background). One way ANOVA followed by Tukey's test was performed for each gene separately (i.e., this comparison should be read vertically). For each gene, means labeled with the same letter are not statistically different. One way ANOVA followed by Tukey's test was also performed for each clinical manifestation separately (i.e., this comparison should be read horizontally). For each clinical manifestation, means labeled with the same number are not statistically different.

	Mucocutaneous Asymptomatic		**Cutaneous Warts**		**Genital Warts**		**Mucosal lesions**	
E6	0.73±0.02	c 2	0.75±0.02	a 2	0.74±0.01	b 1	0.72±0.02	c 1,2
E7	0.73±0.03	a 2	0.73±0.03	a 3	0.71±0.02	b 2	0.71±0.03	b 2,3
E1	0.71±0.01	b 3	0.72±0.02	a 3	0.71±0.01	b 2	0.69±0.01	c 3
E2	0.73±0.01	a 2	0.73±0.01	a,2 a 2	0.72±0.02	b 1,2	0.70±0.01	c 3
E4	0.74±0.01	a 1,2	0.75±0.04	a 1,2	0.68±0.02	b 3	0.68±0.03	b 3
L2	0.70±0.01	c 3	0.74±0.01	a 2	0.71±0.01	b 2	0.71±0.01	b 2
L1	0.71±0.01	c 3	0.77±0.01	a 1	0.73±0.01	b 1	0.72±0.01	c 1

Table S3*:* Distribution of HPVs by their genus in each cluster obtained by two-step cluster analysis.

	E6*, %			**E7, %**	
	Cluster1	Cluster2	Cluster3	Cluster1	Cluster2
AlphaPVs (n=63)	60.3	-	39.7	100	
BetaPVs (n=45)	-	100	-	-	100
GammaPVs (n=45)	4.8	95.2	-	11.1	88.9
MuPVs (n=2)	100	-	-	100	-
NuPVs (n=1)	-	100	-		100

	E1, %			**E2, %**			**E4, %**	
	Cluster1	Cluster2	Cluster3	Cluster1	Cluster2	Cluster3	Cluster1	Cluster2
AlphaPVs (n=63)	-	60.3	39.7	-	60.3	39.7	100	-
BetaPVs (n=45)	100	-	-	100	-	-	-	100
GammaPVs (n=45)	88.9	6.7	4.4	88.9	6.7	4.4	11.1	88.9
MuPVs (n=2)	-	-	100	-	-	100	100	-
NuPVs (n=1)	100	-	-	100	-	-	-	100

	L2, %			**L1, %**		
	Cluster1	Cluster2	Cluster3	Cluster1	Cluster2	Cluster3
AlphaPVs (n=63)	-	58.7	41.3	-	57.1	42.9
BetaPVs (n=45)	100	-	-	100	-	-
GammaPVs (n=45)	88.9	6.7	4.4	88.9	6.7	4.4
MuPVs (n=2)	-	-	100	-	-	100
NuPVs (n=1)	100	-	-	100	-	-

*For GammaPVs n=42

Table S4: Compositional codon description of each gene analyzed in each genus. The first four columns give the percentage of each codon within each synonymous codon family; the last column gives the number of tRNA genes corresponding to each codon in the human genome.

	Codon	AlphaPVs	BetaPVs	GammaPVs	Human	tRNA genes
Leu	CTA	16	12	11	7	2
	CTC	2	5	3	20	0
	CTG	16	12	11	40	6
	CTT	10	14	14	13	13
	TTA	35	37	40	7	8
	TTG	21	20	20	13	6
Ser	AGC	15	13	12	24	7
	AGT	28	23	25	15	0
	TCA	16	21	20	15	5
	TCC	15	15	10	22	0
	TCG	4	5	5	6	4
	TCT	22	24	28	19	10
Arg	AGA	26	36	46	21	5
	AGG	19	20	15	21	4
	CGA	11	14	15	11	7
	CGC	14	11	9	19	0
	CGG	11	8	5	20	5
	CGT	19	11	10	8	9
Gly	GGA	25	31	35	25	5
	GGC	24	19	15	34	11
	GGG	23	20	17	25	8
	GGT	29	30	33	16	0
Val	GTA	34.2	31.6	33.4	12	5
	GTC	6.1	10.3	8.3	24	0
	GTG	36.5	25.8	21.2	47	19
	GTT	23.2	32.4	37.1	18	20
Pro	CCA	31.9	39	37.4	27	10
	CCC	18.9	15.9	11.6	33	0
	CCG	8.9	7.4	7.1	11	4
	CCT	40.3	37.7	43.9	28	11
Ala	GCA	46.5	41.5	40.6	23	5
	GCC	20.8	15	11.5	40	0
	GCG	8.7	7.1	6.7	11	5
	GCT	24	36.4	41.2	26	25
Thr	ACA	46	41.7	41.8	28	10
	ACC	20.4	19.8	14.2	36	0
	ACG	9.4	6.7	6.3	11	7
	ACT	24.2	31.7	37.6	24	8
Cys	TGC	36.4	33.5	26.6	55	30
	TGT	63.6	66.5	73.4	45	0
Lys	AAA	65.6	68.3	73.4	43	16
	AAG	34.4	31.7	26.6	57	22