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Supplementary Materials for

Pan-tumor genomic biomarkers for PD-1 checkpoint blockade–based immunotherapy

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This PDF file includes:

Correction: Since the original publication, table S2 has been expanded to include the raw NanoString counts for the housekeeping and predictor genes that make up the GEP score, as well as the weighting algorithm used to determine the score (table S2B).

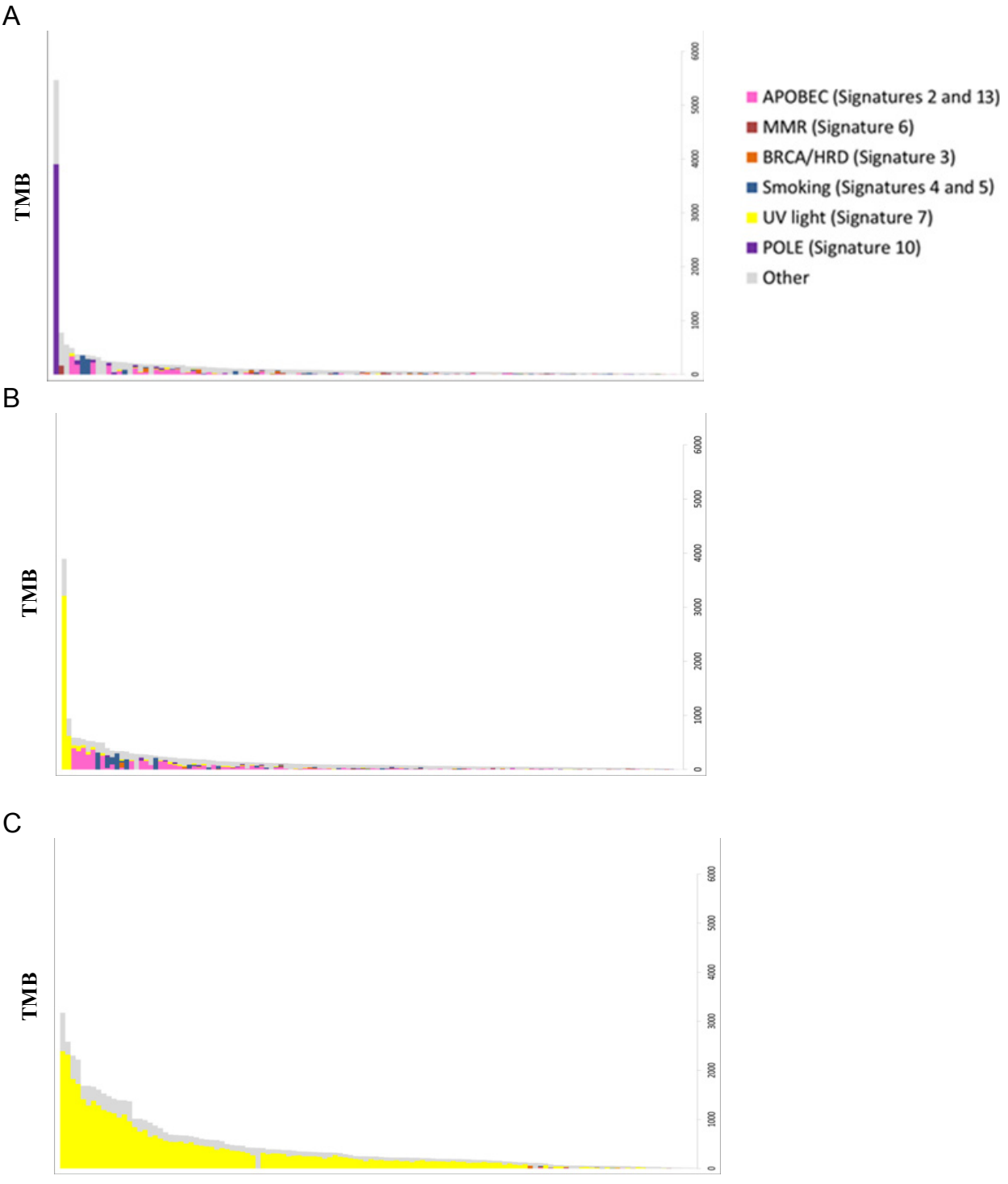
A
TMB
APOBEC (Signatures 2 and 13)
MMR (Signature 6)
BRCA/HRD (Signature 3)
Smoking (Signatures 4 and 5)
UV light (Signature 7)
POLE (Signature 10)
Other
B
TMB
C
TMB

Fig. S1

Distribution and spectrum of TMB across indications. The major signatures(*17*) displayed above were identified in the mutational landscape of the patients in the clinical cohorts in this study and are illustrated as proportions of the TMB. (**A**) Pan-cancer cohort, (**B**) Head and neck, (**C**) Melanoma.

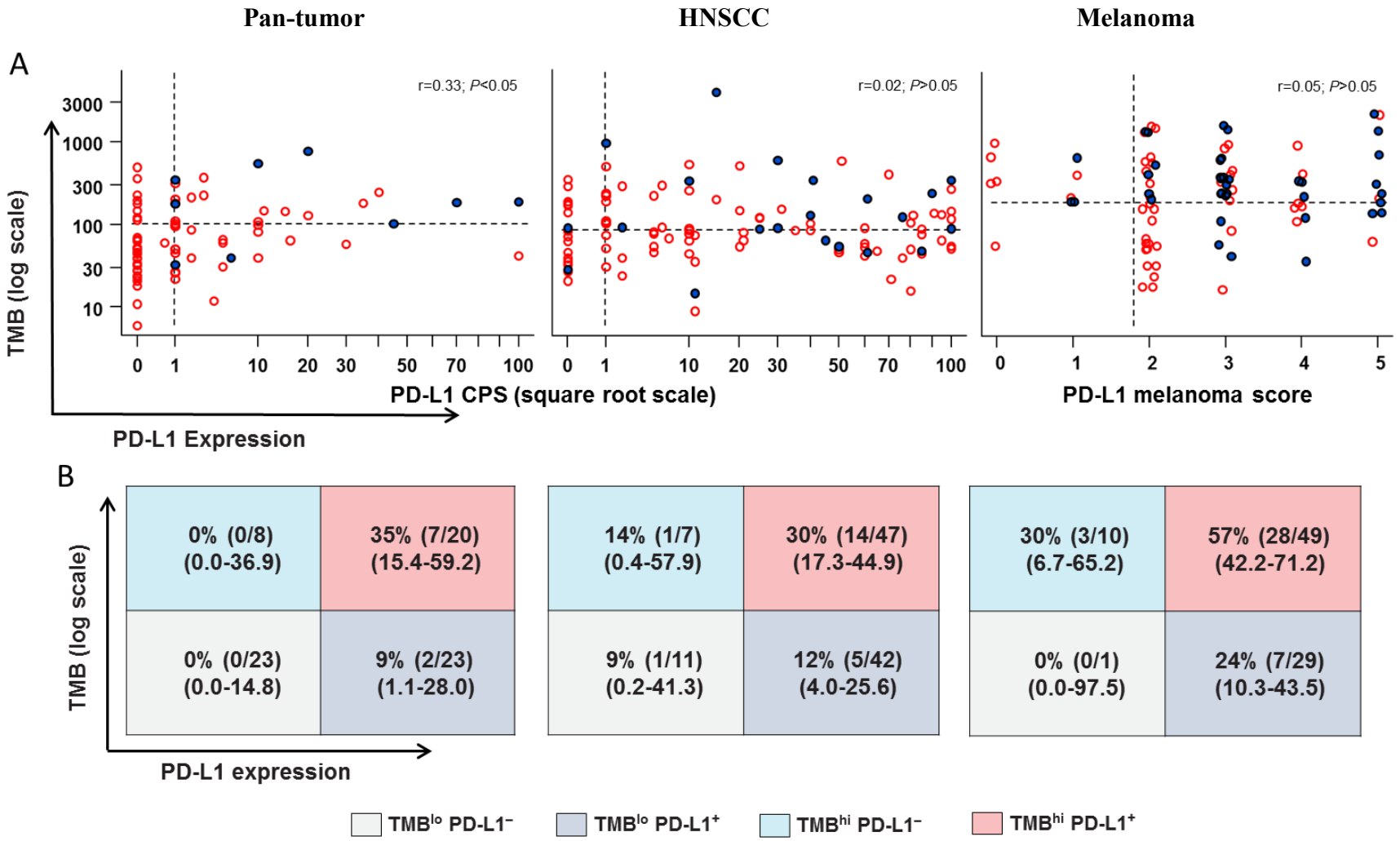
A
Pan-tumor
HNSCC
Melanoma
r=0.33; P<0.05
r=0.02; P>0.05
r=0.05; P>0.05
TMB (log scale)
3000
1000
300
100
30
10
0 1 10 20 30 50 70 100
0 1 10 20 30 50 70 100
0 1 2 3 4 5
PD-L1 CPS (square root scale)
PD-L1 melanoma score
PD-L1 Expression
B
0% (0/8) (0.0-36.9)
35% (7/20) (15.4-59.2)
14% (1/7) (0.4-57.9)
30% (14/47) (17.3-44.9)
30% (3/10) (6.7-65.2)
57% (28/49) (42.2-71.2)
0% (0/23) (0.0-14.8)
9% (2/23) (1.1-28.0)
9% (1/11) (0.2-41.3)
12% (5/42) (4.0-25.6)
0% (0/1) (0.0-97.5)
24% (7/29) (10.3-43.5)
TMB (log scale)
PD-L1 expression
TMB^lo PD-L1^−
TMB^lo PD-L1^+
TMB^hi PD-L1^−
TMB^hi PD-L1^+

Fig. S2

Relationships between PD-L1 and TMB with BOR in pan-tumor validation, HNSCC and melanoma cohorts. (**A**) Relationships between TMB and PD-L1 with BOR; responder is PR or CR (filled circles); non-responder is not PR or CR (open circles). Dashed horizontal lines represent the Youden-Index associated cutoffs for TMB in each cohort as derived from AUROCs in Figure 1C. Dashed vertical lines represent PD-L1 CPS cutoff of 1. (**B**) Response (PR or CR) rates (%, n/N for responder/cut-off defined group, 95% CI) per TMB and PD-L1 cut-off status as designated in **(A)**. TMB^{hi} and $PD\text{-}L1^{-}$ response groups are defined by ≥ and < Youden-Index associated cutpoints (102.5, 86, 191.5 for pan-cancer, HNSCC, melanoma cohorts, respectively); $PD\text{-}L1^{+}$ and $PD\text{-}L1^{-}$ groups are defined cut-offs ≥ 1 and 0 respectively.

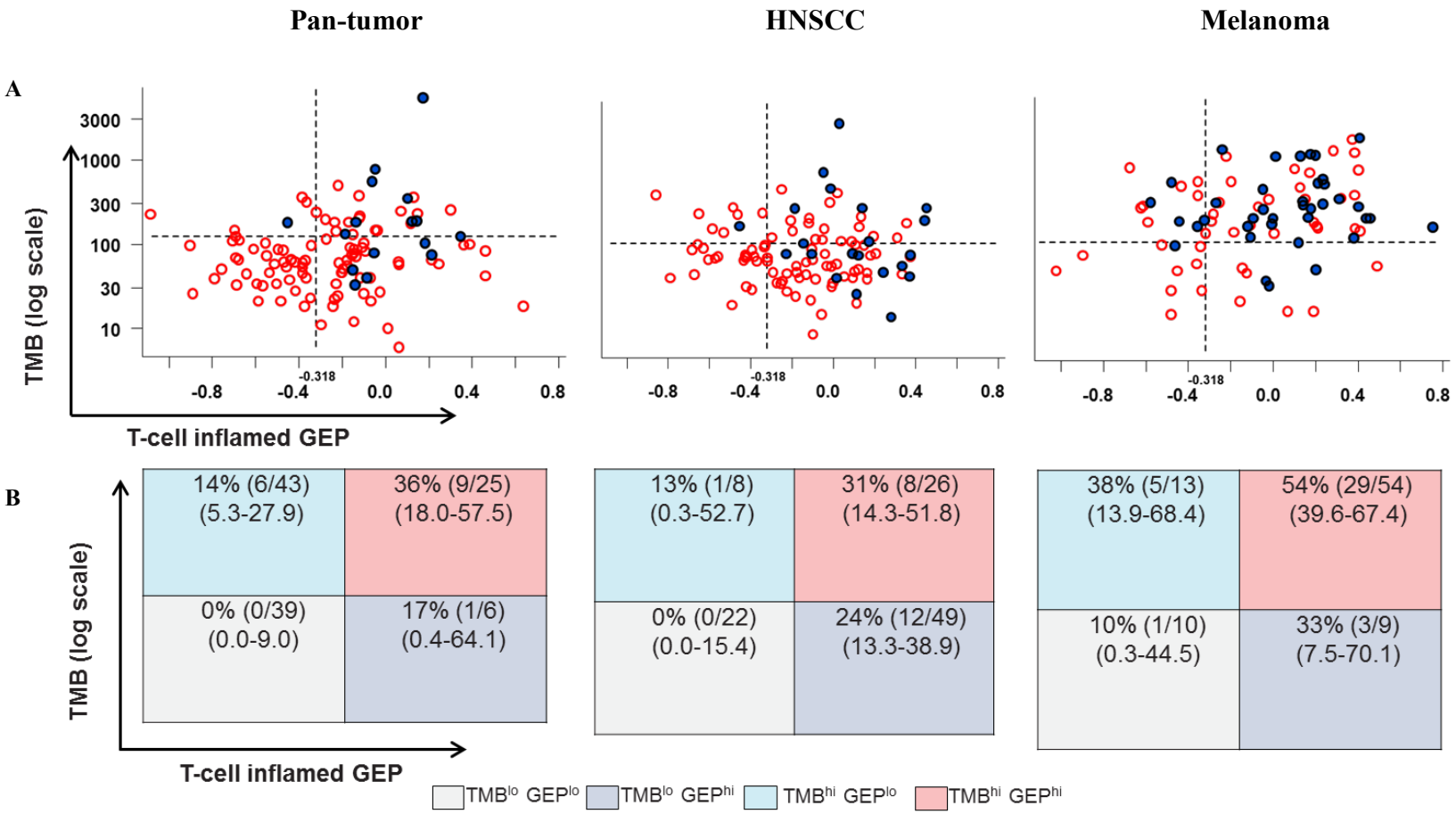

Fig. S3

Relationship between TMB and T cell inflamed GEP with BOR in pan-tumor, HNSCC and Melanoma cohorts at TMB pan-tumor cutoff of 123. (**A**) Relationships between TMB and T cell-inflamed GEP with BOR; responder is PR or CR (filled circles); non-responder is not PR or CR (open circles). Dashed horizontal lines represent the clinically applicable TMB threshold (TMB ≥123

mutations per exome) derived using GEP and TMB data from each cohort (*20*). Dashed vertical lines represent a discovery cutoff for the T cell-inflamed GEP selected via analysis of pan-cancer data (*15*). (**B**) Response (PR or CR) rates (%, n/N for responder/cut-off defined group, 95% CI) per TMB and T cell-inflamed GEP cut-off status as designated in (A). For all cohorts, TMB^{hi} and TMB^{lo} response groups are defined by the clinically applicable TMB threshold ≥ and < 123, and GEP^{hi} and GEP^{lo} groups are defined cut-offs ≥ and < -0.318 respectively. A pan-tumor threshold (20) may be further optimized with additional data beyond those in our study. For example, a pan-tumor TMB threshold of ≥175 mutations per exome was recently reported for response to pembrolizumab (*21*).

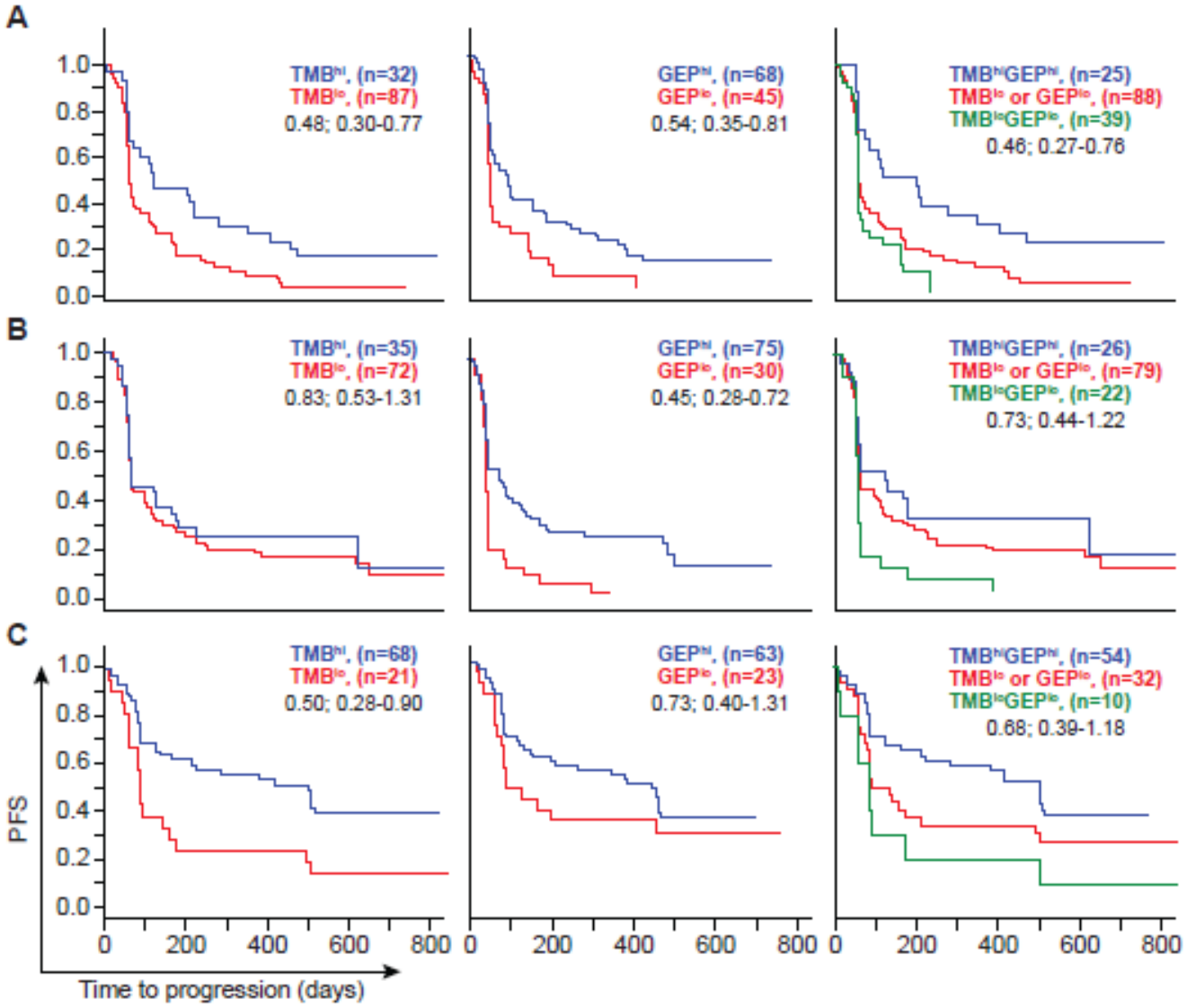
A
TMB^hi, (n=32)
TMB^lo, (n=87)
0.48; 0.30-0.77
GEP^hi, (n=68)
GEP^lo, (n=45)
0.54; 0.35-0.81
TMB^hiGEP^hi, (n=25)
TMB^lo or GEP^lo, (n=88)
TMB^loGEP^lo, (n=39)
0.46; 0.27-0.76
B
TMB^hi, (n=35)
TMB^lo, (n=72)
0.83; 0.53-1.31
GEP^hi, (n=75)
GEP^lo, (n=30)
0.45; 0.28-0.72
TMB^hiGEP^hi, (n=26)
TMB^lo or GEP^lo, (n=79)
TMB^loGEP^lo, (n=22)
0.73; 0.44-1.22
C
TMB^hi, (n=68)
TMB^lo, (n=21)
0.50; 0.28-0.90
GEP^hi, (n=63)
GEP^lo, (n=23)
0.73; 0.40-1.31
TMB^hiGEP^hi, (n=54)
TMB^lo or GEP^lo, (n=32)
TMB^loGEP^lo, (n=10)
0.68; 0.39-1.18
PFS
0.0
0.2
0.4
0.6
0.8
1.0
0
200
400
600
800
Time to progression (days)

Fig. S4

Relationship between TMB and T-cell-inflamed GEP and PFS in pan-tumor, HNSCC and melanoma cohorts at TMB pan-tumor cutoff of 123. Relationships between TMB and T cell-inflamed GEP with PFS in all patients-as-treated per TMB and GEP cut-offs as described in Fig. S2. Median PFS in days (hazard ratio; 95% CI) for pan-tumor (**A**), HNSCC (**B**) and melanoma (**C**) cohorts respectively for TMB^{hi} vs TMB^{lo} are designated.

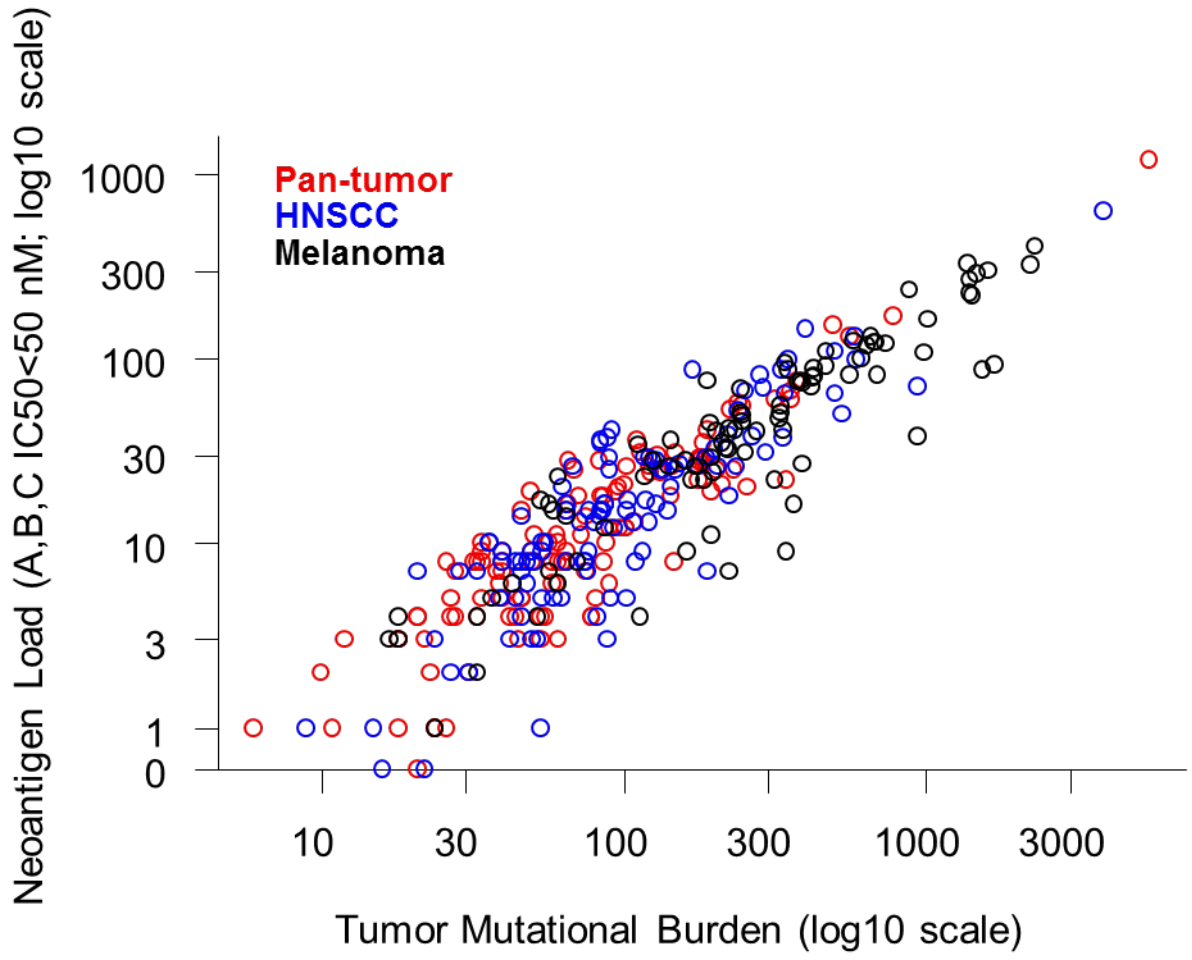

Fig. S5

Relationship between tumor mutational burden (TMB) and neoantigen load. The x and y axes represent TMB and neoantigen load [$\log_{10}$] respectively and dots represent tumors grouped by the indications used in this study.

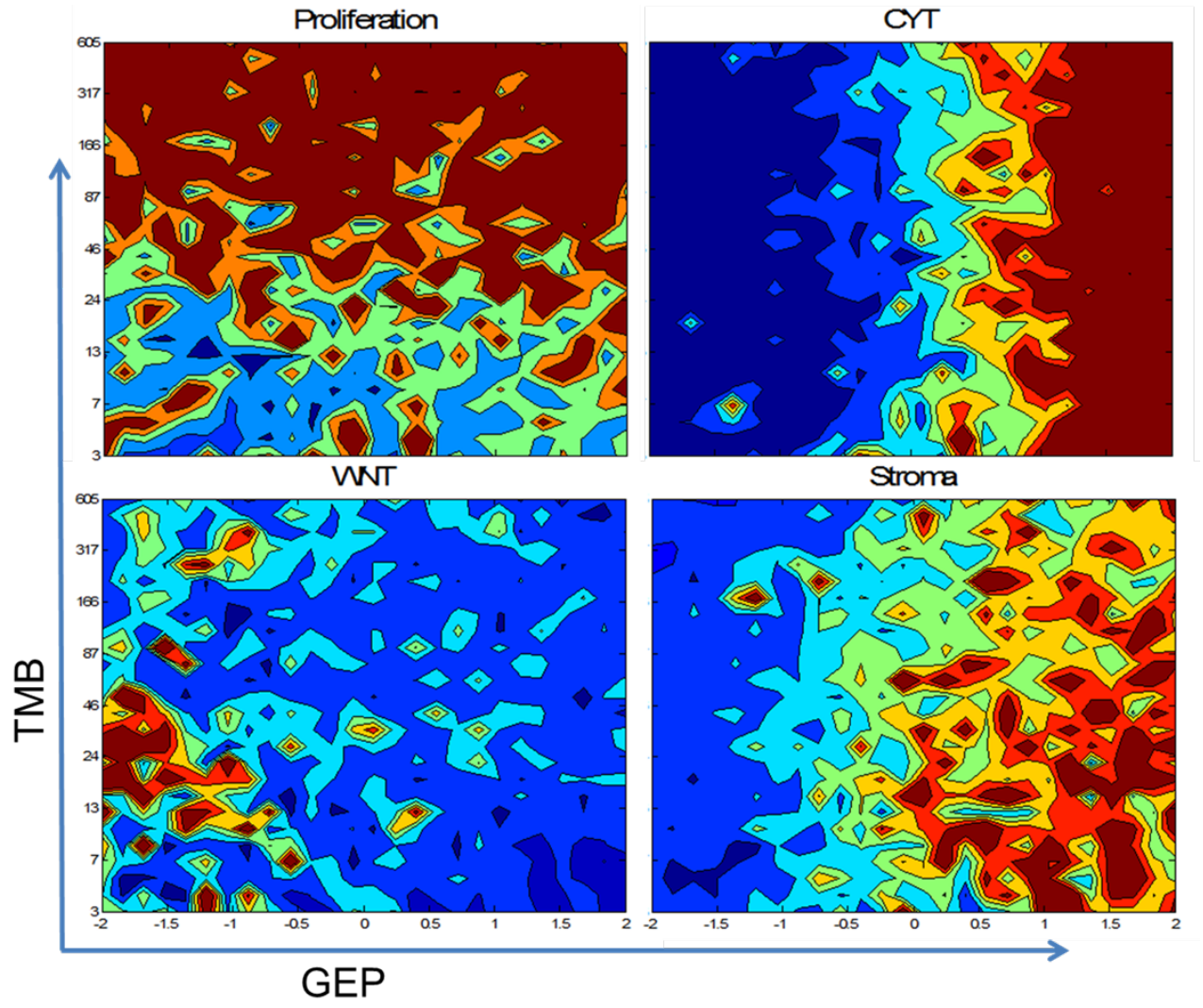

Fig. S6

Association of T-cell-inflamed GEP and TMB with gene signatures in TCGA database. Contour plots illustrating association of TMB and GEP with selected patterns of biology represented by previously reported gene signatures (*13, 31-33*) in the TCGA database. Blue/red represent under/over-expression, respectively.

Table S1.
Baseline characteristics of study cohorts

Characteristic n (%)	**Pan-tumor KN012/028 N=119**	**HNSCC KN012 B1/B2 N=107**	**Melanoma KN001/006 N=89**
Age years median (range)	62 (23, 86)	61 (25, 83)	60 (30, 88)
Male	52 (43.7)	88 (82.2)	58 (65.2)
White	77 (64.7)	79 (73.8)	86 (96.6)
Asian	26 (21.8)	17 (15.9)	2 (2.2)
Other	16 (13.4)	11 (10.3)	1 (1.1)
ECOG performance status			
0	41 (34.5)	36 (33.6)	61 (68.5)
1	75 (63.0)	71 (66.4)	28 (31.5)
Unknown	3 (2.5)	0 (0.0)	0 (0.0)
HPV/EBV status			
Positive	17 (14.3)	34 (31.8)	NA
Negative	102 (85.7)	73 (68.2)	NA
BRAF V600			
Wt	NA	NA	69 (77.5)
Mutant	NA	NA	20 (22.5)

ECOG = Eastern Cooperative Oncology Group; EBV = Epstein Barr Virus; HNSCC = head and neck squamous cell carcinoma; HPV = papillomavirus; NA = not applicable

Table S2.

A. Baseline characteristics of all patients

Patient ID	Age	Sex	Tumor Type	TMB	GEP*	Patient ID	Age	Sex	Tumor Type	TMB	GEP*
001	68	M	Urothelial	180	-0.451	159	56	F	HNSCC Exp	54	-0.291
002	73	M	Urothelial	51	-0.199	160	80	M	HNSCC Exp	204	-0.455
003	72	M	Urothelial	345	0.102	161	55	F	HNSCC Exp	84	0.374
004	67	M	Urothelial	372	-0.122	162	67	M	HNSCC Exp	91	-0.105
005	76	F	Urothelial	40	-0.116	163	61	M	HNSCC Exp	65	-0.179
006	36	F	TNBC	58	0.247	164	76	M	HNSCC Exp	63	-0.010
007	42	F	TNBC	23	-0.347	165	25	M	HNSCC Exp	24	-0.112
008	54	F	Gastric	776	-0.047	166	66	F	HNSCC Exp	55	0.103
009	62	M	Gastric	42	0.459	167	78	M	HNSCC Exp	84	-0.382
010	61	M	Urothelial	86	-0.499	168	67	M	HNSCC Exp	177	-0.198
011	70	F	Urothelial	103	0.181	169	65	M	HNSCC Exp	90	-0.042
012	44	M	Urothelial	66	-0.678	170	67	M	HNSCC Exp	42	-0.246
013	74	M	Urothelial	122	-0.691	171	48	M	HNSCC Exp	44	-0.085
014	76	M	Urothelial	492	-0.221	172	52	M	HNSCC Exp	502	NA
015	70	M	Urothelial	247	0.070	173	53	M	HNSCC Exp	50	-0.131
016	63	F	Urothelial	40	-0.071	174	51	M	HNSCC Exp	584	-0.249
017	78	M	Urothelial	231	0.145	175	49	M	HNSCC Exp	77	-0.101
018	40	F	TNBC	22	-0.234	176	63	M	HNSCC Exp	148	-0.297
019	77	F	Urothelial	65	0.214	177	47	M	HNSCC Exp	3893	0.029
020	49	F	TNBC	44	-0.644	178	54	M	HNSCC Exp	80	-0.573
021	29	F	TNBC	66	-0.437	179	60	M	HNSCC Exp	283	-0.464
022	36	F	TNBC	60	-0.217	180	72	M	HNSCC Exp	526	0.019
023	63	F	TNBC	146	-0.696	181	48	F	HNSCC Exp	46	0.018
024	67	M	Gastric	186	0.124	182	69	M	HNSCC Exp	50	-0.672
025	40	M	Gastric	96	-0.343	183	57	M	HNSCC Exp	36	-0.421
026	65	F	Urothelial	183	-0.234	184	59	F	HNSCC Exp	110	-0.334
027	78	M	Urothelial	100	0.390	185	52	M	HNSCC Exp	118	-0.331
028	60	M	Urothelial	227	-1.087	186	54	M	HNSCC Exp	153	0.196
029	49	F	TNBC	33	-0.687	187	52	M	HNSCC Exp	44	0.166
030	50	F	TNBC	102	-0.556	188	62	M	HNSCC Exp	68	0.017
031	53	F	TNBC	189	0.143	189	55	M	HNSCC Exp	36	-0.009
032	72	F	TNBC	145	-0.039	190	52	M	HNSCC Exp	221	0.356
033	68	F	TNBC	6	0.063	191	67	M	HNSCC Exp	254	-0.118
034	78	M	Gastric	114	-0.275	192	61	F	HNSCC Exp	76	-0.435
035	65	M	Gastric	45	-0.384	193	46	M	HNSCC Exp	59	0.123
036	68	F	Gastric	130	-0.152	194	56	M	HNSCC Exp	89	0.373
037	35	F	Gastric	109	-0.705	195	65	M	HNSCC Exp	92	0.208
038	71	M	Gastric	97	0.360	196	60	F	HNSCC Exp	200	0.126
039	72	M	Gastric	27	NA	197	49	M	HNSCC Exp	22	0.114
040	64	M	Thyroid†	50	-0.756	198	59	M	HNSCC Exp	90	-0.229
041	54	F	Carcinoid Tumors	21	-0.589	199	68	M	HNSCC Exp	121	-0.659
042	75	F	Vulvar SCC	57	0.063	200	68	M	HNSCC Exp	21	-0.490
043	54	M	Salivary Gland	32	-0.566	201	64	M	HNSCC Exp	335	-0.185
044	49	F	Anal Canal SCC	143	-0.229	202	59	M	HNSCC Exp	65	0.333
045	55	M	Salivary Gland	12	-0.147	203	63	F	HNSCC Exp	48	0.370
046	56	M	Anal Canal SCC	177	0.116	204	55	F	HNSCC Exp	46	-0.791
047	71	M	Prostate Adeno	123	0.346	205	44	M	HNSCC Exp	54	-0.177
048	47	F	Anal Canal SCC	181	-0.137	206	65	M	HNSCC Exp	119	0.107
049	73	M	Prostate Adeno	65	-0.180	207	60	M	HNSCC Exp	27	-0.183
050	42	F	$ER^{+}HER^{-}$ Breast	55	-0.176	208	55	M	HNSCC Exp	188	-0.584
051	65	M	Prostate Adeno	95	-0.903	209	52	M	HNSCC Exp	239	0.441
052	50	F	Leiomyosarcoma	84	-0.472	210	53	F	HNSCC Exp	116	0.151
053	63	F	Anal Canal SCC	195	-0.278	211	64	M	HNSCC Exp	297	-0.345
054	46	F	Anal Canal SCC	46	-0.200	212	60	M	HNSCC Exp	33	-0.393
055	53	F	Salivary Gland	81	-0.093	213	59	M	HNSCC Exp	288	-0.651
056	65	F	Biliary Tract Adeno‡	11	-0.297	214	68	F	HNSCC Exp	107	-0.632
057	71	F	SCLC	111	-0.676	215	55	F	HNSCC Exp	53	0.165
058	76	F	Neuroendocrine §	60	-0.384	216	62	M	HNSCC Exp	223	-0.120
059	54	F	Colon/Rectal Adeno	73	-0.548	217	61	F	HNSCC Exp	16	-0.057
060	45	M	Colon/Rectal Adeno	86	-0.147	218	54	M	HNSCC Exp	15	0.281
061	72	M	Salivary Gland	61	0.058	219	61	M	HNSCC Exp	499	-0.859
062	70	M	Salivary Gland	69	-0.690	220	73	M	HNSCC Exp	398	-0.016
063	36	F	$ER^{+}HER^{-}$ Breast	75	-0.157	221	65	M	HNSCC Exp	190	-0.044
064	54	F	Anal Canal SCC	183	-0.171	222	67	M	HNSCC Exp	87	0.122
065	65	F	Biliary Tract Adeno‡	555	-0.061	223	55	M	HNSCC Exp	89	-0.429
066	59	F	Mesothelioma¶	24	-0.223	224	50	M	HNSCC Exp	40	-0.003
067	37	F	Cervical SCC	31	NA	225	51	M	HNSCC Exp	340	0.451
068	58	F	Endometrial	53	-0.458	226	71	M	HNSCC Exp	129	0.173
069	69	F	Thyroid Cancer	34	NA	227	54	M	Melanoma	1371	-0.223
070	41	F	Cervical SCC	50	NA	228	68	F	Melanoma	18	0.067
071	43	M	Carcinoid Tumors	28	-1.427	229	62	F	Melanoma	52	NA

Patient ID	Age	Sex	Tumor Type	TMB	GEP*	Patient ID	Age	Sex	Tumor Type	TMB	GEP*
072	72	F	Carcinoid Tumors	21	-0.483	230	70	M	Melanoma	185	0.385
073	66	M	Colon/Rectal Adeno	90	-0.164	231	86	M	Melanoma	114	-0.464
074	55	F	Thyroid†	38	-0.443	232	56	M	Melanoma	677	-0.479
075	73	F	Thyroid†	49	-0.153	233	74	M	Melanoma	57	-1.022
076	23	M	Thyroid†	24	NA	234	76	F	Melanoma	162	0.004
077	53	F	Endometrial	5464	0.174	235	74	M	Melanoma	1607	0.283
078	58	M	Carcinoid Tumors	239	-0.321	236	71	F	Melanoma	418	-0.022
079	43	F	Carcinoid Tumors	63	-0.370	237	61	M	Melanoma	248	0.435
080	65	F	Thyroid†	39	-0.791	238	56	M	Melanoma	2300	0.405
081	74	F	Endometrial	53	-0.381	239	54	F	Melanoma	112	-0.345
082	51	M	Salivary Gland	26	-0.102	240	42	M	Melanoma	53	-0.127
083	57	F	Carcinoid Tumors	18	-0.372	241	63	M	Melanoma	877	0.171
084	48	M	Leiomyosarcoma	58	-0.513	242	30	M	Melanoma	253	0.165
085	71	F	Endometrial	61	-0.418	243	67	F	Melanoma	144	-0.108
086	55	F	Biliary Tract Adeno†	46	-0.205	244	64	M	Melanoma	1015	-0.677
087	59	F	Vulvar SCC	148	-0.046	245	88	F	Melanoma	1392	0.129
088	28	F	Cervical SCC	46	-0.536	246	63	F	Melanoma	65	0.489
089	61	F	Vulvar SCC	27	-0.025	247	66	M	Melanoma	689	-0.200
090	56	M	Mesothelioma¶	10	0.011	248	82	M	Melanoma	174	0.411
091	67	F	Mesothelioma¶	18	-0.243	249	54	M	Melanoma	225	-0.444
092	68	M	Mesothelioma¶	34	-0.502	250	53	M	Melanoma	469	0.384
093	65	M	Mesothelioma¶	255	0.299	251	47	F	Melanoma	70	-0.361
094	63	F	Colon/Rectal Adeno	88	-0.611	252	44	F	Melanoma	87	-0.896
095	56	F	Anal Canal SCC	75	0.213	253	66	M	Melanoma	245	0.454
096	56	M	SCLC	358	0.128	254	43	M	Melanoma	1530	0.384
097	86	M	Mesothelioma¶	317	-0.366	255	60	M	Melanoma	330	NA
098	63	F	Pancreas Adeno	61	-0.471	256	85	F	Melanoma	18	0.188
099	58	F	SCLC	83	0.460	257	53	F	Melanoma	276	-0.282
100	52	F	Mesothelioma¶	40	-0.086	258	34	M	Melanoma	377	-0.270
101	65	M	Esophageal SCC/ Adeno‖	132	-0.187	259	57	F	Melanoma	212	-0.009
102	40	F	Esophageal SCC/ Adeno‖	90	-0.107	260	76	F	Melanoma	61	NA
103	62	M	Esophageal SCC/ Adeno‖	34	-0.596	261	76	M	Melanoma	197	-0.119
104	58	M	Salivary Gland	178	NA	262	55	M	Melanoma	168	-0.187
105	66	M	Salivary Gland	79	-0.055	263	43	M	Melanoma	248	-0.095
106	53	M	Pancreas Adeno	21	-0.069	264	66	M	Melanoma	636	0.240
107	70	M	Biliary Tract Adeno†	33	-0.140	265	77	M	Melanoma	607	-0.434
108	51	M	Biliary Tract Adeno†	102	-0.102	266	39	M	Melanoma	160	-0.318
109	72	M	Salivary Gland	34	-0.229	267	76	M	Melanoma	329	-0.624
110	64	F	Thyroid†	28	-0.415	268	65	M	Melanoma	246	-0.003
111	66	M	Salivary Gland	79	-0.147	269	64	M	Melanoma	43	-0.034
112	65	F	Biliary Tract Adeno†	18	0.637	270	66	M	Melanoma	203	-0.109
113	67	F	Thyroid†	26	-0.891	271	64	M	Melanoma	326	0.175
114	60	M	Thyroid†	65	-0.437	272	59	F	Melanoma	341	-0.072
115	67	F	Colon/Rectal Adeno	71	-0.137	273	65	M	Melanoma	392	0.137
116	47	F	Anal Canal SCC	202	-0.122	274	31	M	Melanoma	190	0.209
117	64	M	Mesothelioma¶	213	-0.118	275	43	M	Melanoma	17	-0.483
118	53	M	Mesothelioma¶	40	-0.367	276	52	F	Melanoma	385	-0.579
119	53	F	SCLC	358	-0.386	277	68	F	Melanoma	219	0.192
120	50	M	HNSCC	132	0.037	278	57	F	Melanoma	33	-0.481
121	67	M	HNSCC	40	-0.274	279	70	M	Melanoma	1474	0.174
122	63	M	HNSCC	39	-0.251	280	52	M	Melanoma	986	0.100
123	66	M	HNSCC	54	0.242	281	64	F	Melanoma	344	-0.612
124	65	M	HNSCC	62	NA	282	33	M	Melanoma	658	0.210
125	69	M	HNSCC	103	-0.686	283	64	F	Melanoma	364	0.233
126	52	M	HNSCC	237	-0.207	284	62	F	Melanoma	117	-0.525
127	76	M	HNSCC	46	-0.165	285	71	M	Melanoma	142	0.378
128	72	F	HNSCC	144	0.309	286	71	M	Melanoma	225	-0.293
129	64	F	HNSCC	9	-0.097	287	74	M	Melanoma	221	-0.590
130	52	M	HNSCC	87	0.181	288	54	M	Melanoma	389	-0.254
131	83	M	HNSCC	941	-0.046	289	58	F	Melanoma	351	0.140
132	69	M	HNSCC	84	-0.417	290	60	M	Melanoma	126	0.120
133	72	M	HNSCC	82	-0.320	291	49	F	Melanoma	197	-0.358
134	58	M	HNSCC	83	-0.429	292	76	M	Melanoma	465	-0.354
135	70	M	HNSCC	140	-0.088	293	44	M	Melanoma	1423	0.198
136	68	F	HNSCC	85	-0.558	294	73	M	Melanoma	1685	-0.241
137	39	M	HNSCC	29	0.112	295	59	F	Melanoma	683	-0.355
138	72	M	HNSCC	103	-0.393	296	55	F	Melanoma	193	0.751
139	60	M	HNSCC	65	-0.030	297	69	M	Melanoma	428	0.319
140	62	M	HNSCC	170	-0.531	298	81	M	Melanoma	2221	0.372

Patient ID	Age	Sex	Tumor Type	TMB	GEP*		Patient ID	Age	Sex	Tumor Type	TMB	GEP*
141	71	M	HNSCC	51	0.335		299	69	F	Melanoma	937	0.399
142	74	F	HNSCC	74	-0.319		300	57	M	Melanoma	61	-0.146
143	70	M	HNSCC	104	-0.103		301	73	F	Melanoma	198	0.205
144	51	M	HNSCC	122	-0.142		302	52	M	Melanoma	57	-0.453
145	63	F	HNSCC	342	0.142		303	43	M	Melanoma	740	0.235
146	63	M	HNSCC	77	-0.605		304	56	M	Melanoma	317	-0.046
147	62	M	HNSCC	31	-0.227		305	60	M	Melanoma	578	0.126
148	62	M	HNSCC	52	-0.227		306	56	M	Melanoma	421	0.308
149	50	M	HNSCC	590	-0.014		307	38	M	Melanoma	340	0.401
150	74	M	HNSCC	75	-0.372		308	55	M	Melanoma	1388	0.011
151	57	M	HNSCC	136	-0.053		309	47	F	Melanoma	59	0.201
152	69	M	HNSCC	350	-0.485		310	68	F	Melanoma	24	-0.157
153	66	M	HNSCC	46	0.094		311	42	F	Melanoma	33	-0.338
154	62	M	HNSCC Exp	48	0.053		312	60	M	Melanoma	233	-0.327
155	49	M	HNSCC Exp	129	0.090		313	51	M	Melanoma	557	-0.051
156	71	M	HNSCC Exp	93	0.093		314	45	F	Melanoma	37	-0.021
157	54	M	HNSCC Exp	72	-0.131		315	46	M	Melanoma	425	0.150
158	60	F	HNSCC Exp	267	0.135		-	-	-	-	-	-

Adeno=Adenocarcinoma; $ER^{+}HER^{-}$ Breast= Estrogen Receptor Positive Human Epidermal Growth Factor Receptor-2 Negative Breast Cancer; Ext=extension study; PNET=pancreatic neuroendocrine tumors; SCC=squamous cell carcinoma; TNBC=triple-negative breast cancer. *GEP scores were calculated using gene data listed in Table S2B. †Papillary/Follicular; ‡ Gallbladder+Biliary Tree, excluding Ampulla of Vater; § Well/moderately differentiated PNET; ¶ Malignant Pleural; ‖ Including GE Junction

B. GEP gene data

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
001	43	18	49	462	217	1505	82	17	1059	47	65	43	7	13	328	11	22	43	6	171	359	561	31	8	26	11	48	206	23
002	42	56	62	1253	221	131	121	36	2288	98	97	118	48	30	440	24	128	31	6	996	1722	1172	13	37	79	30	78	197	35
003	38	9	49	157	150	96	53	15	407	15	29	75	36	8	168	27	25	61	7	215	933	545	33	25	43	10	44	140	46
004	28	45	59	923	181	173	135	35	2490	99	89	106	39	63	282	19	23	167	13	695	2328	1138	37	24	70	27	93	412	37
005	44	36	43	751	147	113	85	23	1041	84	96	129	26	18	304	25	56	274	8	8	181	1154	133	19	34	17	67	234	54
006	159	152	185	2580	490	411	336	61	4011	194	230	793	72	132	856	91	386	1450	46	4271	4901	4216	1579	182	434	110	349	1533	87
007	426	284	673	4635	1309	934	1178	162	10080	1133	592	263	292	66	3557	92	296	1006	35	2695	4709	6562	176	97	297	78	430	1569	137
008	16	31	36	352	117	23	41	14	1104	55	43	24	18	13	113	9	20	153	11	162	261	540	72	22	21	11	51	188	10
009	18	11	21	229	119	43	40	8	887	32	34	101	22	152	144	40	23	429	13	791	936	788	97	51	50	38	46	509	14
010	28	14	45	494	177	293	107	15	1196	51	99	53	8	8	406	8	19	12	4	251	582	612	7	19	38	13	38	108	10
011	61	61	63	1143	349	1546	207	59	2614	107	262	218	79	97	466	49	65	702	13	1360	2910	2703	334	118	122	24	148	2157	141
012	89	107	48	2060	418	1155	209	59	3366	105	265	45	14	33	1273	8	56	30	9	345	624	1041	22	24	22	35	32	461	14
013	36	36	109	1099	144	121	152	42	1228	77	96	34	4	12	627	7	15	61	23	87	277	266	19	20	4	12	22	164	14
014	38	39	77	1015	206	582	203	73	2462	70	148	101	61	13	154	15	36	317	7	352	1199	1561	65	20	53	10	127	431	59
015	44	69	61	1752	199	414	265	54	2929	187	180	498	28	76	219	43	46	574	21	715	1786	1551	265	145	151	41	186	1245	60
016	59	53	68	1626	246	117	172	45	2014	119	142	267	122	20	639	54	53	292	11	608	1846	1394	119	34	175	21	115	280	78
017	81	60	87	1337	284	167	173	75	2968	115	132	257	293	47	335	94	113	871	29	1438	1106	2455	157	57	253	48	147	463	197
018	103	112	108	1621	514	245	416	70	3514	281	211	170	92	25	1078	63	213	404	45	2802	3168	2757	113	39	111	70	113	401	20
019	16	31	23	513	83	62	72	24	1324	52	38	149	117	14	117	48	36	482	8	417	812	954	83	15	77	16	46	188	124
020	292	234	289	1093	888	339	532	80	4226	387	176	59	24	34	1094	43	53	122	14	1429	1945	1448	70	28	36	27	113	525	38
021	226	144	215	1885	1179	213	457	115	6679	337	321	153	70	31	295	45	75	288	49	1366	1510	1381	313	50	150	43	111	481	75
022	115	110	192	2125	447	221	282	44	5711	222	321	140	57	37	850	58	162	878	42	13	204	2955	123	68	127	64	215	769	57
023	182	179	284	2762	618	637	651	81	10617	562	198	64	18	109	2412	62	236	84	13	150	615	2032	23	43	53	63	100	453	32
024	197	142	197	2385	880	291	544	104	5662	326	282	323	293	163	905	95	421	2275	91	9	3343	6592	310	88	265	188	399	2291	158
025	48	51	61	707	236	75	83	33	1609	60	126	55	21	20	264	20	32	74	16	6	387	1003	47	13	43	9	119	241	12
026	11	6	10	17	96	104	3	3	58	7	9	6	2	1	36	7	1	1	1	10	276	222	2	8	5	10	15	56	5
027	30	43	32	611	110	111	86	19	1134	49	67	206	44	41	274	41	96	1213	19	615	1569	1154	112	90	137	24	79	421	60
028	72	95	113	3281	311	1088	492	91	5683	184	183	7	6	15	899	8	53	5	3	121	632	1246	8	12	13	17	58	160	18
029	334	397	210	3080	859	471	785	68	7939	579	349	52	13	14	1246	19	115	212	19	781	706	1859	72	50	54	28	67	1378	22
030	179	139	212	2259	581	418	329	111	5297	312	314	141	16	35	1530	17	214	93	14	7	1044	2446	44	38	48	36	131	920	23
031	147	132	206	2479	1088	722	320	48	9710	329	446	722	308	124	592	274	350	1633	134	20	2064	7217	356	212	624	118	391	1611	211
032	300	235	261	3698	784	430	586	110	8659	303	362	523	215	120	2393	194	276	3673	61	8	1013	4205	817	189	435	125	212	1747	107
033	68	70	84	956	307	118	88	51	1329	106	90	131	319	44	149	57	113	270	27	1252	1653	2567	102	20	190	42	143	183	142
034	31	13	42	85	312	101	45	9	381	19	47	19	10	11	138	6	14	14	2	80	312	798	11	7	13	3	73	121	11
035	8	8	5	100	29	5	25	7	309	9	22	5	4	3	34	1	8	15	1	75	64	110	1	1	6	3	6	33	2
036	96	87	163	2277	855	247	233	65	2262	180	210	170	20	66	798	35	115	488	35	8	473	3722	543	100	77	53	298	1205	21
037	65	37	37	255	220	37	55	18	824	49	81	4	6	49	187	7	26	9	4	86	382	526	8	1	9	7	53	89	1
038	38	23	44	445	182	50	61	17	848	64	63	189	61	24	159	59	74	907	22	1195	1763	1252	62	38	208	35	75	361	40
040	131	109	162	1392	1228	605	254	112	2796	150	787	53	16	38	728	23	109	51	13	320	1952	1068	13	25	25	13	93	429	7
041	398	108	148	2165	844	390	374	102	2957	328	1725	87	28	58	497	22	193	187	10	693	1165	1722	26	37	62	24	128	613	28
042	131	114	255	2994	1146	414	389	79	3720	247	904	574	149	96	1190	210	296	1369	150	11	1630	3681	451	160	325	84	344	2358	158
043	87	44	148	1131	467	441	191	50	4546	74	2199	97	33	32	463	57	107	86	20	417	630	645	68	30	48	5	95	191	26
044	10	13	30	327	97	46	38	11	422	31	38	16	18	25	42	5	12	58	8	1	98	364	73	11	8	13	24	88	5
045	125	71	85	734	555	171	194	56	1393	101	1280	200	79	36	585	99	191	333	29	643	3037	1176	100	42	172	12	135	294	38
046	57	55	73	798	333	88	53	22	937	74	86	116	39	45	431	44	136	279	23	575	923	1382	222	26	136	33	145	331	25
047	98	87	156	2619	768	259	394	89	4900	244	977	1026	296	85	485	223	580	4618	178	5851	7413	2170	350	235	675	113	325	2179	124
048	45	63	106	1562	401	848	130	51	4002	186	358	129	19	320	541	32	105	692	32	4	345	3354	815	33	103	71	238	998	28
049	139	121	164	1866	817	207	266	112	2843	229	1608	569	76	54	709	126	367	318	121	5	5899	2020	193	82	145	49	317	671	65

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
050	106	55	132	1375	390	410	202	58	4239	148	629	213	33	27	423	55	129	1123	21	6	608	596	914	74	85	15	200	943	30
051	180	61	280	2772	920	315	598	128	9869	253	1077	37	8	35	2317	14	122	42	17	3	118	663	35	33	25	15	119	1126	10
052	110	170	436	3178	911	326	732	160	1831	265	986	130	11	35	1574	25	1685	94	23	5	608	1166	26	121	178	134	139	921	19
053	21	62	62	1664	282	55	121	19	1747	97	172	43	12	18	363	12	40	646	11	4	232	860	48	15	15	28	40	643	13
054	81	59	185	896	754	167	188	44	2457	108	156	51	59	34	415	28	51	246	16	607	962	1478	344	28	58	17	203	500	45
055	43	21	102	600	382	689	113	28	1451	50	460	127	93	33	249	70	83	335	14	723	2346	844	90	43	55	16	90	236	36
056	140	134	180	2072	796	203	250	84	4968	229	188	176	69	36	1339	61	282	126	29	1847	1981	3066	46	32	217	60	220	402	45
057	160	250	383	11372	2116	4825	1493	176	9801	864	7185	287	66	52	1200	66	262	2052	50	1970	2235	1070	173	164	175	44	218	1453	47
058	153	250	289	4443	1122	301	710	161	1184	388	3075	216	42	83	1441	41	259	1313	42	8	819	1654	97	188	283	55	342	1221	20
059	87	64	82	1062	405	123	144	38	2529	129	134	35	26	12	538	12	41	40	13	771	534	1475	14	11	41	22	119	197	22
060	35	21	41	428	154	35	71	14	985	37	60	33	14	16	306	11	47	67	11	327	637	769	39	10	45	12	60	121	10
061	31	17	40	226	121	55	43	17	737	43	438	130	58	23	59	96	44	295	16	3	303	509	73	25	76	8	96	170	29
062	79	71	136	1213	549	91	188	20	2111	66	632	45	8	29	605	25	43	17	16	206	1280	383	38	17	32	10	40	165	8
063	116	110	253	4393	872	839	599	98	6500	401	1007	778	48	65	972	133	430	327	46	6	3514	2157	95	218	398	56	268	3108	46
064	69	95	187	2196	793	894	229	60	3399	191	177	170	27	97	698	30	103	386	23	12	283	4928	2857	44	136	46	271	1148	44
065	39	34	50	803	301	87	101	28	2067	75	72	67	25	103	382	32	61	160	24	839	360	1739	89	30	74	50	54	215	37
066	69	83	138	1330	516	136	190	72	2750	124	650	195	50	27	584	51	265	78	37	9	2692	1538	18	74	175	21	275	586	18
068	144	104	280	4130	688	356	593	160	4026	362	1397	149	46	24	968	36	145	131	26	402	1020	1734	568	96	97	25	113	1452	14
071	390	328	290	6589	1752	2059	738	378	14435	584	2459	26	6	51	744	25	58	40	10	33	272	458	216	30	10	15	117	415	8
072	199	181	224	2026	1640	352	514	149	4339	401	1372	120	26	48	1069	69	79	81	19	568	1984	1210	63	683	158	13	94	1134	24
073	58	36	79	839	182	44	65	13	1661	78	106	43	35	13	395	22	89	201	22	5	126	1027	31	16	41	21	123	228	34
074	137	101	224	1915	1089	758	264	117	4744	184	761	90	224	35	556	52	118	49	19	561	2321	1530	49	53	42	9	191	1733	8
075	161	107	286	3708	1003	479	413	129	6759	262	1184	312	86	90	945	109	212	551	86	4901	16706	2737	123	66	191	109	369	1840	78
077	136	107	191	3064	956	245	518	58	3938	346	612	764	85	81	834	124	317	4829	119	3335	4544	2095	612	259	396	67	235	1978	70
078	211	108	203	2265	1124	469	437	130	4222	247	1953	618	86	48	1149	116	198	326	56	2483	3094	1519	171	95	207	35	259	815	42
079	86	138	231	2499	1411	363	555	129	5870	317	2274	343	133	42	451	93	149	218	86	782	1338	1528	199	72	188	26	270	1160	37
080	95	85	245	4577	665	405	386	137	11584	369	1146	59	26	56	630	24	150	100	13	6	625	1053	33	22	39	33	132	571	22
081	131	108	213	1339	1380	235	483	121	1141	276	1436	139	19	24	725	26	104	130	18	700	2334	1208	434	85	100	34	179	1094	17
082	65	49	107	1156	452	385	154	56	2557	78	541	206	94	31	442	71	137	446	46	1023	3123	1002	128	48	98	11	120	428	37
083	154	130	298	3094	1436	301	551	115	6152	327	1387	321	88	82	1132	138	249	434	58	1643	2319	1578	227	78	162	31	223	666	36
084	134	191	419	5008	2070	996	439	82	8147	254	2542	279	48	28	547	89	265	511	26	1984	2304	2222	90	64	142	35	222	868	46
085	83	50	158	2952	735	528	420	58	2612	163	440	120	28	32	428	55	84	427	20	425	700	414	112	65	100	14	77	689	11
086	74	54	70	856	268	99	120	28	2342	99	121	105	68	14	557	22	65	90	30	6	282	1733	83	29	52	24	85	404	30
087	184	129	439	3422	1515	353	581	130	4820	238	1278	756	124	129	1439	194	289	1711	107	10	2347	2969	1654	141	330	48	553	2177	105
088	88	106	266	5579	888	758	1058	108	3294	260	2513	270	24	115	1251	47	149	149	25	2	301	2644	204	86	196	150	301	1148	34
089	97	102	216	1914	977	222	327	99	3814	230	952	440	224	55	927	144	297	1408	61	6	2053	2724	217	71	229	86	270	1235	128
090	105	109	226	2385	950	226	316	105	4516	184	1032	744	277	58	585	194	415	243	118	2123	3761	3486	88	108	375	55	365	1483	41
091	66	69	146	1878	646	197	188	57	3218	151	568	242	49	18	685	47	387	71	48	2197	4584	1433	59	46	140	54	141	321	28
092	82	109	183	2047	705	301	232	58	3351	139	720	192	40	21	1255	39	209	42	19	1183	3973	1000	15	28	92	40	121	371	18
093	80	48	121	3266	419	161	250	82	3967	165	582	1682	118	106	606	373	322	1747	200	1945	3964	1328	379	128	899	117	248	1485	89
094	45	31	62	443	284	54	71	18	1799	48	113	20	9	7	159	7	20	53	3	5	41	513	6	9	26	13	127	124	7
095	106	49	103	1100	704	114	168	62	2485	104	122	166	239	67	525	78	170	615	23	2940	3601	3293	538	39	195	48	230	658	80
096	197	156	502	8182	1229	1014	896	154	8686	583	2947	1480	335	98	438	283	552	6257	198	3425	7337	4096	614	570	1255	89	581	3893	191
097	68	93	225	1804	560	415	267	50	3147	234	1085	118	196	43	1003	42	172	52	19	13	1059	1540	24	99	80	32	161	608	47
098	70	25	86	471	317	124	123	28	1458	61	88	34	30	7	626	20	30	22	7	192	825	1127	23	6	10	3	104	240	13
099	134	89	215	2545	1722	481	1125	157	5622	531	1789	1811	179	373	817	492	493	8279	230	3265	6372	9768	6721	448	1162	85	351	8447	137
100	75	67	115	1379	633	132	154	62	2915	99	855	314	56	30	274	81	179	182	31	7	2761	1970	69	63	300	18	232	986	15
101	39	24	62	716	249	148	102	18	1222	79	86	210	8	32	462	18	39	174	8	3	200	1429	106	25	49	28	98	332	17
102	16	5	20	38	221	116	9	3	108	9	11	19	5	4	71	9	5	5	2	81	342	414	7	11	8	3	31	75	3

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
103	16	21	37	385	154	49	58	20	640	40	53	9	10	8	85	7	10	20	5	3	19	444	14	12	8	4	15	59	8
105	112	45	182	1283	559	900	185	46	1377	128	901	291	65	51	660	84	203	1202	58	1267	3779	1128	328	54	177	39	123	626	39
106	49	23	45	238	262	63	44	27	785	30	38	53	13	33	345	30	49	46	18	714	930	977	52	10	40	12	70	137	25
107	31	25	64	206	322	69	68	23	1281	47	95	75	15	16	361	19	35	102	5	3	637	1369	97	8	49	15	110	275	23
108	84	62	252	1622	456	172	306	52	1861	130	1081	157	18	53	665	41	225	524	20	1193	1126	1825	49	58	94	34	275	1830	20
109	74	34	98	1160	552	986	198	50	2026	110	817	224	48	37	415	96	226	270	36	1307	6958	1436	62	20	91	19	172	345	27
110	116	119	170	1510	823	320	207	94	3003	150	1539	162	46	92	674	49	165	132	35	904	3181	1295	28	38	58	20	171	590	26
111	75	51	171	2356	682	462	256	60	2326	149	1791	451	59	43	413	173	121	780	58	939	1838	1614	138	64	258	18	168	754	55
112	61	11	35	42	409	151	24	40	123	40	472	524	43	51	81	321	104	403	26	242	2876	705	157	92	441	6	153	890	37
113	151	120	200	2753	1987	1053	475	105	5618	312	1399	87	10	36	1132	27	177	80	18	8	484	1770	11	28	48	13	162	637	14
114	139	64	177	1281	844	361	206	97	2466	189	974	211	25	68	562	76	140	40	42	3104	4520	1429	37	34	75	20	121	462	30
115	26	12	15	29	159	41	19	6	148	8	16	9	9	3	70	7	8	19	7	70	295	253	7	4	19	4	37	46	11
116	33	14	45	155	553	117	41	14	751	42	53	49	30	18	282	17	34	57	2	426	704	773	28	11	21	10	46	167	20
117	62	49	101	850	484	102	134	34	2000	76	429	195	38	19	548	56	189	80	34	704	3064	890	16	47	136	24	112	487	18
118	74	126	190	2943	502	354	367	46	4713	269	961	297	70	35	1061	90	237	153	59	5	2747	1924	55	61	136	28	133	561	35
119	427	216	444	3399	3101	767	881	351	4967	728	2994	714	238	98	820	194	239	364	30	763	856	1804	215	364	709	33	292	1891	86
120	5	3	7	31	23	14	4	7	73	7	3	6	1	11	19	5	6	16	1	17	85	53	19	6	3	7	2	27	4
121	21	29	22	335	54	61	46	13	528	32	31	40	8	8	93	1	14	20	2	184	312	353	24	12	13	14	12	100	18
122	6	18	9	87	21	14	11	2	240	7	17	8	1	1	30	3	6	10	1	6	34	38	7	9	9	7	4	53	2
123	61	75	70	1870	269	174	194	78	3354	133	170	326	103	81	291	40	176	1348	73	1767	2637	2258	556	50	115	72	231	1243	114
125	36	145	36	651	294	118	147	51	1409	155	175	106	2	15	346	3	29	17	5	5	129	472	18	34	17	12	29	334	10
126	11	21	23	379	96	37	91	22	744	48	52	32	5	19	214	11	31	34	9	237	227	682	10	18	20	20	19	120	16
127	32	84	92	1113	227	210	189	51	2576	78	114	187	46	20	206	26	33	406	11	391	659	669	86	48	65	9	35	557	46
128	51	78	53	1930	450	208	261	59	4722	118	176	292	45	187	1037	48	209	2270	31	3606	7859	2255	423	123	131	247	146	1550	85
129	12	14	27	554	103	106	54	23	987	29	41	63	24	16	222	15	37	57	4	271	725	506	15	14	24	9	45	130	18
130	81	51	82	1780	547	380	241	56	3331	115	128	660	60	104	576	117	175	805	38	1478	2020	2886	507	85	284	99	157	808	110
131	16	49	32	721	206	140	66	22	1983	48	131	34	12	17	288	7	69	141	7	211	1297	715	13	28	26	40	24	851	21
132	12	18	10	184	67	97	32	12	327	18	29	15	9	9	58	5	11	21	3	2	111	184	7	5	8	5	6	46	8
133	10	13	5	180	51	60	23	11	253	23	29	11	23	3	53	8	5	10	2	2	75	186	7	13	7	14	23	47	6
134	31	36	33	852	137	360	102	21	1095	38	75	62	11	34	491	3	99	71	3	5	190	618	14	14	13	16	45	139	7
135	6	10	2	92	13	29	14	9	114	7	7	6	2	4	29	6	6	29	1	40	101	147	5	5	5	4	2	39	3
136	9	18	17	601	87	279	33	13	1006	36	65	44	19	15	107	8	9	12	6	9	99	322	7	3	28	18	19	78	5
137	29	38	26	893	139	151	93	27	1779	76	77	200	192	23	89	43	41	119	32	915	670	1170	50	35	137	25	45	320	113
138	7	6	6	107	21	13	16	9	191	5	13	7	4	4	44	2	1	4	2	10	25	76	1	5	8	6	4	44	4
139	34	21	28	504	111	111	81	25	830	56	55	112	25	11	306	32	23	184	11	471	1364	891	44	22	46	14	40	204	31
140	28	46	27	387	74	567	93	15	695	66	67	19	8	4	237	3	7	51	1	51	97	332	17	12	13	11	47	289	8
141	28	26	33	490	163	92	70	24	1040	59	63	211	45	112	205	57	50	613	19	649	2127	997	83	32	121	108	82	495	67
142	39	59	20	990	89	87	70	37	829	79	68	47	13	13	134	10	14	96	6	7	97	733	20	17	11	20	44	414	24
143	65	91	72	2199	258	832	193	87	3590	207	161	279	45	82	799	32	88	476	19	683	507	1797	182	98	91	75	109	1044	63
144	31	97	41	1853	181	946	169	48	3271	83	128	113	61	63	487	17	44	197	24	1088	1995	1200	72	35	34	43	48	762	75
145	39	109	64	1804	156	2841	304	49	2903	177	134	480	56	144	465	48	183	539	15	1947	1608	1935	534	118	158	160	139	1363	72
146	50	54	65	1451	293	335	201	49	2456	188	179	45	23	53	747	14	50	11	6	496	1527	780	37	15	25	36	65	141	39
147	28	87	46	1292	130	98	150	90	2945	154	160	155	56	37	224	38	32	105	23	7	1059	959	91	34	84	30	50	297	82
148	28	87	46	1292	130	98	150	90	2945	154	160	155	56	37	224	38	32	105	23	7	1059	959	91	34	84	30	50	297	82
149	27	28	49	1093	230	392	108	29	1175	78	115	240	35	33	164	20	79	659	14	7	194	821	112	40	100	34	63	460	37
150	11	37	31	467	117	75	112	44	796	53	79	134	4	39	81	6	7	41	11	43	90	372	44	27	12	13	13	344	8
151	17	36	21	600	165	101	87	36	959	65	47	100	17	102	325	3	27	76	10	208	414	734	96	33	16	62	32	437	18
152	17	36	29	570	117	62	70	20	981	51	70	43	3	17	190	6	30	30	7	6	232	476	10	9	12	23	30	94	11
153	44	23	44	621	198	192	92	28	1179	57	77	172	38	25	297	21	43	691	12	8	1109	1199	195	35	51	22	72	438	64

Patient ID	Housekeeping Genes											Predictor Genes																		
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
154	8	1	1	61	18	27	4394	13	57	121	543	104	135	30	40	39	285	7	48	110	71	1	37	17	238	26	19	14	180
155	198	207	153	2378	903	393	872	113	4113	295	2735	1113	341	97	1197	406	432	2989	160	18	728	3490	346	247	406	295	258	3265	236
156	29	16	34	498	234	130	69	23	365	41	207	204	102	39	127	86	32	168	28	17	309	1072	59	28	63	30	54	372	29
157	3	1	1	36	7	14	970	8	5	12	167	12	40	5	11	4	42	4	31	18	31	1	8	14	4	6	42	4	15
158	3	1	1	33	24	17	1697	2	13	23	232	27	38	10	28	8	156	6	29	34	15	1	11	11	515	6	9	11	37
159	31	49	37	491	161	56	77	21	554	37	441	37	9	51	198	15	18	97	6	43	250	643	28	13	12	77	36	341	14
160	29	53	48	1179	338	152	215	37	1462	154	647	72	35	25	171	43	30	56	19	278	366	564	64	29	34	36	27	238	25
161	33	23	30	243	178	60	40	12	589	26	202	156	34	32	102	96	47	782	24	170	876	514	312	34	59	22	43	593	30
162	44	65	67	1359	353	214	201	38	1556	127	836	233	53	18	229	95	90	367	45	1579	1240	1535	295	53	73	31	73	455	31
163	16	12	5	19	20	24	9	9	40	4	19	18	6	14	21	9	10	3	5	8	6	23	12	6	5	10	4	31	2
164	85	98	88	2537	891	302	349	60	3668	222	819	340	28	57	339	90	121	950	52	1695	2668	2642	969	89	123	99	119	2282	34
165	19	13	11	41	39	24	14	7	139	17	33	33	9	12	39	16	13	7	6	44	55	56	21	9	10	11	8	52	8
166	19	7	8	70	35	27	16	3	103	9	13	54	5	14	24	24	24	11	6	9	40	71	8	20	19	30	11	48	10
167	36	27	21	146	112	109	41	18	245	34	197	30	16	13	101	21	20	15	6	140	278	153	25	13	12	14	15	64	11
168	18	9	3	19	15	15	5	6	26	3	9	5	5	8	9	8	5	2	4	18	21	9	10	5	1	6	1	13	8
169	20	13	14	181	80	87	29	6	428	25	84	57	18	9	61	23	36	47	11	325	134	164	24	14	26	19	20	103	10
170	16	22	12	197	91	64	37	11	268	12	95	36	9	15	97	13	19	35	7	10	80	234	14	3	9	8	13	152	9
171	20	23	31	257	88	32	59	14	345	16	81	81	25	39	43	33	20	177	12	12	49	170	32	11	30	59	18	118	17
173	14	7	6	31	19	25	7	6	30	6	9	19	2	8	7	17	4	4	4	73	45	21	26	6	7	4	8	21	2
174	61	92	91	1097	485	296	243	52	1771	133	1184	132	34	43	456	69	105	276	23	793	1134	1134	180	34	76	41	115	643	21
175	21	9	6	61	34	25	18	5	97	10	26	25	4	8	16	7	13	34	7	63	134	78	18	4	2	7	5	54	5
176	16	9	7	72	31	27	13	6	99	12	23	32	9	8	34	12	9	4	4	10	33	40	22	5	2	6	2	31	5
177	73	71	62	1321	646	1251	235	76	3829	257	866	370	41	26	478	101	155	893	48	1295	1898	1523	153	159	124	84	238	3045	59
178	86	122	55	1106	590	416	296	55	2095	122	888	85	21	27	445	45	59	76	18	930	1258	1658	18	15	35	32	38	464	14
179	70	94	57	1414	555	165	257	50	1977	172	560	122	35	24	403	44	115	37	22	17	900	1005	217	16	27	48	50	398	19
180	54	39	24	309	316	101	91	26	429	66	246	132	37	59	149	66	47	427	19	11	171	1036	88	44	61	52	47	433	10
181	10	19	13	198	73	19	36	4	95	20	57	30	10	29	9	10	19	33	6	168	147	59	35	23	16	14	15	63	7
182	52	72	41	938	329	105	197	53	1156	98	612	51	12	15	248	28	113	20	12	10	394	403	15	16	20	21	34	161	4
183	238	160	128	2454	647	399	543	64	5072	435	1445	194	29	32	417	86	119	424	31	15	2304	2338	148	48	132	51	144	1254	34
184	16	17	10	76	59	37	30	9	169	24	60	22	4	4	62	19	12	7	8	8	159	73	10	5	8	12	7	91	4
185	47	44	62	650	719	207	262	44	928	23	628	202	19	15	279	42	67	65	12	19	341	1570	129	19	67	17	58	352	13
186	53	63	50	749	248	130	112	29	935	68	422	157	88	41	167	77	87	845	26	612	719	1012	128	47	47	59	59	1099	89
187	84	48	38	479	429	169	203	43	1192	53	706	369	73	33	325	134	211	671	53	9	2155	2267	211	66	329	32	114	481	44
188	37	51	15	378	507	145	129	30	810	46	448	125	80	35	311	79	44	452	36	732	1922	754	210	18	54	13	48	433	15
189	13	10	3	65	90	50	33	11	172	5	122	45	10	12	49	40	22	18	5	243	571	293	9	6	34	11	11	48	5
190	28	27	23	520	192	82	107	32	524	45	345	341	74	22	255	147	106	1176	33	27	433	726	134	101	149	38	50	651	44
191	37	35	23	550	115	37	66	23	1379	67	597	97	22	16	104	47	69	17	19	970	1244	653	20	17	34	23	53	370	17
192	61	57	46	884	487	818	186	38	786	89	545	137	23	50	163	44	32	168	14	8	113	1009	51	33	51	54	66	436	13
193	97	84	76	1164	647	305	331	71	1966	178	733	414	379	86	271	383	94	480	69	15	2579	3832	280	96	159	106	237	1382	170
194	48	22	18	156	410	119	92	20	463	26	486	195	29	38	182	103	44	496	18	9	201	890	257	107	126	14	79	1677	29
195	51	71	54	727	457	138	148	26	1090	97	434	238	70	103	126	77	71	755	22	415	617	2008	115	75	76	113	97	1419	77
196	5	1	2	103	47	13	4991	19	3	64	1062	35	148	25	12	39	263	4	126	92	29	1	13	15	2123	34	102	15	96
197	74	74	59	1483	543	355	291	52	2076	133	615	258	305	54	182	107	152	516	56	5613	4702	2706	375	59	109	97	120	784	90
198	62	88	70	1233	373	340	248	57	2602	131	501	163	41	45	1528	61	221	192	18	2298	2256	1299	129	31	48	184	66	464	20
199	42	39	31	544	250	592	98	24	1144	50	514	38	20	24	240	24	36	17	12	289	283	397	20	12	13	12	30	98	6
200	16	13	5	18	95	42	35	2	115	9	123	24	2	2	21	9	2	1	3	109	124	48	8	3	9	3	3	39	7
201	28	81	97	886	342	127	172	37	1342	106	706	103	24	31	597	60	84	637	21	515	1126	820	65	22	75	38	35	426	39
202	22	58	48	447	124	74	58	27	942	36	342	363	52	34	79	136	67	1139	37	7	351	659	443	71	141	48	42	744	47
203	43	29	29	348	310	467	121	17	778	53	660	199	159	39	255	150	73	180	35	746	478	1524	133	179	95	46	133	1723	79

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
204	49	32	35	394	510	186	117	28	436	51	1120	54	12	18	705	22	22	12	10	176	260	523	16	5	22	14	11	84	4
205	17	14	6	108	35	28	20	12	178	20	38	17	7	7	74	15	17	11	3	98	184	111	16	7	4	15	8	57	7
206	22	11	8	31	179	145	28	23	67	16	228	56	13	17	35	44	21	25	14	173	60	129	33	26	25	7	28	302	14
207	25	24	15	98	107	42	59	10	146	18	70	13	6	7	104	22	22	8	4	45	46	113	80	62	6	10	13	100	6
208	31	30	22	394	131	125	96	21	695	35	200	25	7	23	224	14	19	8	1	10	131	335	17	9	12	16	21	108	9
209	79	39	85	1638	688	279	234	54	1291	126	955	1273	58	226	89	454	153	2379	194	5250	7229	2379	1575	225	536	109	316	1526	80
210	34	20	23	309	106	83	31	15	344	24	143	62	16	40	105	55	40	371	7	18	202	524	103	22	49	51	11	310	22
211	19	10	10	67	21	30	13	5	82	8	34	13	3	7	14	7	5	14	5	4	24	44	7	3	8	8	6	29	5
212	34	54	52	560	204	136	112	29	694	77	291	48	13	11	82	22	14	48	12	104	362	459	151	16	15	18	24	372	15
213	35	41	54	585	257	139	123	26	1006	71	289	50	10	13	276	19	39	19	5	10	42	532	14	9	20	27	27	149	13
214	24	29	20	483	202	338	57	16	729	38	248	25	12	15	88	10	10	10	5	113	120	254	13	11	12	12	11	115	8
215	48	67	63	1062	393	122	200	43	3578	126	625	704	36	25	264	130	108	1827	45	2320	2194	1115	795	94	208	49	128	924	54
216	4	1	1	19	12	5	2298	8	5	21	199	17	19	9	13	10	47	4	28	14	11	1	7	13	391	6	15	2	22
217	2	1	1	12	6	6	688	6	3	4	27	11	8	6	1	4	11	3	3	11	3	1	2	6	63	3	3	5	7
218	26	25	17	148	75	40	28	11	218	13	128	99	67	13	38	72	24	217	13	9	75	316	75	30	39	13	40	278	31
219	42	96	71	1411	356	233	224	27	1410	96	763	38	15	18	403	26	14	33	5	140	153	292	31	10	9	14	28	196	11
220	24	18	13	145	59	52	39	10	160	21	59	43	12	11	72	32	29	55	10	128	261	264	10	10	16	15	25	122	9
221	14	5	5	11	47	21	11	3	36	8	62	11	5	5	15	5	9	10	3	295	46	68	10	2	5	7	6	37	10
222	23	23	22	81	49	116	32	8	133	10	90	98	19	9	92	58	23	176	9	154	384	262	28	20	34	7	27	87	18
223	7	45	29	161	105	38	66	17	521	27	169	26	6	8	143	8	14	9	2	3	26	415	12	8	6	11	12	359	3
224	4	1	1	40	26	16	5027	5	14	58	509	55	159	23	16	22	165	3	82	142	39	1	5	14	190	27	14	8	63
225	47	36	37	457	235	94	80	20	844	46	306	185	47	53	263	83	146	1694	36	1040	2455	1202	212	72	92	123	66	1051	36
226	41	32	28	397	351	108	105	15	730	51	336	178	62	46	153	59	35	256	28	10	204	1112	237	61	83	66	63	998	26
227	13	18	31	284	132	62	65	15	885	22	286	30	9	12	88	19	21	35	7	134	713	355	9	13	31	10	39	224	6
228	26	33	52	419	198	91	67	22	996	45	385	144	205	20	43	55	88	172	13	4	277	958	48	31	52	19	163	241	88
230	44	66	159	2018	557	342	250	48	2645	92	886	1485	267	67	705	624	421	2587	131	9	1718	3652	65	160	682	119	421	2632	152
231	16	17	56	419	130	70	59	12	615	18	169	53	13	12	176	13	22	10	7	84	370	304	4	3	27	26	45	80	12
232	15	20	30	283	73	41	67	16	295	28	166	19	13	6	184	12	23	32	10	1	79	271	5	4	16	2	25	62	10
233	86	81	130	925	955	136	417	71	2854	159	951	55	10	9	419	11	62	30	11	2	254	538	4	14	29	17	55	165	6
234	63	35	77	1041	726	275	214	19	3792	62	890	206	43	50	386	71	127	932	25	2	776	1972	25	40	139	34	174	1914	48
235	9	23	15	185	86	40	17	9	536	12	213	97	21	12	54	23	49	315	15	210	687	324	13	26	74	13	58	175	18
236	6	13	22	180	58	39	39	9	772	13	245	70	14	3	65	23	45	57	11	165	726	233	15	6	30	6	30	135	8
237	14	28	39	340	202	118	54	11	759	20	352	135	40	32	127	83	75	254	17	645	2493	1081	13	65	154	32	163	1157	29
238	23	31	93	1039	306	125	116	16	1330	62	533	282	53	125	742	141	212	1372	36	7	1135	2020	80	100	178	92	307	1565	58
239	75	60	140	782	463	94	418	37	234	73	778	121	16	18	355	50	33	57	6	3	1250	1189	19	22	68	12	71	894	17
240	21	69	88	619	232	126	245	20	1080	58	299	88	28	14	309	35	60	292	10	353	448	840	34	32	93	19	89	469	15
241	23	31	68	378	140	90	177	8	1005	26	279	124	57	15	228	65	39	247	7	841	1471	1021	43	33	72	9	78	718	18
242	21	28	72	511	248	94	109	26	1298	63	239	202	42	12	148	65	113	638	45	454	2357	425	77	47	96	35	53	540	31
243	10	18	27	307	94	53	36	10	402	20	184	36	7	9	297	22	54	57	2	6	154	244	7	11	23	9	27	239	11
244	41	34	79	735	233	97	194	17	1473	79	525	36	5	7	693	10	29	49	4	7	171	715	3	6	11	17	54	381	13
245	12	15	19	147	63	59	45	9	80	16	179	36	7	6	107	23	15	135	2	101	591	540	34	10	17	7	51	323	10
246	38	49	83	857	321	204	135	32	1904	61	474	655	118	62	301	414	177	2283	64	8	1424	2432	155	166	488	79	260	2062	108
247	15	26	45	428	246	53	51	13	644	24	319	17	12	18	165	17	67	33	8	562	1075	299	3	10	20	12	29	261	12
248	26	38	66	855	318	106	132	34	1845	48	651	334	78	63	362	203	211	1239	61	1188	5928	1660	64	89	256	48	273	901	86
249	21	28	46	523	192	139	101	16	2194	39	337	38	12	14	281	18	31	51	9	4	783	346	8	6	34	9	53	306	8
250	23	17	61	702	185	136	127	17	1177	39	615	361	54	50	174	261	128	635	54	1125	3051	1238	24	107	256	26	222	708	40
251	8	34	49	423	104	80	142	19	938	43	550	47	11	6	261	17	32	215	5	2	266	514	15	11	34	11	56	179	8
252	18	27	42	377	106	48	137	10	1375	46	500	11	1	11	93	10	12	15	4	11	127	123	3	4	10	2	13	58	6
253	13	13	48	444	115	100	59	9	325	29	256	180	33	29	152	86	76	532	19	687	2483	499	62	57	99	15	100	563	31

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
254	20	63	75	964	223	113	103	26	1209	78	386	359	104	37	285	206	144	506	22	1490	4769	1633	115	61	327	83	191	1153	38
255	8	15	32	523	113	88	52	9	962	16	121	160	26	19	57	54	36	107	14	352	443	531	11	26	178	17	56	365	13
256	80	63	61	1405	357	200	427	60	346	79	1475	157	22	15	647	37	79	266	8	12	1550	1373	59	21	58	16	105	784	23
257	114	296	103	2328	765	404	272	161	1442	209	1414	221	109	41	536	123	88	234	22	898	2835	1570	90	57	170	21	129	1286	57
258	50	59	64	1655	256	195	177	44	1887	63	630	185	68	30	616	61	114	593	18	755	4991	1496	40	27	91	29	125	758	42
261	15	18	8	186	67	35	36	10	358	18	277	27	30	7	77	9	33	37	7	51	169	343	8	24	12	4	26	53	17
262	113	88	140	3978	704	560	460	71	2663	123	941	304	84	74	2046	116	225	157	42	1428	6570	2153	31	44	146	24	262	1424	56
263	14	14	4	124	51	25	36	10	303	15	223	29	14	9	56	21	19	28	7	76	368	254	12	10	34	4	21	38	11
264	56	158	62	2758	505	323	233	54	3387	136	761	412	149	50	377	184	420	836	60	4635	15203	2824	58	115	311	50	168	1481	120
265	59	145	64	2373	456	509	679	54	5298	135	832	76	50	21	946	24	58	280	15	552	1712	4138	37	33	70	22	119	712	27
266	135	130	70	2559	442	414	648	52	680	148	1288	133	58	25	788	49	121	261	16	798	2627	2179	34	33	60	20	135	705	43
267	38	105	65	952	339	148	298	34	1785	47	637	23	17	7	552	11	86	21	3	6	251	1033	9	16	36	5	113	237	14
268	169	218	124	5367	1216	537	572	116	6387	274	1561	330	154	89	1382	118	313	1118	70	10028	20020	4812	139	107	339	92	405	2866	102
269	34	30	36	656	183	103	111	19	674	31	508	23	15	16	380	33	63	179	6	239	1270	1187	39	17	35	20	54	567	19
270	163	222	119	4673	1407	531	704	173	8155	399	1599	353	135	71	1524	182	299	1843	42	13	2259	8962	198	114	390	108	421	2941	139
271	67	85	116	3457	481	999	881	73	3626	204	1297	824	308	73	1369	468	184	1222	98	2314	2045	6989	370	184	563	54	360	2073	203
272	24	80	41	1394	250	107	400	44	798	108	753	196	82	27	418	117	50	145	15	1058	1571	1543	62	37	82	19	109	545	61
273	175	295	157	4670	905	579	643	71	6138	261	1486	612	746	92	2883	295	523	1042	81	4400	14678	4733	236	152	529	64	429	2219	250
274	56	62	42	1211	440	321	345	74	3584	115	783	456	192	34	427	241	104	493	34	3099	3559	4464	265	157	424	33	237	1095	88
275	64	267	80	2360	403	330	832	82	5344	183	3903	123	64	23	663	58	128	208	11	463	1538	2265	63	44	52	15	178	642	46
276	93	53	69	2416	432	315	170	45	2379	99	818	56	33	23	1442	12	76	30	6	197	1118	937	7	22	36	15	64	544	10
277	82	77	70	2019	529	452	227	39	2802	119	1133	780	299	60	767	340	126	666	95	8	2395	2737	154	177	436	42	237	1563	227
278	116	156	90	3080	1072	164	678	85	5835	156	705	85	77	26	843	36	67	190	14	523	1684	2016	83	40	48	15	127	678	38
279	120	201	134	5811	943	395	567	113	2035	237	1778	1251	388	61	574	473	250	3222	220	7581	10012	5102	484	173	601	72	346	1513	186
280	55	68	58	1738	365	193	325	43	3026	82	794	230	85	32	338	119	118	508	31	1621	4193	2000	81	90	140	37	169	1344	48
281	159	226	166	8572	890	540	961	96	3495	224	1061	142	62	31	3360	44	91	279	12	683	1149	1927	46	54	71	20	115	872	40
282	112	105	65	3288	694	355	236	81	3861	178	1149	570	246	102	909	354	241	2110	53	14	4794	2846	272	182	524	58	252	1906	150
283	75	96	103	3098	550	376	452	30	3134	100	827	481	209	63	485	72	204	3004	62	1887	3431	3578	185	107	435	60	242	1902	84
284	69	154	74	3132	866	370	700	45	2627	150	1309	168	42	24	680	55	57	241	30	794	765	1832	46	23	53	14	158	624	32
285	39	49	41	1121	316	155	188	49	1239	87	603	210	385	42	99	116	99	431	30	2769	3640	2542	599	130	204	33	228	788	142
286	86	341	101	3165	577	327	978	100	4198	127	1545	170	127	30	867	98	97	284	19	13	518	3667	71	74	153	20	236	2161	74
287	71	157	73	1847	877	237	389	45	2965	139	689	36	26	9	742	22	128	55	13	7	1599	1120	15	17	20	16	99	666	34
288	68	150	73	1571	580	292	378	39	2734	68	811	113	41	32	461	50	87	134	8	13	696	2399	15	49	112	12	155	1514	36
289	69	143	78	1719	582	406	270	46	3422	134	820	597	169	65	650	290	230	863	80	14	1255	2829	86	134	496	54	180	1877	102
290	84	114	102	2686	482	273	258	56	2855	183	826	373	195	41	1131	185	122	580	50	1865	2443	1992	203	97	329	50	189	2560	91
291	11	18	3	116	55	30	25	13	225	24	290	16	25	10	46	10	17	9	3	8	35	82	6	22	9	1	13	20	10
292	30	27	18	869	174	161	132	35	501	75	523	28	22	12	452	10	36	39	2	237	436	838	11	13	21	9	57	314	18
293	33	27	27	351	150	54	48	15	269	40	331	118	43	42	220	60	59	208	9	13	534	691	130	31	77	14	96	345	18
294	32	21	20	691	90	102	97	20	508	26	434	39	25	12	235	13	20	21	6	146	737	410	22	22	12	5	37	297	15
295	100	235	120	2564	623	538	304	88	4722	183	1163	222	57	70	1183	88	172	126	23	1788	5400	2689	58	44	273	39	232	524	41
296	16	62	37	993	185	99	84	27	1279	34	492	873	239	38	149	644	131	1245	53	1997	6310	1941	130	149	838	55	124	1712	258
297	103	133	111	2165	440	366	619	51	3410	146	1588	530	185	99	678	306	184	2192	55	13	10660	7010	182	256	424	68	592	4726	115
298	108	145	185	6400	1021	505	1075	132	10517	304	1448	1077	280	399	1540	314	793	2673	105	7174	22815	9123	423	343	669	461	807	5770	254
299	66	85	57	3175	482	211	244	41	2631	153	750	566	424	48	270	232	239	2510	86	2900	8376	3515	310	137	308	80	251	1578	157
300	58	113	65	1365	258	213	380	42	1821	78	624	145	54	37	599	56	212	388	14	4	3749	1795	75	18	82	31	138	519	55
301	46	143	60	2681	301	509	234	47	2724	134	797	171	86	64	236	110	282	1726	32	3385	5970	3037	513	61	104	60	164	1590	75
302	203	283	148	3269	1244	355	808	129	5645	269	1633	146	209	22	2217	92	245	259	20	1300	2084	2395	139	51	103	26	163	691	83
303	28	37	15	594	234	117	71	17	828	35	469	271	51	32	200	106	37	284	9	8	411	1488	325	66	150	9	136	591	36
304	62	80	59	1912	546	319	305	33	3497	78	654	255	83	50	913	140	134	629	37	15	2843	1845	57	76	108	23	130	900	57

Patient ID	Housekeeping Genes											Predictor Genes																	
	STK11IP	*ZBTB34*	*TBC1D10B*	*OAZ1*	*POLR2A*	*G6PD*	*ABCF1*	*C14orf102*	*UBB*	*TBP*	*SDHA*	*CCL5*	*CD27*	*CD274*	*CD276*	*CD8A*	*CMKLR1*	*CXCL9*	*CXCR6*	*HLA.DQA1*	*HLA.DRB1*	*HLA.E*	*IDO1*	*LAG3*	*NKG7*	*PDCD1LG2*	*PSMB10*	*STAT1*	*TIGIT*
305	83	110	113	3087	932	381	335	102	4675	128	1579	165	523	64	1124	144	178	451	29	2019	7301	5772	166	93	153	50	327	2718	285
306	151	491	213	5857	1404	489	561	102	9594	363	2259	1339	1476	116	493	485	381	2171	175	10249	19873	7168	659	270	1913	119	712	3734	685
307	63	121	107	2846	938	432	516	55	5907	131	1050	1224	416	53	1159	547	374	1274	203	2645	8048	5659	132	493	953	63	381	2976	223
308	78	171	76	2460	539	395	287	66	2212	157	808	289	135	54	751	128	351	939	36	13	992	3666	87	78	198	94	155	1479	63
309	53	26	10	127	201	68	52	25	171	33	351	56	196	23	42	87	52	35	7	852	1419	503	116	28	42	5	131	181	24
310	10	12	2	99	98	59	24	7	290	8	508	24	24	7	89	18	17	24	2	9	84	228	10	5	17	3	16	88	4
311	28	129	48	1117	368	126	294	27	4088	32	494	90	32	21	506	18	22	186	4	339	513	722	70	19	27	8	57	846	18
312	173	259	222	5547	995	961	802	154	7321	455	1682	276	69	68	3667	145	172	1241	41	1722	3091	5047	118	79	193	65	215	2569	73
313	174	192	168	6477	1382	414	582	129	8524	230	1827	519	99	117	1256	179	289	727	43	6313	7009	5413	209	97	299	56	336	4071	85
314	40	81	39	1521	307	143	135	41	1854	76	396	126	196	43	279	84	101	134	8	6	532	1729	139	43	75	33	123	569	59
315	66	144	86	2475	907	324	615	93	4741	119	1558	547	112	64	1040	319	221	3878	57	1085	5585	4268	458	106	322	57	180	1975	123

STK11IP = Serine/threonine-protein kinase 11-interacting protein; ZBTB34 = Zinc finger and BTB domain-containing protein 34; TBC1D10B = TBC1 domain family member 10B; OAZ1 = Ornithine decarboxylase antizyme 1; POLR2A = DNA-directed RNA polymerase II subunit RPB1; G6PD = glucose-6-phosphate dehydrogenase; ABCF1 = ATP-binding cassette sub-family F member 1; C14orf102 = Chromosome 14 open reading frame 102-like protein; UBB = Ubiquitin; TBP = TATA-box binding protein; SDHA = succinate dehydrogenase complex flavoprotein subunit A; CCL5 = Chemokine (C-C motif) ligand 5; CD27 = CD27L receptor; PD-L1 (CD274) = programmed death ligand 1, CD274 molecule; CD276 (B7-H3) = CD276 antigen; CD8A = Cluster of differentiation 8a; CMKLR1 = Chemokine-like receptor 1; CXCL9 = Chemokine C-X-C motif ligand 9; CXCR6 = Chemokine C-X-C motif receptor 6; HLA. DQA1 = Major histocompatibility complex class II DQ alpha 1; HLA.DRB1 = Major histocompatibility complex class II DR beta 1; HLA.E = Major histocompatibility complex class I E; IDO1 = Indoleamine 2-3-dioxygenase 1; LAG3 = Lymphocyte-activation gene 3; NKG7 = Natural killer cell group 7 sequence; PDL2 (PDCD1LG2) = Programmed cell death 1 ligand 2; PSMB10 = Proteasome subunit beta type 10; STAT1 = Signal transducer and activator of transcription 1; TIGIT = T cell immunoreceptor with Ig and ITIM domains. GEP scores listed in Table S2A were computed by first normalizing the raw counts by subtracting the average of the log10 counts of the house-keeping genes from the log10 count of each of the predictor genes, and then a weighted sum of the normalized predictor gene values was calculated using the weights for each of the 18 genes (CCL5=0.008346; CD27=0.072293; CD274=0.042853; CD276=-0.0239; CD8A=0.031021; CMKLR1=0.151253; CXCL9=0.074135; CXCR6=0.004313; HLA.DQA1=0.020091; HLA.DRB1=0.058806; HLA.E=0.07175; IDO1=0.060679; LAG3=0.123895; NKG7=0.075524; PDCD1LG2=0.003734; PSMB10=0.032999; STAT1=0.250229; TIGIT=0.084767).

Table S3.
Tumor types and dominant mutational signatures in BOR Analysis

Study #	Cohort	Total (N)	Responders (n)	Dominant mutational signature (tumors with high TMB)
KN028	Colon or rectal	5	0	Low TMB
	Anal	8	2	APOBEC
	Pancreas	2	0	Low TMB
	Esophageal	3	1	Low TMB
	Biliary	6	2	MMR
	Carcinoid	6	0	Other
	Neuroendocrine	1	0	Low TMB
	ER^+ $HER2^-$ Breast	2	0	HRD
	Endometrial	4	1	POLE
	Cervical	3	0	APOBEC
	Vulvar	3	0	APOBEC
	Small cell lung cancer	4	0	Smoking
	Mesothelioma	9	1	Other
	Thyroid	9	1	Other
	Salivary gland	10	1	APOBEC
	Leiomyosarcoma	2	0	Smoking
	Prostate	3	1	MMR
KN012	Gastric	10	2	MMR
	TNBC	12	1	HRD
	Bladder	17	3	APOBEC
KN028/012	Combined	119	16	Heterogeneous
KN012	HNSCC	107	21	APOBEC
KN001, 006	Melanoma	89	38	UV exposure
	All combined cohorts	315	75	Heterogeneous

The major mutational signatures displayed above as previously reported are the dominant signatures identified in the patient samples in this dataset (*16*). APOBEC=apolipoprotein B mRNA editing enzyme, catalytic polypeptide-like; ER=estrogen receptor; HER2=human epidermal growth factor 2; HNSCC=head and neck squamous cell carcinoma; HRD=homologous recombination deficiency; MMR=DNA mismatch repair; POLE=DNA polymerase epsilon catalytic subunit; TMB=tumor mutational burden; TNBC=triple negative breast cancer

Table S4.
Association of mutational signatures with BOR and PFS in pan-tumor cohort

Measure of Mutation	One-sided Nominal *P*-values	
	All subjects as treated	
	BOR N = 119	PFS N = 119
WES TMB (log scale)	0.001	0.017
DNA repair panel including HRD (any vs no mutation in panel)	0.037	0.155
Neoantigen signature (HLA-A,B binding <50nM, log-scale)	0.001	0.021
Smoking signature (log scale)	0.001	0.018
TP53 mutation	0.637	0.030
Fraction of APOBEC- driven mutations	0.226	0.319
Specific nucleotide change: sum C to A	0.144	0.119
Specific nucleotide change: sum C to G	0.102	0.116
Specific nucleotide change: sum C to T	0.004	0.020
Specific nucleotide change: sum T to A	0.008	0.041
Specific nucleotide change: sum T to C	0.029	0.056
Specific nucleotide change: sum T to G	0.015	0.052

APOBEC=apolipoprotein B mRNA editing enzyme; HLA=human leukocyte antigen; HRD=Homologous recombination deficiency; TMB=tumor mutational burden; WES=whole exome sequencing. Logistic regression testing and Cox models were used for BOR and PFS, respectively. Models included terms for study (KN012/KN028) and baseline ECOG status (0 versus ≥ 1). APOBEC assessed only in Anal, Bladder, Breast and Cervical cancers. All mutational measures were tested for association with increased BOR and PFS, with the exception of TP53.

Table S5.
Gene enrichment in Sets 1 and 2

Genes with correlations >0.6

Keyword	Source	Pvalue	Evalue
Allograft Rejection Signaling (445lc)	IngenuityPathways	2.89E-42	5.25E-38
Immune response_Inhibitory PD-1 signaling in T cells	GeneGo	5.16E-41	9.38E-37
Immune response_Differentiation and clonal expansion of CD8+ T cells	GeneGo	2.94E-39	5.35E-35
NK cells in allergic contact dermatitis	GeneGo	4.49E-39	8.16E-35
Immune response_Immunological synapse formation	GeneGo	8.08E-38	1.47E-33
Immune response_Th1 and Th2 cell differentiation	GeneGo	2.16E-37	3.93E-33

Genes with correlations >0.15 and <0.6

Keyword	Source	Pvalue	Evalue
Role of Macrophages_ Fibroblasts and Endothelial Cells in Rheumatoid Arthritis (4ctnm)	IngenuityPathways	1.04E-27	1.89E-23
TREM1 Signaling (3j6wq)	IngenuityPathways	3.36E-26	6.10E-22
Cell adhesion_Chemokines and adhesion	GeneGo	6.94E-25	1.26E-20
Granulocyte Adhesion and Diapedesis (8tsni)	IngenuityPathways	1.03E-24	1.87E-20
Agranulocyte Adhesion and Diapedesis (8tsnh)	IngenuityPathways	1.80E-23	3.28E-19
Cytokine-cytokine receptor interaction	kegg	9.87E-23	1.79E-18
B Cell Receptor Signaling (cil)	IngenuityPathways	1.96E-19	3.57E-15
Immune response_Inflammasome in inflammatory response	GeneGo	2.13E-19	3.87E-15
Atherosclerosis Signaling (4ctne)	IngenuityPathways	2.82E-19	5.13E-15
Release of pro-inflammatory factors and proteases by alveolar macrophages in asthma	GeneGo	2.93E-19	5.32E-15
Hepatic Fibrosis _ Hepatic Stellate Cell Activation (1nilk)	IngenuityPathways	7.50E-19	1.36E-14
Cell adhesion_ECM remodeling	GeneGo	1.57E-18	2.85E-14
Role of Pattern Recognition Receptors in Recognition of Bacteria and Viruses (3j6wo)	IngenuityPathways	1.58E-18	2.88E-14

Table S6.
General group annotation of genes in modules

	General annotation
1	Anti-bacterial defense
2	ECM remodeling
3	Keratins and MMPs
4	Proliferation
5	Vasculature
6	Wound healing
7	PMNs
8	B-cell receptor (I)
9	B-cell receptor (II)
10	Cytoskeleton remodeling

Table S7.
Gene annotation (TCGA database)

Annotation of genes with average correlation with TMB in GEP+ <-0.2

1425 genes: Key annotation (cell cyc, kegg, Ingenuity, genego): Vasculature

Name	Source	EValue	PValue
Vascular smooth muscle contraction	kegg	1.50E-05	8.08E-09
GABA Receptor Signaling (cih)	Ingenuity	6.70E-05	3.66E-08
Development_Alpha-1 adrenergic receptors signaling via cAMP	GeneGo	0.00011	5.84E-08
Cellular Effects of Sildenafil Viagra (3v731)	Ingenuity	0.00014	7.86E-08
Role of NFAT in Cardiac Hypertrophy (4uiun)	Ingenuity	0.00018	9.92E-08
Muscle contraction_GPCRs in the regulation of smooth muscle tone	GeneGo	0.00019	1.06E-07
G-Protein Coupled Receptor Signaling (cj8)	Ingenuity	0.00052	2.84E-07
Relaxin Signaling (3v73l)	Ingenuity	0.00068	3.73E-07
Regulation of intrinsic membrane properties and excitability of cortical pyramidal neurons	GeneGo	0.00083	4.57E-07

Annotation of genes with average correlation with TMB in GEP+ >0.2

1921 genes: Key annotation (cell cyc, kegg, Ingenuity, genego): Cell cycle (proliferation)

Name	Source	EValue	PValue
G2	cellcyc	7.00E-22	3.83E-25
G2/M	cellcyc	3.30E-21	1.81E-24
Cell cycle_The metaphase checkpoint	GeneGo	6.50E-20	3.58E-23
Cell cycle_Role of APC in cell cycle regulation	GeneGo	1.30E-17	7.37E-21
Cell cycle_Transition and termination of DNA replication	GeneGo	6.00E-17	3.28E-20
HSP70 and HSP40-dependent folding in Huntington's disease	GeneGo	6.80E-15	3.73E-18
Putative pathways of MHC class I-dependent postsynaptic long-term depression in major depressive disorder	GeneGo	1.20E-14	6.30E-18
DNA replication	kegg	3.60E-14	1.99E-17
Immune response_Antigen presentation by MHC class I	GeneGo	1.20E-13	6.41E-17
Ubiquitin-proteasome system in Huntington's disease	GeneGo	2.70E-13	1.46E-16
Cell cycle	kegg	9.30E-13	5.08E-16

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