Supplementary Table 1. Clinical information on the patients in this study.

Supplementary Table 2A. Functions of the genes that were upregulated in the better versus the poorer prognostic group.

geneset	description	link	P Value	FDR[1]	overlapGene
hsa04060	Cytokine-cytokine receptor interaction - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04060	4.22E-08	1.28E-05	CXCL13;TNFSF13B;CCR8;CSF2RB;IFNG;IL2RA;FASLG;IL7;IL12A;IL15;TNFRSF9;CXCL10;CXCL9;IL21;CXCL11;XCL1;XCL2;CCR2;TNFSF10;IL18RAP;IL18R1
hsa05162	Measles - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05162	2.43E-06	0.000368	CDK6;DDX58;IFNG;IL2RA;FASLG;IL12A;SH2D1A;PIK3CG;IFIH1;STAT1;TLR2;TNFSF10;CD3G
hsa04650	Natural killer cell mediated cytotoxicity - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04650	1.28E-05	0.001295	FCGR3A;KLRK1;LAT;IFNG;FASLG;KLRC2;KLRC3;KLRD1;LCP2;SH2D1A;PIK3CG;TNFSF10
hsa04062	Chemokine signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04062	1.73E-05	0.001314	CXCL13;CCR8;DOCK2;PLCB1;GNGT1;CXCL10;ITK;CXCL9;PIK3CG;CXCL11;XCL1;STAT1;XCL2;CCR2
hsa05321	Inflammatory bowel disease (IBD) - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05321	3.72E-05	0.002108	IFNG;IL12A;IL21;STAT1;STAT4;TLR2;IL18RAP;IL18R1
hsa04620	Toll-like receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04620	4.17E-05	0.002108	IL12A;CXCL10;CXCL9;TLR8;PIK3CG;CXCL11;STAT1;TLR2;TLR3;CD80
hsa05143	African trypanosomiasis - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05143	5.43E-05	0.002349	PLCB1;IFNG;FASLG;IL12A;IDO1;VCAM1
hsa04621	NOD-like receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04621	0.000126	0.004759	TANK;GBP4;GBP5;CYBB;PLCB1;GBP1;GBP2;GBP3;NAIP;STAT1;CASP5;AIM2
hsa05164	Influenza A - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05164	0.000165	0.00557	DDX58;IFNG;FASLG;IL12A;CXCL10;CIITA;PIK3CG;IFIH1;STAT1;TLR3;TNFSF10;RSAD2
hsa04660	T cell receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04660	0.000214	0.00649	RASGRP1;LAT;ICOS;IFNG;ITK;LCP2;PIK3CG;PTPRC;CD3G
hsa04630	Jak-STAT signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04630	0.000273	0.007531	CSF2RB;IFNG;IL2RA;IL7;IL12A;IL15;PIK3CG;IL21;STAT1;STAT4;IL27RA

[1]P value was adjusted using the Benjamini and Hochberg method by WebGestalt.

Supplementary Table 2B. Functions of the genes that were upregulated in the better versus the poorer prognostic group.

Category	Term	P Value	Benjamini[1]	Genes
KEGG_PATHWAY	hsa04060:Cytokine-cytokine receptor interaction	3.26E-08	6.14E-06	IL18R1, IL2RA, IL18RAP, IL7, CXCL9, FASLG, IL15, CXCL11, IL21, CXCL10, CCR8, TNFRSF9, TNFSF10, TNFSF13B, CXCL13, CCR2, IFNG, IL12A, CSF2RB, XCL1, XCL2
KEGG_PATHWAY	hsa05162:Measles	8.69E-06	8.16E-04	PIK3CG, IFIH1, IL2RA, CD3G, TLR2, FASLG, CDK6, STAT1, DDX58, TNFSF10, SH2D1A, IFNG, IL12A
KEGG_PATHWAY	hsa04062:Chemokine signaling pathway	5.67E-05	0.0035478	PIK3CG, ITK, CXCL9, STAT1, CXCL11, CXCL10, CCR8, GNGT1, DOCK2, CXCL13, CCR2, PLCB1, XCL1, XCL2
KEGG_PATHWAY	hsa04620:Toll-like receptor signaling pathway	1.94E-04	0.0090657	PIK3CG, CD80, IL12A, TLR2, CXCL9, TLR3, CXCL11, STAT1, TLR8, CXCL10
KEGG_PATHWAY	hsa05321:Inflammatory bowel disease (IBD)	2.14E-04	0.0080151	IL18R1, STAT4, IL18RAP, IFNG, IL12A, TLR2, STAT1, IL21

[1]P value was adjusted using the Benjamini and Hochberg method by DAVID.

Supplementary Table 3A. Functions of the genes that were downregulated in the better versus the poorer prognostic group.

geneset	description	link	P Value	FDR[1]	overlapGene
hsa00190	Oxidative phosphorylation - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa00190	6.26E-11	1.90E-08	NDUFA11;COX6B1;CYC1;NDUFS7;ATP6;COX3;CYTB;ND1;ND3;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NDUFA13;ATP5D;ATP5G2;ATP6V0C;ATP6V0A1;ATP6AP1;NDUFB11;COX4I2;ATP6V0D1
hsa01100	Metabolic pathways - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa01100	3.49E-10	5.29E-08	ALG3;PEMT;AGPAT2;CERS1;ADSSL1;NDUFA11;COMT;COX6B1;CYC1;CYP27A1;POLR3H;AHCY;AK1;FAH;ALDH3B1;ALDOA;DOLK;PGLS;GALK1;GAMT;GAPDH;GBA;GPI;GSTZ1;GYS1;IDH3G;ACADS;APRT;ITPKB;NDUFS7;MPST;ATP6;COX3;CYTB;ND1;ND3;NAGLU;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NME4;NOS3;ACO2;PAFAH1B3;NDUFA13;DCXR;ATP5D;ISYNA1;ATP5G2;PFKL;ATP6V0C;ATP6V0A1;ATP6AP1;DPM3;POLR2I;NDUFB11;NT5M;PYCR1;PCYT2;PYCRL;SMPD2;TKT;TST;TSTA3;TYR;TYRP1;ALG8;HSD17B8;CERS4;PTGES2;FLAD1;PTDSS2;COX4I2;DGAT1;GPAA1;ATP6V0D1;UAP1L1;G6PC3;NAPRT;PPT2
hsa05012	Parkinson's disease - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05012	4.55E-08	4.59E-06	NDUFA11;COX6B1;CYC1;NDUFS7;ATP6;COX3;CYTB;ND1;ND3;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NDUFA13;ATP5D;ATP5G2;SEPT5;NDUFB11;COX4I2
hsa05010	Alzheimer's	http://www.keg	4.10E-06	0.00031	NDUFA11;COX6B1;CYC1;GAPDH;NDU

	disease - Homo sapiens (human)	g.jp/kegg-bin/show_pathway?hsa05010			FS7;ATP6;COX3;CYTB;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NDUFA13;ATP5D;ATP5G2;NDUFB11;PSENEN;COX4I2
hsa05016	Huntington's disease - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05016	6.66E-06	0.000404	CLTB;NDUFA11;COX6B1;CYC1;BBC3;NDUFS7;ATP6;COX3;CYTB;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NDUFA13;ATP5D;ATP5G2;POLR2I;NDUFB11;COX4I2
hsa03010	Ribosome - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa03010	1.06E-05	0.000536	MRPL21;MRPL2;MRPS2;RPL8;RPL18;RPL18A;MRPL23;RPL28;MRPS12;RPS2;RPS3;RPS10;RPS15;RPS19;RPS28;UBA52
hsa04932	Non-alcoholic fatty liver disease (NAFLD) - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04932	0.000158	0.006841	NDUFA11;COX6B1;CYC1;NDUFS7;COX3;CYTB;NDUFA3;NDUFB7;NDUFC2;NDUFV1;NDUFS8;NDUFA13;PIK3R2;NDUFB11;COX4I2

[1]P value was adjusted using the Benjamini and Hochberg method by WebGestalt.

Supplementary Table 3B. Functions of the genes that were downregulated in the better versus the poorer prognostic group.

Category	Term	P Value	Benjamini[1]	Genes
KEGG_PATHWAY	hsa01100:Metabolic pathways	1.39E-09	2.96E-07	ATP5D, PTGES2, ATP6AP1, CYC1, ALG3, ITPKB, ALG8, FAH, NDUFS7, TYR, IDH3G, NT5M, NDUFS8, GSTZ1, NOS3, ATP6V0D1, PCYT2, AGPAT2, PTDSS2, NDUFB11, ACO2, PFKL, ACADS, COX4I2, NDUFC2, NDUFA13, ALDH3B1, NDUFA11, NAPRT, NME4, PYCR1, PGLS, DGAT1, CYP27A1, FLAD1, MPST, ALDOA, PYCRL, TYRP1, NAGLU, AHCY, NDUFB7, POLR2I, GPAA1, PPT2, ATP5G2, CERS4, COMT, G6PC3, ATP6V0C, GALK1, ISYNA1, CERS1, PEMT, COX6B1, PAFAH1B3, TSTA3, GAPDH, GBA, HSD17B8, ADSSL1, POLR3H, NDUFA3, AK1, TKT, UAP1L1, APRT, DOLK, TST, GPI, NDUFV1, ATP6V0A1, DPM3, GAMT, QPRT, DCXR, SMPD2
KEGG_PATHWAY	hsa00190:Oxidative phosphorylation	1.08E-06	1.15E-04	ATP5D, NDUFB11, NDUFA3, NDUFB7, ATP6AP1, CYC1, NDUFC2, COX4I2, NDUFA13, ATP5G2, NDUFA11, NDUFS7, ATP6V0C, NDUFV1, NDUFS8, COX6B1, ATP6V0A1, ATP6V0D1
KEGG_PATHWAY	hsa03010:Ribosome	2.89E-05	0.002046409	MRPL2, RPL18, MRPS12, RPS2,

				RPL28, MRPS2, RPS3, MRPL23, RPS19, MRPL21, RPS28, RPL18A, RPL8, RPS15, RPS10, UBA52
KEGG_PATHWAY	hsa05012:Parkinson's disease	1.81E-04	0.009616315	SEPT5, ATP5D, NDUFB11, NDUFA3, NDUFB7, CYC1, NDUFC2, COX4I2, NDUFA13, ATP5G2, NDUFA11, NDUFS7, NDUFV1, NDUFS8, COX6B1

[1]P value was adjusted using the Benjamini and Hochberg method by DAVID.

Supplementary Table 4. Association of upregulated gene expression with OS, and validation in three GEO cohorts.

Supplementary Table 5A. Functions of the validated prognostic genes.

geneset	description	link	P Value	FDR[1]	overlapGene
hsa04060	Cytokine-cytokine receptor interaction - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04060	7.15E-07	0.000217	CXCL13;TNFSF13B;CCR8;CSF2RB;IFNG;IL2RA;FASLG;IL7;TNFRSF9;CXCL10;CXCL9;IL18R1
hsa04620	Toll-like receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04620	1.46E-06	0.000222	CXCL10;CXCL9;TLR8;PIK3CG;STAT1;TLR2;TLR3;CD80
hsa05162	Measles - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05162	9.53E-06	0.000962	IFNG;IL2RA;FASLG;SH2D1A;PIK3CG;STAT1;TLR2;CD3G
hsa04630	Jak-STAT signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04630	2.85E-05	0.002159	CSF2RB;IFNG;IL2RA;IL7;PIK3CG;STAT1;STAT4;IL27RA
hsa04621	NOD-like receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04621	4.82E-05	0.002923	GBP4;CYBB;GBP1;GBP2;GBP3;NAIP;STAT1;CASP5
hsa04658	Th1 and Th2 cell differentiation - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04658	7.68E-05	0.003878	LAT;IFNG;IL2RA;STAT1;STAT4;CD3G
hsa04640	Hematopoietic cell lineage - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04640	0.000103	0.004469	IL2RA;IL7;CD1D;CD2;CD3G;CD38
hsa05321	Inflammatory bowel disease (IBD) - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa05321	0.000146	0.005387	IFNG;STAT1;STAT4;TLR2;IL18R1
hsa04660	T cell receptor signaling pathway - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04660	0.00016	0.005387	RASGRP1;LAT;IFNG;PIK3CG;PTPRC;CD3G
hsa04659	Th17 cell differentiation - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04659	0.000178	0.005387	LAT;IFNG;IL2RA;STAT1;CD3G;IL27RA

[1]P value was adjusted using the Benjamini and Hochberg method by WebGestalt.

Supplementary Table 5B. Functions of the validated prognostic genes.

Category	Term	P Value	Benjamini[1]	Genes
KEGG_PATHWAY	hsa04060:Cytokine-cytokine receptor interaction	6.06E-07	6.96E-05	TNFRSF9, IL18R1, CCR8, IL2RA, TNFSF13B, CXCL13, IL7, IFNG, CXCL9, CSF2RB, FASLG, CXCL10
KEGG_PATHWAY	hsa04620:Toll-like receptor signaling pathway	7.40E-06	4.26E-04	PIK3CG, CD80, TLR2, CXCL9, TLR3, STAT1, TLR8, CXCL10
KEGG_PATHWAY	hsa05162:Measles	3.28E-05	0.0012563	PIK3CG, SH2D1A, CD3G, IL2RA, IFNG, TLR2, FASLG, STAT1
KEGG_PATHWAY	hsa04640:Hematopoietic cell lineage	3.22E-04	0.0092085	CD38, CD3G, IL2RA, IL7, CD2, CD1D

[1]P value was adjusted using the Benjamini and Hochberg method by DAVID.

Supplementary Table 6A. Functions of the genes that were hypomethylated in the better versus the poorer prognostic group.

geneset	description	link	P Value	FDR[1]	OverlapGene
hsa04060	Cytokine-cytokine receptor interaction - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04060	1.41E-06	0.000426	EDAR;CCR1;CCR4;CCR6;CCR7;CNTFR;CSF2;CSF2RB;CSF3R;IFNLR1;EDA;EGF;EGFR;EPO;FLT3;FLT4;IL17RA;IFNL1;CXCL2;CXCL3;IFNAR2;IFNG;IFNGR2;IL1A;IL2RA;IL2RG;IL4;IL6R;IL7;CXCR1;IL9;CXCR2;IL10RA;IL12RB1;IL13RA1;IL15;IL15RA;IL17A;INHBB;CCL4L1;LIF;LIFR;LTA;LTB;LTBR;OSM;IL21R;IL22;IL23A;PDGFRB;TNFRSF19;PDGFC;ACKR3;CXCL16;IL22RA1;CCL1;CCL3;CCL4;CCL8;CCL11;CCL13;CCL14;CCL15;CCL16;CCL22;CCL23;CXCL5;CXCL12;CXCR5;TGFB2;TNF;TNFRSF1B;TNFSF4;TNFRSF4;IL1R2;TSLP;TNFRSF25;TNFSF14;TNFSF12;TNFSF10;TNFRSF18;TNFRSF10D;OSMR;CD27;TNFRSF8;TNFSF8;CD40
hsa04080	Neuroactive ligand-receptor interaction - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04080	6.59E-06	0.000741	NPFFR2;GPR83;CHRM3;CHRM4;CHRNA5;CHRNB1;CHRNB2;CHRNB3;CHRNB4;CHRND;CHRNE;CHRNG;ADCYAP1R1;CNR2;ADORA1;CRHR1;CRHR2;ADRA1A;CTSG;ADRA2C;ADRB3;DRD1;APLNR;S1PR1;LPAR1;GABRR3;F2RL1;F2RL2;GABBR1;GABRA1;GABRA2;GABRA4;GABRA6;GABRG3;GALR1;GHSR;GIPR;P2RY10;GLP1R;GLRB;NPBWR1;NPBWR2;MCHR1;GRIA1;GRIA3;GRIA4;GRID1;GRIK2;GRIK3;GRIK4;GRIN2A;GRM6;GRM8;GZMA;HRH2;HTR1B;HTR1E;HTR2A;HTR2C;HTR5A;HTR7;LHCGR;MC3R;MTNR1A;MTNR1B;NMBR;NPY1R;OPRL1;P2RY6;P2RY11;AVPR1B;AVPR2;PTGDR;PTGER2;PTGER3;PTGER4;BDKRB2;SCTR;SSTR1;TACR3;THRB;C3AR1;TSHB;VIPR2;MCHR2;F2RL3;TAAR5;GPR50

hsa04640	Hematopoietic cell lineage - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04640	7.33E-06	0.000741	CR1;CR2;CSF2;CSF3R;DNTT;EPO;FLT3;ANPEP;HLA-DMA;HLA-DMB;HLA-DOA;HLA-DPA1;HLA-DRA;IL1A;IL2RA;IL4;IL6R;IL7;ITGA3;ITGA4;ITGA5;ITGB3;MME;TNF;IL1R2;CD1A;CD1B;CD1C;CD1D;CD1E;CD3E;CD5;CD7;CD8A;MS4A1;CD22;CD33;CD34;CD38
hsa04950	Maturity onset diabetes of the young - Homo sapiens (human)	http://www.kegg.jp/kegg-bin/show_pathway?hsa04950	3.64E-05	0.002758	RFX6;NR5A2;HHEX;MNX1;FOXA2;HNF4G;ONECUT1;INS;PDX1;NKX2-2;NKX6-1;NEUROG3;PAX4;PAX6;HNF1B

[1]P value was adjusted using the Benjamini and Hochberg method by WebGestalt.

Supplementary Table 6B. Functions of the genes that were hypomethylated in the better versus the poorer prognostic group.

Category	Term	P Value	Benjamini[1]	Genes
KEGG_PATHWAY	hsa04060:Cytokine-cytokine receptor interaction	2.11E-06	5.98E-04	OSMR, IL21R, CXCR1, TNFSF14, CXCR2, IL15, TNFSF12, CXCL12, IL17RA, TGFB2, IFNL1, CXCR5, IFNG, CSF3R, IL15RA, CSF2RB, IL13RA1, LTB, IFNGR2, IL1A, LTA, IFNLR1, LTBR, LIFR, CCL4L1, ACKR3, EDAR, CD40, IL6R, IL22, INHBB, OSM, IFNAR2, CCR7, CCR6, CCR4, TNFRSF10D, EDA, CCL1, IL1R2, CSF2, CCL3, TNF, IL22RA1, CXCL5, TNFRSF25, CCR1, CXCL3, CXCL2, CCL8, TNFRSF8, CNTFR, CCL4, TNFRSF4, LIF, IL17A, CCL22, TNFRSF1B, IL12RB1, IL23A, CCL23, IL10RA, TNFRSF18, TNFRSF19, IL2RG, CD27, EPO, IL4, IL2RA, TNFSF4, IL7, IL9, CCL16, CCL15, TNFSF8, CCL11, TSLP, CCL13, TNFSF10, CCL14, CXCL16
KEGG_PATHWAY	hsa04080:Neuroactive ligand-receptor interaction	6.63E-06	9.38E-04	GPR83, F2RL2, F2RL3, MCHR1, MCHR2, TACR3, THRB, GRIK2, GRIK3, GRIK4, F2RL1, LHCGR, GABBR1, LPAR1, VIPR2, ADORA1, SCTR, HTR1B, S1PR1, GALR1, CHRNA5, TAAR5, HTR5A, GRID1, HTR1E, PTGER2, GABRG3, PTGER3, PTGER4, GZMA, NPBWR1, NPBWR2, GRIN2A, CRHR1, GABRR3, CRHR2, CHRM4, CHRM3, SSTR1, GRM8, HTR7, GRM6, PTGDR, GIPR, GPR50, GLP1R, CTSG, C3AR1, AVPR2, DRD1, ADCYAP1R1, TSHB, BDKRB2, ADRB3, APLNR, P2RY6, HRH2, CNR2, NPFFR2, ADRA2C, MC3R, GABRA2, GLRB, GABRA1, GABRA4, OPRL1, GABRA6,

				GRIA3, GRIA4, NPY1R, P2RY10, P2RY11, GRIA1, AVPR1B, MTNR1B, CHRNB4, ADRA1A, CHRNB3, CHRND, CHRNB2, CHRNB1, NMBR, GHSR, HTR2C, CHRNE, HTR2A, MTNR1A, CHRNG
KEGG_PATHWAY	hsa04640:Hematopoietic cell lineage	4.41E-05	0.004152929	IL1R2, CSF2, TNF, CD8A, MME, ANPEP, ITGB3, DNTT, MS4A1, CSF3R, CD22, CD5, IL1A, EPO, CD7, IL4, CR1, CR2, IL2RA, IL7, FLT3, CD3E, CD1C, CD1B, CD1A, ITGA3, IL6R, ITGA4, CD1E, CD1D, CD38, CD34, ITGA5, CD33, HLA-DRA

[1]P value was adjusted using the Benjamini and Hochberg method by DAVID.