

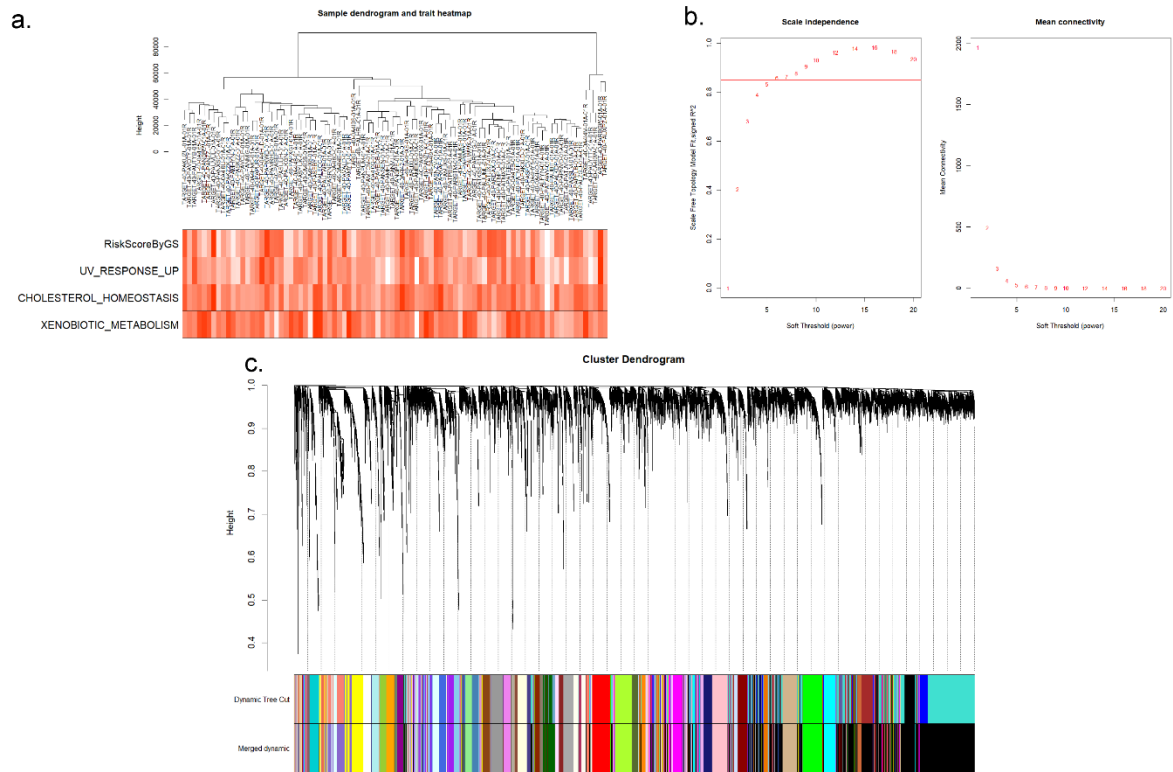


Figure S1. WGCNA analysis in TARGET-OS cohort. (a) Sample dendrogram and trait heatmaps; (b) Analysis of the scale-free fit index for various soft-thresholding powers (left) and the mean connectivity for various soft-thresholding powers (right). (c) Cluster dendrogram indicating different modules.

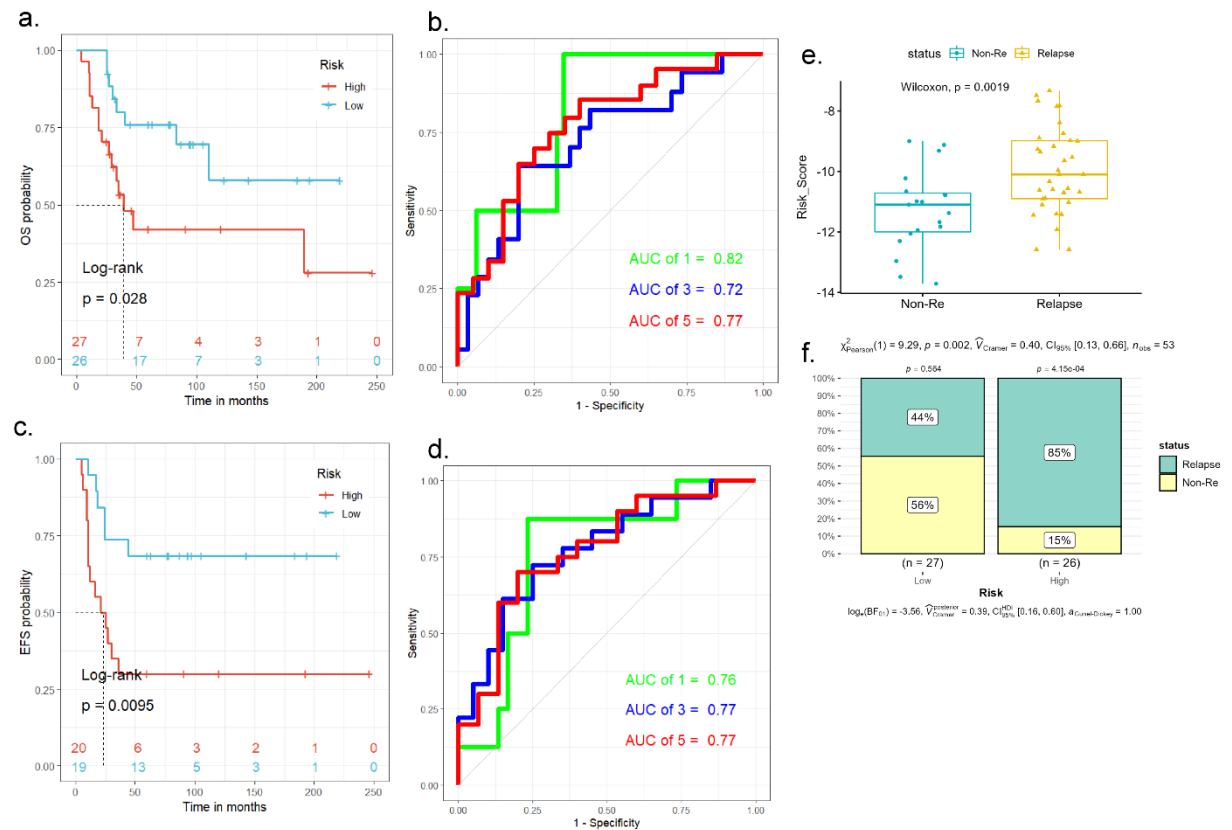


Figure S2. External validation of the predictive value of the gene signature. Kaplan-Meier survival curve of OS (a) and EFS (c) between the low- and high-risk group in GSE21257 dataset; Time-dependent ROC curves for predicting death (b) and relapse (d) at 1, 3, and 5 years; (e) Association of Risk Score with relapse status within five years in GSE42352 dataset; Association of Risk Score with Enneking stage (f) and response to neoadjuvant chemotherapy (g) in TARGET-OS cohort.

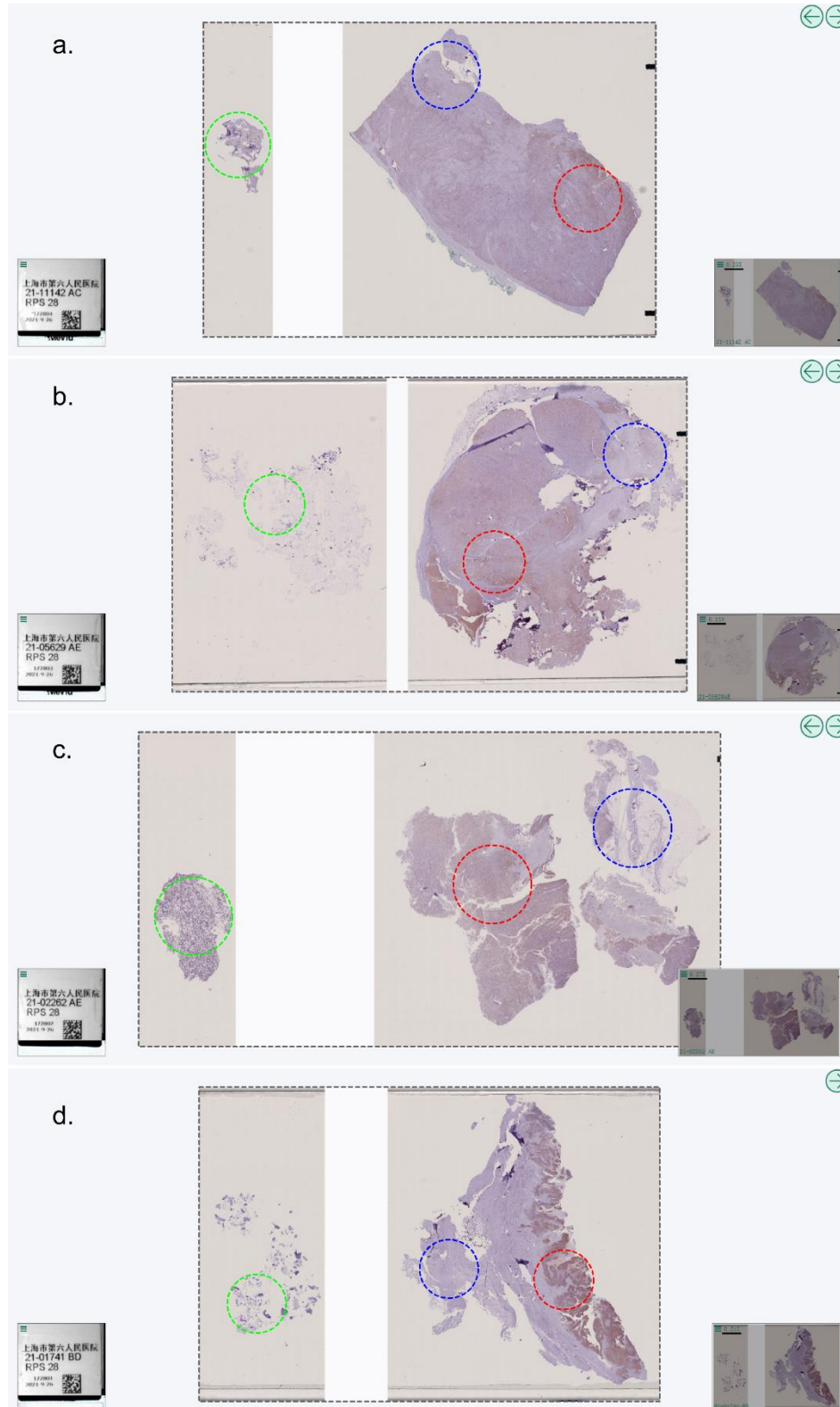


Figure S3. Immunohistochemistry staining of RPS28 in our cohort. (a-d) Immunohistochemistry staining image of RPS28 in OSA tissue (red circle), para-tumor soft tissue (blue circle), and normal bone tissue (green circle)

Table S1. Differentially expressed genes (DEGs) between high- and low-risk groups with $|\log_2(\text{fold change})| > 0.69$ and $p\text{-Value} < 0.05$ by RRA analysis.

Gene symbol	Gene ID	Log2 (fold change)	p-Value	change
PANX3	116337	1.650819674	1.74E-10	up
COL2A1	1280	1.439373066	1.10E-07	up
SOST	50964	1.38318355	1.76E-06	up
CRYAB	1410	1.377660105	2.48E-07	up
CPE	1363	1.220484392	3.58E-07	up
IFITM5	387733	1.159743408	2.16E-05	up
NGEF	25791	1.12565376	1.23E-05	up
COL22A1	169044	1.048387962	2.48E-05	up
PTPRZ1	5803	1.019207375	1.36E-06	up
SLC36A2	153201	1.008950629	0.000296846	up
RBP4	5950	1.008063033	4.44E-06	up
RPL23	9349	1.003869287	2.75E-06	up
SLC8A3	6547	0.997474501	1.53E-05	up
PCOLCE2	26577	0.985560296	6.18E-06	up
FGFR3	2261	0.955868307	1.24E-05	up
NPTX2	4885	0.949448723	1.09E-06	up
UCHL1	7345	0.947272579	1.21E-05	up
GALNT14	79623	0.946093199	0.000497925	up
RPS28	6234	0.942341344	3.18E-05	up
CDH2	1000	0.925419959	1.46E-05	up
P4HA1	5033	0.913351804	5.87E-06	up
PRSS35	167681	0.91317314	7.48E-05	up
AMBN	258	0.908394454	3.43E-05	up
PRRX2	51450	0.906818191	1.07E-06	up
TAC3	6866	0.905569839	2.88E-05	up
COL11A2	1302	0.891554773	0.000122863	up
SP7	121340	0.883670988	1.59E-05	up
FAT3	120114	0.869772256	7.93E-07	up
SCRG1	11341	0.858237221	3.43E-05	up
NDUFB9	4715	0.843661786	1.10E-05	up
CORT	1325	0.84203388	0.000103298	up
SUMO2	6613	0.83699095	3.33E-06	up
HSPB2	3316	0.827925047	6.59E-06	up
RPLP1	6176	0.823844338	9.94E-06	up
CGREF1	10669	0.818869012	0.002986725	up
PHOSPHO1	162466	0.80764342	0.000202578	up
PTMA	5757	0.804435267	4.65E-06	up

RHBDL2	54933	0.801300653	0.000286351	up
SLC13A5	284111	0.796408836	3.11E-05	up
COL13A1	1305	0.791881601	0.000226589	up
RCOR2	283248	0.787910159	7.35E-05	up
SMPD3	55512	0.781061837	0.000204234	up
SEMA3B	7869	0.77490777	8.23E-06	up
COL5A2	1290	0.770112658	5.55E-05	up
RERG	85004	0.767839622	1.13E-05	up
KIF21A	55605	0.766869391	8.93E-06	up
FRZB	2487	0.766300936	8.92E-05	up
APCDD1	147495	0.762736531	2.25E-05	up
EEF1A2	1917	0.754581229	2.64E-05	up
HSPA1A	3303	0.739399003	4.18E-05	up
DKK1	22943	0.73602337	0.000339229	up
IBSP	3381	0.732838677	4.10E-05	up
STAC2	342667	0.724957897	0.000398246	up
CKMT2	1160	0.72007988	0.000288436	up
SDK2	54549	0.718405857	7.10E-05	up
VIT	5212	0.718057157	0.003790811	up
TMEM119	338773	0.715590198	1.27E-05	up
C14orf180	400258	0.714433967	0.002489076	up
COL24A1	255631	0.704785437	7.20E-06	up
CCDC3	83643	0.69751377	0.000326581	up
TCEA3	6920	0.695302009	9.78E-06	up
NUCB2	4925	0.694760669	0.000162602	up
PGAM4	441531	0.692535017	5.41E-05	up
S100A9	6280	-0.691326995	1.83E-05	down
ARHGAP9	64333	-0.691402678	0.00014344	down
CTSB	1508	-0.697366978	0.000156963	down
MBP	4155	-0.701294688	0.000124647	down
EOMES	8320	-0.702044858	0.001200801	down
CD8A	925	-0.702931066	8.92E-05	down
MAGEA3	4102	-0.705109366	0.002489076	down
CORO1A	11151	-0.705129385	5.51E-05	down
TNFSF13B	10673	-0.705269756	0.000231969	down
CFI	3426	-0.706318235	1.48E-05	down
MAGEA10	4109	-0.709666434	0.001991371	down
SNCA	6622	-0.709915318	2.10E-05	down
CTSS	1520	-0.709954127	1.29E-05	down
IL10RA	3587	-0.710097219	2.51E-05	down
TNFSF10	8743	-0.71031579	0.000442285	down
IGSF6	10261	-0.71246118	0.000477708	down
GIMAP5	55340	-0.712936545	0.000369137	down

SPI1	6688	-0.71312738	6.54E-05	down
SFRP4	6424	-0.715118664	0.000207863	down
TNFRSF1B	7133	-0.716736449	0.000118191	down
TGM2	7052	-0.720690397	0.000272036	down
PRG1	23574	-0.723245726	0.000253009	down
SLC11A1	6556	-0.72780027	1.05E-05	down
IFI44L	10964	-0.728390111	0.000122863	down
OLFML2B	25903	-0.729322731	0.000154544	down
NKG7	4818	-0.729939413	1.98E-05	down
CD33	945	-0.729982864	0.000207573	down
PLTP	5360	-0.733754203	8.05E-05	down
SOD2	6648	-0.73472736	0.000119719	down
HLA-DRB4	3126	-0.735128208	0.000158687	down
GABRA3	2556	-0.735371402	0.001493611	down
APBB1IP	54518	-0.735507245	4.04E-05	down
CHRNA1	1134	-0.736813768	8.93E-06	down
IFI27	3429	-0.738278305	9.57E-05	down
GBP2	2634	-0.738346274	0.000162885	down
LST1	7940	-0.738875072	0.000314184	down
ARHGAP30	257106	-0.742412882	0.000215218	down
OLR1	4973	-0.743484683	1.32E-05	down
NPC2	10577	-0.749866037	0.000279999	down
GPSM3	63940	-0.750678766	0.00017578	down
IRF8	3394	-0.750772584	0.000195237	down
CXCL12	6387	-0.752268832	2.12E-05	down
MAF	4094	-0.755765256	7.02E-06	down
PTPN6	5777	-0.756707867	0.000258298	down
PYCARD	29108	-0.758092613	0.000274492	down
VNN2	8875	-0.758166168	1.02E-05	down
ARHGDIB	397	-0.760227236	0.000382898	down
CCL13	6357	-0.760785534	9.35E-06	down
F13A1	2162	-0.763808284	1.88E-05	down
ITGAM	3684	-0.765306332	8.62E-06	down
CD48	962	-0.769189156	0.000216942	down
RNASE1	6035	-0.771867847	2.97E-05	down
STAB1	23166	-0.773862529	5.73E-05	down
CD84	8832	-0.778444966	0.000302571	down
CYBA	1535	-0.779872436	0.000130835	down
CPB1	1360	-0.78104445	0.000851938	down
SERPINA1	5265	-0.782467372	0.000410022	down
GIMAP4	55303	-0.782845656	0.000302571	down
CEBPA	1050	-0.784826228	3.77E-06	down
AQP9	366	-0.79374006	1.79E-05	down

CD209	30835	-0.805033693	4.54E-05	down
LCP2	3937	-0.805904048	0.00010542	down
HCLS1	3059	-0.807824179	0.000105663	down
CSAG1	158511	-0.810818657	3.82E-05	down
MS4A7	58475	-0.812988235	9.46E-06	down
GLIPR1	11010	-0.813308143	0.000110302	down
PPARG	5468	-0.821094919	2.32E-06	down
RENBP	5973	-0.822535595	8.23E-06	down
ALOX5	240	-0.82858269	4.85E-05	down
RNASE6	6039	-0.829682441	0.000142444	down
RNASE2	6036	-0.830197397	0.000176532	down
CCL2	6347	-0.831703621	1.07E-05	down
TDO2	6999	-0.834441659	4.01E-05	down
ACTG2	72	-0.842141931	1.41E-05	down
CD53	963	-0.843038739	1.66E-05	down
SLC7A7	9056	-0.844680376	3.71E-06	down
FOLR2	2350	-0.845869815	5.33E-05	down
FUCA1	2517	-0.848604646	0.000121684	down
FGL2	10875	-0.867076211	0.000157661	down
PLEK	5341	-0.871683017	3.25E-05	down
C2	717	-0.871842056	5.56E-06	down
LY86	9450	-0.880527771	8.32E-05	down
GNA15	2769	-0.88939515	0.000171311	down
ITGB2	3689	-0.890775538	2.92E-05	down
RSPO3	84870	-0.891764218	0.000574859	down
RAC2	5880	-0.891835123	7.72E-05	down
SLC37A2	219855	-0.892517964	8.78E-05	down
DOCK2	1794	-0.893404585	2.20E-05	down
SNX10	29887	-0.899995237	0.000102286	down
EVI2B	2124	-0.907989196	0.000112582	down
HCST	10870	-0.918441124	5.57E-05	down
WAS	7454	-0.919897157	6.34E-05	down
FCN1	2219	-0.921832446	8.73E-06	down
BST2	684	-0.922102819	1.84E-05	down
HLA-DMB	3109	-0.923878355	7.44E-05	down
ACP5	54	-0.924153437	3.97E-05	down
PAGE5	90737	-0.928526674	3.76E-05	down
ISLR	3671	-0.933049159	0.000365496	down
LCP1	3936	-0.93389038	3.71E-05	down
PRAME	23532	-0.940336487	0.000497925	down
HMOX1	3162	-0.941898557	6.58E-07	down
FPR1	2357	-0.947211542	4.09E-07	down
HLA-DMA	3108	-0.948526119	6.87E-05	down

C1orf162	128346	-0.949493374	4.91E-06	down
IFI30	10437	-0.951619098	2.01E-05	down
SLCO2B1	11309	-0.952241678	2.82E-06	down
HBA1	3039	-0.95397456	2.85E-05	down
CYBB	1536	-0.963925848	4.22E-07	down
HAVCR2	84868	-0.970030984	4.40E-05	down
AIF1	199	-1.004704473	2.31E-05	down
VAMP8	8673	-1.005863094	1.46E-05	down
HBB	3043	-1.010451999	1.76E-05	down
LAPTM5	7805	-1.018877289	2.79E-05	down
FCGR2A	2212	-1.019523492	9.03E-06	down
HLA-DPA1	3113	-1.021109894	1.21E-05	down
APOC1	341	-1.029067196	2.48E-05	down
CD74	972	-1.032301749	2.05E-05	down
IER3	8870	-1.039309622	3.57E-05	down
KERA	11081	-1.062069234	4.71E-06	down
CSF1R	1436	-1.108699703	1.16E-05	down
HLA-DQA1	3117	-1.12174786	9.92E-07	down
GZMA	3001	-1.123960692	2.60E-07	down
CXCL10	3627	-1.127435569	5.40E-06	down
HLA-DRA	3122	-1.131102132	6.20E-06	down
ALOX5AP	241	-1.132527186	1.59E-05	down
HLA-DRB1	3123	-1.150955403	5.33E-05	down
S100A8	6279	-1.159840764	1.76E-06	down
TYROBP	7305	-1.165757565	2.75E-06	down
APOE	348	-1.176035883	1.14E-06	down
CD14	929	-1.186395156	9.92E-07	down
MS4A6A	64231	-1.204786266	4.25E-06	down
CCL8	6355	-1.231296163	2.00E-08	down
FCER1G	2207	-1.249838864	1.35E-06	down
VSIG4	11326	-1.267144437	2.00E-08	down
C1QA	712	-1.307833866	6.76E-07	down
CD163	9332	-1.316560374	1.51E-08	down
C1QB	713	-1.322648565	7.14E-07	down
C1QC	714	-1.388083184	2.51E-07	down
LYZ	4069	-1.430504327	1.10E-07	down