

## SUPPLEMENTARY TABLES

**Supplementary Table 1. Logistic analysis of the association between TSEN54 expression and clinical characteristics.**

Clinical characteristics	Total (N)	Odds ratio in TSEN54 expression	P value
Age (>60 vs. ≤60)	370	0.72(0.48-1.09)	0.119
Gender (Female vs. Male)	371	1.32(0.86-2.05)	0.210
Grade (III vs. I)	366	3.48(1.80-6.90)	<b>&lt;0.001</b>
Stage (II vs. I)	347	2.26(1.34- 3.86)	<b>0.002</b>
T (T2 vs. T1)	368	2.55(1.54-4.29)	<b>&lt;0.001</b>
M (M1 vs. M0)	270	3.05(0.38-62.00)	0.338

T, tumor; M, metastasis; Bold values indicate P-values<0.05.

**Supplementary Table 2. Univariate and multivariate COX regression analysis of factors associated with OS in liver cancer patients.**

Variable	Univariate analysis			Multivariate analysis		
	HR	95%CI	P-value	HR	95%CI	P-value
age	1.007	0.990-1.024	0.441	1.007	0.990-1.024	0.404
gender	0.839	0.536-1.314	0.443	1.019	0.638-1.627	0.938
grade	1.073	0.795-1.449	0.645	1.158	0.838-1.599	0.375
stage	1.809	1.426-2.294	<b>&lt;0.001</b>	1.053	0.420-2.638	0.913
T	1.767	1.415-2.207	<b>&lt;0.001</b>	1.607	0.689-3.751	0.272
M	3.892	1.223-12.386	<b>0.021</b>	1.520	0.415-5.573	0.528
TSEN54	1.057	1.023-1.093	<b>0.001</b>	1.036	1.001-1.072	<b>0.042</b>

OS, overall survival; HR, hazard ratio; CI, confidence interval; T, tumor; N, node; M, metastasis; Bold values indicate P-values<0.05.

**Supplementary Table 3. Correlation analysis between TSEN54 and gene markers of different types of immune cells in TIMER.**

Description	Gene markers	LIHC			
		None		Purity	
		Cor	p	Cor	p
B cell	CD19	0.202389235	<b>8.64E-05</b>	0.267377717	<b>4.65E-07</b>
	CD79A	0.128911048	<b>0.012955142</b>	0.240176753	<b>6.45E-06</b>
	CD3D	0.234449883	<b>5.33E-06</b>	0.346004645	<b>3.88E-11</b>
T cell (general)	CD3E	0.105762836	<b>0.041791929</b>	0.241193771	<b>5.88E-06</b>
	CD2	0.124508092	<b>0.016468742</b>	0.251270165	<b>2.29E-06</b>
CD8+ T cell	CD8A	0.123889815	<b>0.017015243</b>	0.222738442	<b>2.98E-05</b>
	CD8B	0.146929914	<b>0.004569294</b>	0.242568159	<b>5.18E-06</b>
Monocyte	CD86	0.229956737	<b>8.11E-06</b>	0.366020432	<b>2.24E-12</b>
	CSF1R	0.147265925	<b>0.004509586</b>	0.274518328	<b>2.22E-07</b>
	CCL2	0.076182565	0.142987697	0.171499465	<b>0.001385652</b>
TAM	CD68	0.11589803	<b>0.025640279</b>	0.19251427	<b>0.000322508</b>
	IL10	0.150779612	<b>0.003601813</b>	0.253448179	<b>1.86E-06</b>
M1	IRF5	0.49114087	<b>6.38E-24</b>	0.492025997	<b>1.96E-22</b>
	PTGS2	0.021590413	0.678503783	0.121095345	<b>0.024489161</b>
M2	CD163	-0.037099129	0.476208689	0.044501381	0.409948133
	VSIG4	0.069820956	0.179530032	0.172752072	<b>0.001275952</b>
	MS4A4A	0.005913939	0.909570673	0.107434277	<b>0.046148153</b>
Neutrophils	CEACAM8	0.010704639	0.837184606	0.038274868	0.47857044
	ITGAM	0.295853945	<b>7.40E-09</b>	0.376340649	<b>4.74E-13</b>
	CCR7	0.015556345	0.765212213	0.126487372	<b>0.018757309</b>
Natural killer cell	KIR2DL1	-0.057048328	0.273072999	-0.088365409	0.101303959
	KIR2DL3	0.169935675	<b>0.001015924</b>	0.221890148	<b>3.20E-05</b>
	KIR2DL4	0.125536127	<b>0.015545474</b>	0.151887885	<b>0.004693128</b>
	KIR3DL1	-0.031109239	0.550287866	-0.025165954	0.641348507
	KIR3DL2	0.06023975	0.24709449	0.107992064	<b>0.045021948</b>
	KIR3DL3	0.043800893	0.400223792	0.044544858	0.409490419
	HLA-DPB1	0.130829752	<b>0.011705036</b>	0.231304715	<b>1.43E-05</b>
Dendritic cell	HLA-DQB1	0.102332112	<b>0.048920189</b>	0.188670792	<b>0.000426079</b>
	HLA-DRA	0.095978023	0.064810567	0.185502114	<b>0.000533893</b>
	HLA-DPA1	0.077766211	0.134843094	0.175633352	<b>0.001053238</b>
	CD1C	0.054657825	0.293710519	0.125151012	<b>0.020056474</b>
	NRP1	0.207734463	<b>5.74E-05</b>	0.223667441	<b>2.76E-05</b>
	ITGAX	0.241468544	<b>2.72E-06</b>	0.354940261	<b>1.11E-11</b>

Supplementary Table 4. Correlation analysis between TSEN54 and gene markers of different types of T cells in TIMER.

Description	Gene markers	LIHC			
		None		Purity	
		Cor	p	Cor	p
Th1	TBX21	0.008268494	0.873883393	0.092547169	0.086082606
	STAT4	0.13685461	<b>0.008343938</b>	0.183705472	<b>0.000605761</b>
	STAT1	0.279569814	<b>4.96E-08</b>	0.317637102	<b>1.59E-09</b>
	TNF	0.195364992	<b>0.000152569</b>	0.308501719	<b>4.84E-09</b>
	IFNG	0.214103055	<b>3.21E-05</b>	0.289851459	<b>4.20E-08</b>
Th1-like	HAVCR2	0.234246846	<b>5.44E-06</b>	0.373995183	<b>6.78E-13</b>
	IFNG	0.214103055	<b>3.21E-05</b>	0.289851459	<b>4.20E-08</b>
	CXCR3	0.181744948	<b>0.000443358</b>	0.288709772	<b>4.77E-08</b>
Th2	BHLHE40	0.081995455	0.114842512	0.098127933	0.068694105
	CD4	0.065401128	0.208718979	0.133184303	<b>0.013291946</b>
	STAT6	0.133242609	<b>0.010192215</b>	0.110737147	<b>0.039810208</b>
Treg	STAT5A	0.314992604	<b>5.46E-10</b>	0.358338792	<b>6.84E-12</b>
	FOXP3	0.013934159	0.789085628	0.062912231	0.243834173
	CCR8	0.188294211	<b>0.000265072</b>	0.272358282	<b>2.78E-07</b>
Tfh	TGFB1	0.280147907	<b>4.64E-08</b>	0.384976126	<b>1.24E-13</b>
	BCL6	0.145675934	<b>0.004966362</b>	0.150219762	<b>0.005174512</b>
Th17	CXCR5	0.154108372	<b>0.002919221</b>	0.25562637	<b>1.50E-06</b>
	STAT3	0.099431072	0.055716785	0.133663869	<b>0.012960765</b>
Resting Treg	IL17A	-0.021952393	0.67342148	-0.010627959	0.844066457
	FOXP3	0.013934159	0.789085628	0.062912231	0.243834173
	IL2RA	0.21861064	<b>2.16E-05</b>	0.337482259	<b>1.23E-10</b>
Effector Treg T-cell	FOXP3	0.013934159	0.789085628	0.062912231	0.243834173
	CCR8	0.188294211	<b>0.000265072</b>	0.272358282	<b>2.78E-07</b>
	TNFRSF9	0.268843967	<b>1.46E-07</b>	0.347024997	<b>3.37E-11</b>
Effector T-cell	CX3CR1	0.109856017	<b>0.034453452</b>	0.157832362	<b>0.003288359</b>
	FGFBP2	-0.166104568	<b>0.001323027</b>	-0.160474669	<b>0.00279651</b>
	FCGR3A	0.165879113	<b>0.001361374</b>	0.240568277	<b>6.22E-06</b>
Naïve T-cell	CCR7	0.015556345	0.765212213	0.126487372	<b>0.018757309</b>
	SELL	0.087163278	0.093649226	0.168112938	<b>0.00172701</b>
	DUSP4	0.210204518	<b>4.66E-05</b>	0.310944533	<b>3.60E-09</b>
Effector memory T-cell	GZMK	-0.030926455	0.552634182	0.072100061	0.181523666
	GZMA	0.050513824	0.33189635	0.142621342	<b>0.007977156</b>
	CD69	0.012372955	0.812249658	0.110508722	<b>0.040223521</b>
Resident memory T-cell	CXCR6	0.055378619	0.287380959	0.167829048	<b>0.001758867</b>
	MYADM	0.258235124	<b>5.04E-07</b>	0.300630413	<b>1.23E-08</b>
General	CCR7	0.015556345	0.765212213	0.126487372	<b>0.018757309</b>
Memory T-cell	SELL	0.087163278	0.093649226	0.168112938	<b>0.00172701</b>
	IL7R	-0.047784366	0.358718137	0.042168211	0.434952771
Exhausted T-cell	HAVCR2	0.234246846	<b>5.44E-06</b>	0.373995183	<b>6.78E-13</b>
	LAG3	0.245711889	<b>1.80E-06</b>	0.289404995	<b>4.41E-08</b>
	CXCL13	0.148664025	<b>0.004107682</b>	0.221172856	<b>3.40E-05</b>
	LAYN	0.156964964	<b>0.00245437</b>	0.214500211	<b>5.91E-05</b>