Supplementary

Δ											
Л			Exper	imental			Control	Standardized Mean			
	Study	Total	Mean	SD	Total	Mean	SD	Difference	SMD	95%-CI	Weight
	E MTAB 4171	15	12.80	0.5270	15	12.26	0.1684	-	1.33	[0.53: 2.13]	2.1%
	E_MTAB_8887	23	6.65	1.0045	17	6.00	0.8355		0.68	[0.03; 1.33]	2.5%
	GPL10558	523	6.93	0.4000	403	6.47	0.2092		1.39	[1.24; 1.53]	3.7%
	GPL11154	163	4.34	0.9395	140	3.45	0.6649	+	1.08	[0.83; 1.32]	3.5%
	GPL14951	93	10.54	0.8024	18	9.93	0.6714		0.77	[0.26; 1.29]	2.9%
	GPL16043	25	1.58	1.0103	25	1.57	1.0623	÷.	0.02	[-0.54; 0.57]	2.8%
	GPL16791	79	6.10	0.8979	78	5.48	0.8095		0.72	[0.40; 1.05]	3.4%
	GPL21047	10	3.67	0.0998	10	3.55	0.0320		1.62	[0.58; 2.67]	1.6%
	GPL5175	48	3.33	0.0786	48	3.21	0.0388		2.05	[1.55; 2.55]	2.9%
	GPL570	844	5.16	0.3187	528	4.81	0.2079		1.26	[1.14; 1.38]	3.7%
	GPL571	96	3.17	0.0854	131	3.13	0.0523	+	0.49	[0.23; 0.76]	3.5%
	GPL6244	66	4.22	0.1015	75	4.12	0.0724		1.19	[0.83; 1.54]	3.3%
	GPL6480	83	3.56	0.0813	82	3.50	0.0578		0.80	[0.48; 1.12]	3.4%
	GPL6947	104	3.37	0.1337	97	3.31	0.0445	*	0.55	[0.27; 0.84]	3.5%
	GPL9052	60	5.79	0.6177	60	4.62	0.4040		2.21	[1.76; 2.67]	3.0%
	GSE10143_GPL5474	80	11.88	0.9364	307	11.18	0.8823		0.79	[0.54; 1.04]	3.5%
	GSE114783_GPL15491	10	10.32	2.1425	26	10.94	1.7608	青島	-0.33	[-1.06; 0.41]	2.3%
	GSE115018_GPL20115	12	1.78	0.2782	12	1.44	0.1681	-	1.40	[0.49; 2.31]	1.9%
	GSE124535_GPL20795	35	5.57	1.0354	35	4.38	0.4001	1	1.50	[0.97; 2.04]	2.8%
	GSE120409_GPL20301	3	5.04	0.0072	3	4.00	0.1291		1.30	[-0.71, 3.42]	0.0%
	GSE120274_GPL10373	225	3 13	0.0010	220	2 00	0.0937		3.02	[0.73, 0.30]	3.6%
	GSE14320_GFE3321	220	6 25	1 0314	220	5.89	3 0646		0.13	[-1.48: 1.73]	0.0%
	GSE20140 GPI 18461	35	9.42	0.4430	34	8 75	0.2906	Γ.	1 75	[1.40, 1.73]	2.8%
	GSE22058 GPL6793	100	10.95	0.5766	97	10.70	0.2560		1.70	[1.10, 2.01]	3.4%
	GSE22405 GPI 10553	24	2.92	0 1855	24	2.85	0 1143		0.44	[-0.14:1.01]	2.7%
	GSE25097 GPL10687	268	3.03	0 2332	289	2.82	0.0930	Ten .	1.24	[1.06:1.42]	3.7%
	GSE33294 GPL10999	- 3	6.24	0.5946	3	3.81	0.0365		4.61	[-0.12: 9.34]	0.1%
	GSE46408 GPL4133	6	11.62	0.7630	6	10.26	0.4672		1.99	[0.50; 3.48]	1.0%
	GSE46444 GPL13369	88	7.78	1.4557	48	7.89	1.5205		-0.08	[-0.43; 0.27]	3.3%
	GSE50579_GPL14550	67	3.61	0.0881	10	3.55	0.0264		0.77	[0.09; 1.45]	2.4%
	GSE55048_GPL9115	4	5.48	0.8192	4	3.97	0.3760		2.06	[0.08; 4.05]	0.7%
	GSE56545_GPL15433	21	3.43	0.0865	21	3.38	0.0536		0.63	[0.01; 1.25]	2.6%
	GSE57555_GPL16699	5	0.29	0.3954	5	-0.04	0.0147	+	1.06	[-0.32; 2.43]	1.2%
	GSE59259_GPL18451	8	13.62	0.5027	8	13.17	0.1341		1.16	[0.08; 2.25]	1.6%
	GSE60502_GPL96	18	10.65	0.5968	18	9.57	0.2573	-	2.29	[1.43; 3.15]	2.0%
	GSE63898_GPL13667	228	7.13	0.7877	168	6.57	0.5107		0.82	[0.61; 1.03]	3.6%
	GSE67764_GPL17077	3	2.10	0.0379	6	1.96	0.0151		5.32	[1.76; 8.87]	0.2%
	GSE76311_GPL17586	62	3.09	0.0904	59	2.96	0.0379		1.95	[1.51; 2.38]	3.1%
	TCGA_GTEx_liver	371	4.97	0.7406	276	3.94	0.4894	+	1.60	[1.42; 1.77]	3.7%
	Pandom offecte model	2015			2442				1 1 4	1006-1211	100.0%
	Hotorogonoity: $l^2 = 88\%$	2 - 0.2	155 n.c	0.01	3413				1.14	[0.96; 1.31]	100.0%
	Helelogeneity. 7 – 66%, 6	- 0.2	155, p <	0.01				-5 0 5			
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TE Figure S1 Integrative analysis of CDK4 expression in HCC tissues for external datasets. (A) SMD forest plot of CDK4. (B) No insignificant publication bias of CDK4 expression was found in the included datasets. SD, standard deviation; SMD, standardized mean difference; CI, confidence interval; HCC, hepatocellular carcinoma.

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Figure S2 Integrative analysis of HSP90AA1 expression in HCC tissues for external datasets. (A) SMD forest plot of HSP90AA1. (B) No insignificant publication bias of HSP90AA1 expression was found in the included datasets. SD, standard deviation; SMD, standardized mean difference; CI, confidence interval; HCC, hepatocellular carcinoma.



Figure S3 Integrative analysis of HSPA5 expression in HCC tissues for external datasets. (A) SMD forest plot of HSPA5. (B) No insignificant publication bias of HSPA5 expression was found in the included datasets. SD, standard deviation; SMD, standardized mean difference; CI, confidence interval; HCC, hepatocellular carcinoma.



Figure S4 Integrative analysis of HSPA8 expression in HCC tissues for external datasets. (A) SMD forest plot of HSPA8. (B) No insignificant publication bias of HSPA8 expression was found in the included datasets. SD, standard deviation; SMD, standardized mean difference; CI, confidence interval; HCC, hepatocellular carcinoma.

Δ											
Λ		_	Exper	imental		(Control	Standardized Mean			
	Study	Total	Mean	SD	Total	Mean	SD	Difference	SMD	95%-CI	Weight
	E MTAB 4171	15	13.94	1.4046	15	13.52	1.4273	#	0.29	[-0.43; 1.01]	2.2%
	E_MTAB_8887	23	5.57	0.8003	17	5.58	0.7382	÷	-0.01	[-0.64; 0.62]	2.4%
	GPL10558	523	6.80	0.4112	403	6.37	0.2939	+	1.17	[1.03; 1.31]	3.5%
	GPL11154	163	3.67	0.8761	140	3.38	0.9501		0.31	[0.08; 0.54]	3.4%
	GPL14951	93	11.09	1.0004	18	9.79	1.4731		1.18	[0.65; 1.71]	2.7%
	GPL16043	25	1.33	1.1423	25	1.41	0.9677	÷	-0.08	[-0.63; 0.48]	2.6%
	GPL16791	79	5.92	1.0480	78	5.74	1.3310		0.14	[-0.17; 0.46]	3.2%
	GPL21047	10	2.84	0.2135	10	2.87	0.1070	-	-0.18	[-1.06; 0.70]	1.8%
	GPL5175	48	3.28	0.1002	48	3.18	0.0772		1.02	[0.59; 1.45]	2.9%
	GPL570	844	4.50	0.3233	528	4.35	0.2609	+	0.49	[0.38; 0.60]	3.5%
	GPL571	96	2.99	0.1493	131	2.95	0.1044		0.34	[0.07; 0.60]	3.3%
	GPL6244	66	3.92	0.1388	75	3.79	0.1208		1.00	[0.65; 1.35]	3.1%
	GPL6480	83	3.62	0.1007	82	3.58	0.0873		0.41	[0.10; 0.72]	3.2%
	GPL6947	104	3.33	0.1333	97	3.31	0.0662		0.25	[-0.03; 0.52]	3.3%
	GPL9052	60	4.68	0.8895	60	4.16	0.7513	-+	0.62	[0.26; 0.99]	3.1%
	GSE10143_GPL5474	80	10.89	0.5705	307	10.00	0.7348		1.27	[1.01; 1.53]	3.3%
	GSE114783_GPL15491	10	6.96	1.4586	26	7.69	1.4138		-0.50	[-1.24; 0.24]	2.1%
	GSE115018_GPL20115	12	0.51	0.8012	12	0.29	0.4941		0.32	[-0.48; 1.13]	2.0%
	GSE124535_GPL20795	35	4.25	0.7091	35	3.60	0.8897		0.79	[0.31; 1.28]	2.8%
	GSE125469_GPL20301	3	4.53	0.5672	3	4.64	0.1603		-0.22	[-1.83; 1.39]	0.9%
	GSE128274_GPL18573	4	7.19	0.5099	4	6.55	0.5440		1.05	[-0.52; 2.61]	0.9%
	GSE14520_GPL3921	225	3.08	0.1232	220	2.93	0.0869	+	1.34	[1.14; 1.55]	3.4%
	GSE166163_GPL23126	3	6.46	1.2650	3	6.65	2.7670		-0.07	[-1.67; 1.53]	0.9%
	GSE20140_GPL18461	35	9.54	0.4995	34	8.86	0.2957	<u> </u>	1.64	[1.09; 2.19]	2.6%
	GSE22058_GPL6793	100	10.82	0.6441	97	10.63	0.5806	*	0.31	[0.03; 0.59]	3.3%
	GSE22405_GPL10553	24	2.95	0.1060	24	2.90	0.0505		0.53	[-0.05; 1.10]	2.5%
	GSE25097_GPL10687	268	3.01	0.3100	289	3.01	0.3178	+	0.01	[-0.16; 0.17]	3.5%
	GSE33294_GPL10999	3	5.00	0.9661	3	3.15	0.3827	+	2.02	[-0.50; 4.54]	0.4%
	GSE46408_GPL4133	6	12.62	0.6563	6	11.34	0.5048		2.02	[0.52; 3.52]	1.0%
	GSE46444_GPL13369	88	8.26	2.1404	48	8.38	2.3551		-0.05	[-0.40; 0.30]	3.1%
	GSE50579_GPL14550	67	3.55	0.1035	10	3.46	0.1215	-	0.83	[0.16; 1.51]	2.3%
	GSE54238_GPL16955	26	10.58	1.0224	30	9.63	0.6539	<u>=</u>	1.11	[0.54; 1.67]	2.6%
	GSE55048_GPL9115	4	4.27	0.4010	4	2.43	0.2150	L	- 4.97	[1.28; 8.66]	0.2%
	GSE56545_GPL15433	21	3.50	0.1101	21	3.46	0.0994		0.37	[-0.24; 0.98]	2.5%
	GSE57555_GPL16699	5	0.04	0.1669	5	-0.02	0.1141		0.32	[-0.93; 1.57]	1.2%
	GSE59259_GPL18451	8	10.99	0.5178	8	10.60	0.2466		0.90	[-0.14; 1.95]	1.5%
	GSE60502_GPL96	18	9.14	0.8616	18	8.52	0.6342		0.80	[0.12; 1.48]	2.3%
	GSE63898_GPL13667	228	8.67	0.8245	168	8.70	1.2142	+ T:	-0.02	[-0.22; 0.17]	3.4%
	GSE67764_GPL17077	3	1.35	0.2207	6	1.63	0.3300		-0.82	[-2.30; 0.65]	1.0%
	GSE76311_GPL17586	62	3.04	0.1087	59	2.97	0.1245		0.64	[0.27; 1.00]	3.1%
	TCGA_GTEx_liver	371	4.08	0.6938	276	3.94	0.9731	* B	0.17	[0.02; 0.33]	3.5%
	Random effects model	3941			3443			•	0.54	[0.37; 0.71]	100.0%
	Heterogeneity: $I^2 = 89\%$, t	$^{2} = 0.2^{2}$	130, p <	0.01							
								-5 0 5			



Figure S5 Integrative analysis of HSPH1 expression in HCC tissues for external datasets. (A) SMD forest plot of HSPH1. (B) No insignificant publication bias of HSPH1 expression was found in the included datasets. SD, standard deviation; SMD, standardized mean difference; CI, confidence interval; HCC, hepatocellular carcinoma.



Figure S6 Integrative analysis presenting the sensitivity and specificity forest plot of CDK4.



Figure S7 Integrative analysis presenting the sensitivity and specificity forest plot of HSP90AA1.



Figure S8 Integrative analysis presenting the sensitivity and specificity forest plot of HSPA5.



Figure S9 Integrative analysis presenting the sensitivity and specificity forest plot of HSPA8.



Figure S10 Integrative analysis presenting the sensitivity and specificity forest plot of HSPH1.



Figure S11 Immune infiltration and survival analysis of the 5 candidate genes. (A) Immune infiltration analysis of the 5 candidate genes. (B) Survival analysis of the 5 candidate genes.



Figure S12 Clustering effect of nonnegative matrix factorization (NMF) with k = 2, 4–10 based on the heatmap and analysis of the silhouette.