

Supplementary Table 1: NUSAP1 Pan-cancer analysis

UniProt KB/ SwissProt AC	Gene Symbol	Log2 Fold Change	P-value	Adj. P-value	Significant	Expression Trend	TCGA Study
Q9BXS6	NUSAP1	3.13	1.92E-219	1.00E-216	Yes	up	lung cancer
Q9BXS6	NUSAP1	3.05	2.72E-199	2.87E-196	Yes	up	breast cancer
Q9BXS6	NUSAP1	2.95	2.36E-75	8.30E-73	Yes	up	uterine cancer
Q9BXS6	NUSAP1	2.28	2.55E-45	4.07E-43	Yes	up	liver cancer
Q9BXS6	NUSAP1	2	1.99E-15	6.46E-13	Yes	up	esophageal cancer
Q9BXS6	NUSAP1	1.97	3.44E-90	3.23E-88	Yes	up	kidney cancer
Q9BXS6	NUSAP1	1.85	2.79E-15	1.40E-13	Yes	up	bladder cancer
Q9BXS6	NUSAP1	1.41	1.80E-19	1.08E-17	Yes	up	stomach cancer
Q9BXS6	NUSAP1	1.19	1.18E-19	2.40E-18	Yes	up	head_and_neck cancer
Q9BXS6	NUSAP1	1.08	1.16E-29	1.79E-28	Yes	up	colorectal cancer
Q9BXS6	NUSAP1	0.87	1.64E-07	7.82E-07	Yes	up	prostate cancer
Q9BXS6	NUSAP1	0.29	0.0448	0.0757	No	up	thyroid cancer

Supplementary Table 2: NUSAP1 associated transcriptional factors

Index	Name	P-value	Adjusted p-value	Odds Ratio	Combined score
1	E2F1 human	0.001936	0.009678	37.61	234.96
2	ASCL1 mouse	0.004492	0.01123	277.53	1500.17
3	ATF1 human	0.01194	0.01863	96.46	427.12
4	YBX1 human	0.01490	0.01863	76.48	321.69
5	AR human	0.04555	0.04555	24.03	74.23

Probe Id (Gene symbol): E2F1: 2028_s_at, E2F2: 207042_at, E2F3: 203693_s_at, E2F4: 202248_at, E2F5: 221586_s_at, E2F6: 203957_at, E2F7: 228033_at, E2F8: 219990_at

Supplementary Table 3: Lung cancer Patients Survival Index

S.NO.	Gene	Index	Patient Number	Hazard Ratio	CI	Log(P)	Low expression cohort (months)	High expression cohort (months)
1	E2F1	OS	2166	1.45	1.28-1.63	1.1e-09	89	52.97
		FP	1252	2.1	1.76-2.5	<1e-16	33.13	10.28
		PPS	477	1.15	0.93-1.41	0.2	15.7	11
2	E2F2	OS	2166	1.12	0.99-1.26	0.065	73	67
		FP	1252	1.18	1-1.4	0.054	164	75
		PPS	477	1.1	0.89-1.35	0.39	13.6	13
3	E2F3	OS	2166	0.91	0.81-1.02	0.12	69	72
		FP	1252	0.97	0.82-1.14	0.7	94	93
		PPS	477	1.12	0.91-1.38	0.29	15.62	11
4	E2F4	OS	2166	1.31	1.16-1.48	8.4e-06	80.03	59.53
		FP	1252	1.69	1.42-2	1.6e-09	25.73	11.83
		PPS	477	0.95	0.77-1.17	0.65	12.32	14.98
5	E2F5	OS	2166	0.92	0.82-1.04	0.18	68	71
		FP	1252	1.1	0.93-1.3	0.27	93	81
		PPS	477	1.03	0.84-1.27	0.78	14.98	12
6	E2F6	OS	2166	0.96	0.86-1.09	0.55	69	71
		FP	1252	0.94	0.8-1.12	0.49	79	102
		PPS	477	1.02	0.83-1.25	0.87	13.57	13.2
7	E2F7	OS	2166	1.6	1.38-1.86	4e-10	107	53
		FP	1252	1.81	1.45-2.26	1.1e-07	34.9	15.43
		PPS	477	1.24	0.92-1.66	0.15	15	9
8	E2F8	OS	2166	1.39	1.24-1.57	4.4e-08	85	51
		FP	1252	1.58	1.33-1.87	1.2e-07	26	12.13
		PPS	477	1.24	1-1.52	0.045	16.94	10.87

Supplementary Table 4: Overall survivality based on Histology of Lung Cancer

S.NO.	Gene	Index		Patient Number	Hazard Ratio	CI	Log(P)	Low expression cohort (months)	High expression cohort (months)
1	E2F1	Histology	Adenocarcinoma	1161	1.53	1.29-1.81	1.1e-06	108	64
			Squamous cell Carcinoma	780	1.06	0.87-1.28	0.56	56	54.57
2	E2F4	Histology	Adenocarcinoma	1161	1.55	1.3-1.84	5.5e-07	107	68
			Squamous cell Carcinoma	780	1.12	0.92-1.36	0.26	57	54
3	E2F7	Histology	Adenocarcinoma	1161	1.15	0.9-1.46	0.25	110.27	90
			Squamous cell Carcinoma	780	0.81	0.64-1.02	0.068	51.27	65
4	E2F8	Histology	Adenocarcinoma	1161	1.26	1.07-1.5	0.0073	96	74
			Squamous cell Carcinoma	780	0.98	0.81-1.19	0.83	59.53	54

Supplementary Table 5: Overall survival of Lung Adenocarcinoma patients based on Stages

S.NO.	Gene	Index		Patient Number	Hazard Ratio	CI	Log(P)	Low expression cohort (months)	High expression cohort (months)
1	E2F1	Stage	1	370	2.11	1.41-3.15	0.00019	76	40.97
		Stage	2	136	2.07	1.27-3.37	0.0031	88.7	32.95
		Stage	3	24	0.6	0.21-1.71	0.33	15	52
2	E2F4	Stage	1	370	1.3	0.88-1.92	0.18	56.5	47.63
		Stage	2	136	1.45	0.9-2.34	0.13	68.67	44.83
		Stage	3	24	2.08	0.75-5.78	0.15	40.77	15
3	E2F8	Stage	1	370	1.54	1.03-2.29	0.033	72	47.63
		Stage	2	136	0.69	0.42-1.11	0.13	48	68
		Stage	3	24	2.1	0.72-6.09	0.16	52	26.09

Supplementary Table 6: Overall Survival of Lung adenocarcinoma patients based on Gender

S.NO.	Gene	Index		Patient Number	Hazard Ratio	CI	Log(P)	Low expression cohort (months)	High expression cohort (months)
1	E2F1	Gender	Male	566	1.34	1.06-1.7	0.013	95.07	64
		Gender	Female	537	1.89	1.43-2.49	4.2e-06	116	71
2	E2F8	Gender	Male	566	1.23	0.98-1.56	0.078	79	62
		Gender	Female	537	1.28	0.97-1.68	0.078	96.2	96

Supplementary Table 7: Overall Survival of Lung adenocarcinoma patients based on Smoking History

S.NO.	Gene	Index		Patient Number	Hazard Ratio	CI	Log(P)	Low expression cohort (months)	High expression cohort (months)
1	E2F1	Smoking History	Smoker	546	1.63	1.25-2.12	0.00026	116	65
		Smoking History	Non-Smoker	192	2.35	1.26-4.38	0.0054	NA	NA

Supplementary Table 8: hsa-let-7b-5p Pan-Cancer analysis

Cancer type	Fold change	log2 (Fold change)	Mean RPM* (tumor)	Mean RPM* (normal)	p-value	adjusted p-value
Lung adenocarcinoma	-3.27	-1.71	15765.4	51536.4	1.14e-20	1.69e-19
Pheochromocytoma and Paraganglioma	-2.79	-1.48	5553.68	15491.32	0.00392	0.0382
Cervical squamous cell carcinoma and endocervical adenocarcinoma	-1.94	-0.96	17404.89	33843.83	0.0172	0.0568
Lung squamous cell carcinoma	-1.83	-0.87	16297.65	29783.76	1.47e-17	7.23e-17
Skin Cutaneous Melanoma	-1.79	-0.84	24352.91	43620.56	0.192	0.652
Uterine Corpus Endometrial Carcinoma	-1.58	-0.66	16997.1	26893.93	1.02e-9	3.07e-9
Stomach adenocarcinoma	-1.55	-0.63	10410.91	16156.76	0.00000806	0.0000244
Stomach and Esophageal carcinoma	-1.52	-0.6	10349.3	15704.5	3.03e-7	0.00000105
Bladder Urothelial Carcinoma	-1.47	-0.55	10460.37	15330.69	0.0000428	0.000114
Esophageal carcinoma	-1.39	-0.48	10196.22	14185.2	0.00933	0.0283
Head and Neck squamous cell carcinoma	-1.38	-0.46	18044.25	24873.48	0.00000683	0.0000154
Thyroid carcinoma	-1.3	-0.37	10040.22	13014.25	0.00000216	0.00000605
Liver hepatocellular carcinoma	-1.29	-0.37	7843.56	10139.78	1.09e-7	3.14e-7
Breast invasive carcinoma	-1.26	-0.33	30489.15	38406.47	1.04e-9	2.12e-9
Kidney Chromophobe	-1.23	-0.3	10251.82	12636.48	0.0297	0.0441
Kidney renal papillary cell carcinoma	-1.11	-0.14	7285.97	8054.57	0.0151	0.0205
Prostate adenocarcinoma	-1.1	-0.13	8613.99	9456.46	0.00212	0.00354
Thymoma	1.13	0.17	44997.96	39927.43	0.946	0.991

Pan-kidney cohort (KICH+KIRC+KIRP)	1.27	0.34	11727.82	9234.01	0.00000263	0.00000424
Cholangiocarcinoma	1.6	0.68	16521.7	10310.43	0.0759	0.14
Pancreatic adenocarcinoma	1.71	0.77	19633.89	11503.7	0.0105	0.217
Kidney renal clear cell carcinoma	1.78	0.83	14848.28	8346.26	4.36e-22	2.18e-21

Supplementary Table 9: NUSAP1- lncRNAs analysis

Index	Name	P-value	Adjusted p-value	Odds Ratio	Combined score
1	TMPO-AS1	1.344e-20	9.675e-19	1968.03	90049.77
2	PRC1-AS1	1.309e-17	1.885e-16	865.13	33631.66
3	SGO1-AS1	1.309e-17	1.885e-16	865.13	33631.66
4	HMMR-AS1	1.309e-17	1.885e-16	865.13	33631.66
5	DIAPH3-AS1	1.309e-17	1.885e-16	865.13	33631.66
6	CSRP3-AS1	7.476e-15	7.689e-14	499.21	16237.80
7	LINC01775	7.476e-15	7.689e-14	499.21	16237.80
8	RRM1-AS1	2.772e-12	1.996e-11	317.49	8448.82
9	POLH-AS1	2.772e-12	1.996e-11	317.49	8448.82
10	DEPDC1-AS1	2.772e-12	1.996e-11	317.49	8448.82

Supplementary Table 10: Cyclin-CDks

CDK's	4	6	2	2	1
Cyclins	D		E	A	B
CDK's					
	4	6	2	2	1
NUSAP1	0.37	0.23	0.74		0.88
E2F1	0.43	0.02	0.64		0.63
TMPO-AS1	0.24	0.2	0.64		0.62
hsa-let-7b-5p	0.08	0.06	-0.2		-0.31
Cyclins					
	D		E	A	B
NUSAP1	-0.15		0.68	0.006	0.84
E2F1	-0.18		0.68	-0.06	0.65
TMPO-AS1	-0.24		0.52	0.06	0.58
hsa-let-7b-5p	-0.08		-0.37	0.06	-0.37

Supplementary Table 11: Apoptotic Genes

S.No.	Symbol	Name	hsa-let-7b-5p
1	AIFM1	apoptosis-inducing factor, mitochondrion-associated, 1	-0.145
2	AKT1	v-akt murine thymoma viral oncogene homolog 1	0.010
3	AKT2	v-akt murine thymoma viral oncogene homolog 2	-0.207
4	AKT3	v-akt murine thymoma viral oncogene homolog 3	-0.029
5	APAF1	apoptotic peptidase activating factor 1	-0.053
6	ATM	ATM serine/ threonine kinase	0.066
7	BAD	BCL2-associated agonist of cell death	-0.012
8	BAX	BCL2-associated X protein	-0.193
9	BCL2	B-cell CLL/lymphoma 2	0.086
10	BCL2L1	BCL2-like 1	0.011
11	BID	BH3 interacting domain death agonist	-0.006
12	BIRC2	baculoviral IAP repeat containing 2	0.142
13	BIRC3	baculoviral IAP repeat containing 3	0.083
14	CAPN1	calpain 1, (mu/I) large subunit	0.082
15	CAPN2	calpain 2, (m/II) large subunit	0.128
16	CASP10	caspase 10, apoptosis-related cysteine peptidase	0.140
17	CASP3	caspase 3, apoptosis-related cysteine peptidase	-0.043
18	CASP6	caspase 6, apoptosis-related cysteine peptidase	-0.036
19	CASP7	caspase 7, apoptosis-related cysteine peptidase	0.125
20	CASP8	caspase 8, apoptosis-related cysteine peptidase	0.033
21	CASP9	caspase 9, apoptosis-related cysteine peptidase	-0.062

S.No.	Symbol	Name	hsa-let-7b-5p
22	CFLAR	CASP8 and FADD-like apoptosis regulator	0.017
23	CHUK	conserved helix-loop-helix ubiquitous kinase	-0.072
24	CSF2RB	colony stimulating factor 2 receptor, beta, low-affinity (granulocyte-macrophage)	0.092
25	CYCS	cytochrome c, somatic	-0.122
26	DFFA	DNA fragmentation factor, 45kDa, alpha polypeptide	-0.045
27	DFFB	DNA fragmentation factor, 40kDa, beta polypeptide (caspase-activated DNase)	-0.009
28	ENDOG	endonuclease G	-0.081
29	FADD	Fas (TNFRSF6)-associated via death domain	-0.133
30	FAS	Fas cell surface death receptor	0.231
31	FASLG	Fas ligand (TNF superfamily, member 6)	-0.037
32	IKBKB	inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase beta	0.064
33	IKBKG	inhibitor of kappa light polypeptide gene enhancer in B-cells, kinase gamma	-0.163
34	IL1A	interleukin 1, alpha	0.034
35	IL1B	interleukin 1, beta	0.039
36	IL1R1	interleukin 1 receptor, type I	0.182
37	IL1RAP	interleukin 1 receptor accessory protein	0.045
38	IL3	interleukin 3	-0.055
39	IL3RA	interleukin 3 receptor, alpha (low affinity)	-0.003
40	IRAK1	interleukin-1 receptor-associated kinase 1	-0.257
41	IRAK2	interleukin-1 receptor-associated kinase 2	0.066

S.No.	Symbol	Name	hsa-let-7b-5p
42	IRAK3	interleukin-1 receptor-associated kinase 3	0.199
43	IRAK4	interleukin-1 receptor-associated kinase 4	-0.043
44	MAP3K14	mitogen-activated protein kinase kinase kinase 14	-0.032
45	MYD88	myeloid differentiation primary response 88	0.112
46	NFKB1	nuclear factor of kappa light polypeptide gene enhancer in B-cells 1	0.165
47	NFKB2	nuclear factor of kappa light polypeptide gene enhancer in B-cells 2 (p49/p100)	-0.113
48	NFKBIA	nuclear factor of kappa light polypeptide gene enhancer in B-cells inhibitor, alpha	-0.023
49	NTRK1	neurotrophic tyrosine kinase, receptor, type 1	0.025
50	PIK3CA	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit alpha	0.015
51	PIK3CB	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit beta	-0.043
52	PIK3CD	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit delta	0.029
53	PIK3CG	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit gamma	0.201
54	PIK3R1	phosphoinositide-3-kinase, regulatory subunit 1 (alpha)	0.296
55	PIK3R2	phosphoinositide-3-kinase, regulatory subunit 2 (beta)	-0.134
56	PIK3R3	phosphoinositide-3-kinase, regulatory subunit 3 (gamma)	0.090
57	PIK3R5	phosphoinositide-3-kinase, regulatory subunit 5	0.036

S.No.	Symbol	Name	hsa-let-7b-5p
58	PPP3CA	protein phosphatase 3, catalytic subunit, alpha isozyme	0.258
59	PPP3CB	protein phosphatase 3, catalytic subunit, beta isozyme	0.103
60	PPP3CC	protein phosphatase 3, catalytic subunit, gamma isozyme	0.148
61	PPP3R1	protein phosphatase 3, regulatory subunit B, alpha	-0.017
62	PPP3R2	protein phosphatase 3, regulatory subunit B, beta	0.032
63	PRKACA	protein kinase, cAMP-dependent, catalytic, alpha	-0.065
64	PRKACB	protein kinase, cAMP-dependent, catalytic, beta	0.190
65	PRKACG	protein kinase, cAMP-dependent, catalytic, gamma	0.081
66	PRKAR1A	protein kinase, cAMP-dependent, regulatory, type I, alpha	0.153
67	PRKAR1B	protein kinase, cAMP-dependent, regulatory, type I, beta	-0.000
68	PRKAR2A	protein kinase, cAMP-dependent, regulatory, type II, alpha	0.071
69	PRKAR2B	protein kinase, cAMP-dependent, regulatory, type II, beta	0.074
70	RELA	v-rel avian reticuloendotheliosis viral oncogene homolog A	-0.107
71	RIPK1	receptor (TNFRSF)-interacting serine-threonine kinase 1	0.014
72	TNF	tumor necrosis factor	-0.042
73	TNFRSF10A	tumor necrosis factor receptor superfamily, member 10a	0.142

S.No.	Symbol	Name	hsa-let-7b-5p
74	TNFRSF10B	tumor necrosis factor receptor superfamily, member 10b	0.048
75	TNFRSF10C	tumor necrosis factor receptor superfamily, member 10c, decoy without an intracellular domain	0.099
76	TNFRSF10D	tumor necrosis factor receptor superfamily, member 10d, decoy with truncated death domain	0.053
77	TNFRSF1A	tumor necrosis factor receptor superfamily, member 1A	-0.006
78	TNFSF10	tumor necrosis factor (ligand) superfamily, member 10	0.199
79	TP53	tumor protein p53	0.121
80	TRADD	TNFRSF1A-associated via death domain	-0.008
81	TRAF2	TNF receptor-associated factor 2	-0.173

Supplementary Table 12: Apoptotic genes vs. lncRNA/mRNA

S.No.	Symbol	Name	TMPO-AS1	NUSAP1
1	PIK3CG	phosphatidylinositol-4,5-bisphosphate 3-kinase, catalytic subunit gamma	-0.092	-0.059
2	PIK3R1	phosphoinositide-3-kinase, regulatory subunit 1 (alpha)	-0.201	-0.288
3	FAS	Fas cell surface death receptor	-0.217	-0.122
4	PPP3CA	protein phosphatase 3, catalytic subunit, alpha isozyme	-0.327	-0.218