

Supplemental Data

Supplemental Table S1. List of classified fusions along with prevalence reported by tumor site *.

| Specimen Type | Gene Fusion | # of patients | |
|-----------------------------------|---------------------------|---------------|----------------|
| | | with fusion | Prevalence (%) |
| Prostatic adenocarcinoma (N = 89) | <i>TMPRSS2-ERG</i> | 18 | 20.22% |
| | <i>TMPRSS2-ETV4</i> | 1 | 1.12% |
| | <i>TMPRSS2-RUNX1</i> | 1 | 1.12% |
| | <i>TMPRSS2-ETV1</i> | 1 | 1.12% |
| | <i>FOXP1-RALGAPB</i> | 1 | 1.12% |
| | <i>GPS2-WRAP53</i> | 1 | 1.12% |
| | <i>FOXP1-ATP5L</i> | 1 | 1.12% |
| | <i>QSOX1-ABL2</i> | 1 | 1.12% |
| | <i>PTEN-PANK1</i> | 1 | 1.12% |
| | <i>PTEN-KCTD8</i> | 1 | 1.12% |
| | <i>ARID1B-PDE10A</i> | 1 | 1.12% |
| | <i>SUFU-ADK</i> | 1 | 1.12% |
| | <i>SUFU-SAMD8</i> | 1 | 1.12% |
| | <i>FUBP1-ACOT7</i> | 1 | 1.12% |
| | <i>CD58-PBX1</i> | 1 | 1.12% |
| | <i>ACSL3-ETV1</i> | 1 | 1.12% |
| | <i>SETD2-LOC101928323</i> | 1 | 1.12% |
| | <i>SETD2-FHIT</i> | 1 | 1.12% |
| | <i>DECR1-NRG1</i> | 1 | 1.12% |
| | <i>SUZ12-RNF213</i> | 1 | 1.12% |
| | <i>YAF2-RYBP</i> | 1 | 1.12% |
| | <i>ARF4-KMT2A</i> | 1 | 1.12% |
| | <i>SPOP-FAM117A</i> | 1 | 1.12% |
| | <i>YWHAZ-SMAD2</i> | 1 | 1.12% |
| | <i>KDM6A-RANBP17</i> | 1 | 1.12% |
| | <i>EP400-RCSD1</i> | 1 | 1.12% |
| | <i>ITGA9-MLH1</i> | 1 | 1.12% |
| | <i>ATP5L-FOXP1</i> | 1 | 1.12% |
| | <i>IGF2BP1-TP53</i> | 1 | 1.12% |
| | <i>LMAN2-TP53</i> | 1 | 1.12% |
| | <i>SLC45A3-ERG</i> | 1 | 1.12% |
| | Total | 48 | 53.93% |
| Uterine sarcoma (N = 62) | <i>YAF2-RYBP</i> | 4 | 6.44% |
| | <i>EPC1-EED</i> | 2 | 3.22% |
| | <i>CCDC157-EWSR1</i> | 1 | 1.61% |
| | <i>ERBB4-FN1</i> | 1 | 1.61% |
| | <i>JAZF1-SUZ12</i> | 1 | 1.61% |

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| <i>MECOM-LRRC31</i> | 1 | 1.61% |
| <i>MECOM-LRRC34</i> | 1 | 1.61% |
| <i>MECOM-SGCG</i> | 1 | 1.61% |
| <i>NCAPD2-SPOP</i> | 1 | 1.61% |
| <i>UBAP2-ARID4B</i> | 1 | 1.61% |
| <i>ESR1-LMO3</i> | 1 | 1.61% |
| <i>LPP-RAF1</i> | 1 | 1.61% |
| <i>ABL1-NCS1</i> | 1 | 1.61% |
| <i>AXIN1-TMEM8A</i> | 1 | 1.61% |
| <i>TFDP2-ATR</i> | 1 | 1.61% |
| <i>XRCC5-BARD1</i> | 1 | 1.61% |
| <i>POC1A-BAP1</i> | 1 | 1.61% |
| <i>COL1A1-PDGFB</i> | 1 | 1.61% |
| <i>NF1-BBS4</i> | 1 | 1.61% |
| <i>KMT2B-STARD10</i> | 1 | 1.61% |
| <i>SMARCA4-CARM1</i> | 1 | 1.61% |
| Total | 25 | 40.32% |

Esophageal and Esophagogastric Junction
Cancers (N = 37)

| | | |
|------------------------|-----------|---------------|
| <i>FGFR2-NRAP</i> | 1 | 2.70% |
| <i>ZFHX3-LINC01572</i> | 1 | 2.70% |
| <i>FBXL20-CDK12</i> | 1 | 2.70% |
| <i>RARA-LRRC20</i> | 1 | 2.70% |
| <i>KIF13B-DUSP4</i> | 1 | 2.70% |
| <i>ITSN1-RUNX1</i> | 1 | 2.70% |
| <i>CDKN2A-NEK6</i> | 1 | 2.70% |
| <i>ERF-IMPG1</i> | 1 | 2.70% |
| <i>TRAF7-CREBBP</i> | 1 | 2.70% |
| <i>P3H2-MECOM</i> | 1 | 2.70% |
| Total | 11 | 29.73% |

Breast cancer (N = 224)

| | | |
|---------------------|---|-------|
| <i>YAF2-RYBP</i> | 4 | 1.80% |
| <i>DDX5-AXIN2</i> | 1 | 0.45% |
| <i>SPOP-ANKFN1</i> | 1 | 0.45% |
| <i>DDX5-CDC73</i> | 1 | 0.45% |
| <i>RB1-RBM47</i> | 1 | 0.45% |
| <i>CDH1-ANKRD28</i> | 1 | 0.45% |
| <i>FGFR2-NKX1-2</i> | 1 | 0.45% |
| <i>ANKRD28-CDH1</i> | 1 | 0.45% |
| <i>COIL-BRIP1</i> | 1 | 0.45% |
| <i>SAYS1-MAP3K1</i> | 1 | 0.45% |
| <i>TANC2-BRIP1</i> | 1 | 0.45% |
| <i>RARA-PIPOX</i> | 1 | 0.45% |
| <i>RARA-CASC3</i> | 1 | 0.45% |

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|-----------------------|---|-------|
| <i>FOXP1-DLGAP1</i> | 1 | 0.45% |
| <i>ARID1B-VPS13D</i> | 1 | 0.45% |
| <i>GTF2I-SRRM3</i> | 1 | 0.45% |
| <i>ABL1-FUBP3</i> | 1 | 0.45% |
| <i>BMPR1A-SARNP</i> | 1 | 0.45% |
| <i>ARID5B-TSPAN14</i> | 1 | 0.45% |
| <i>ZNF814-FOXO1</i> | 1 | 0.45% |
| <i>SCAF4-ERG</i> | 1 | 0.45% |
| <i>CREBBP-FGD4</i> | 1 | 0.45% |
| <i>TP53BP1-STRC</i> | 1 | 0.45% |
| <i>SUZ12P1-CDK12</i> | 1 | 0.45% |
| <i>AHI1-ESR1</i> | 1 | 0.45% |
| <i>PMP22-NCOR1</i> | 1 | 0.45% |
| <i>ATXN1-PTPRD</i> | 1 | 0.45% |
| <i>WRAP53-TP53</i> | 1 | 0.45% |
| <i>GIN53-INPP4B</i> | 1 | 0.45% |
| <i>BDP1-RAD50</i> | 1 | 0.45% |
| <i>ESR1-AKAP12</i> | 1 | 0.45% |
| <i>ESR1-PLEKHG1</i> | 1 | 0.45% |
| <i>ESR1-ARN2</i> | 1 | 0.45% |
| <i>ESR1-FGGY</i> | 1 | 0.45% |
| <i>VHL-BRK1</i> | 1 | 0.45% |
| <i>SPTBN2-LMO2</i> | 1 | 0.45% |
| <i>SDHAF2-LRRC15</i> | 1 | 0.45% |
| <i>INPPL1-PC</i> | 1 | 0.45% |
| <i>PTPRS-CACNA1A</i> | 1 | 0.45% |
| <i>KATNA1-LATS1</i> | 1 | 0.45% |
| <i>PTPN2-C18orf61</i> | 1 | 0.45% |
| <i>SUZ12-CDK12</i> | 1 | 0.45% |
| <i>RAPGEFL1-RUNX1</i> | 1 | 0.45% |

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| Total | 46 | 20.54% |
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Bladder cancer (N = 74)

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|-----------------------|---|-------|
| <i>ZFH3-PKD1L3</i> | 1 | 1.35% |
| <i>GTF2I-GTF2IRD1</i> | 1 | 1.35% |
| <i>NF1-NSF</i> | 1 | 1.35% |
| <i>F11R-SDHC</i> | 1 | 1.35% |
| <i>BCORL1-CASC15</i> | 1 | 1.35% |
| <i>BCORL1-FGF13</i> | 1 | 1.35% |
| <i>BCORL1-UTP14A</i> | 1 | 1.35% |
| <i>MEMO1-NPM1</i> | 1 | 1.35% |
| <i>CWF19L2-YAP1</i> | 1 | 1.35% |
| <i>ATXN2-KCNJ6</i> | 1 | 1.35% |
| <i>ATXN2-ACAD10</i> | 1 | 1.35% |

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|------------------------------------|-----------------------|-----------|---------------|
| | <i>BRD4-PTBP1</i> | 1 | 1.35% |
| | <i>STAG2-GRIA3</i> | 1 | 1.35% |
| | <i>ABL2-PPP2R5C</i> | 1 | 1.35% |
| | <i>CDK16-RBM10</i> | 1 | 1.35% |
| | Total | 15 | 20.27% |
| Soft tissue tumors (N = 93) | <i>SS18-SSX2</i> | 2 | 2.16% |
| | <i>ASXL2-MSH6</i> | 1 | 1.08% |
| | <i>MDM2-KDM6A</i> | 1 | 1.08% |
| | <i>ARID1B-DSE</i> | 1 | 1.08% |
| | <i>SS18-SSX1</i> | 1 | 1.08% |
| | <i>BMPR1A-LYPD5</i> | 1 | 1.08% |
| | <i>NCOR1-DNAH2</i> | 1 | 1.08% |
| | <i>AKT3-CEP170</i> | 1 | 1.08% |
| | <i>RNF20-EPHA3</i> | 1 | 1.08% |
| | <i>SLC25A3-BTG1</i> | 1 | 1.08% |
| | <i>SDHA-ZDHHC11</i> | 1 | 1.08% |
| | <i>MCM8-RAD51B</i> | 1 | 1.08% |
| | <i>RAD50-TOM1L2</i> | 1 | 1.08% |
| | <i>PAX3-FOXO1</i> | 1 | 1.08% |
| | <i>SDCCAG8-AKT3</i> | 1 | 1.08% |
| | <i>RASA1-SULF2</i> | 1 | 1.08% |
| | <i>HMCN1-TP53</i> | 1 | 1.08% |
| | Total | 18 | 19.35% |
| Cancer of unknown primary (N = 78) | <i>ARID1B-TMEM181</i> | 1 | 1.28% |
| | <i>BRD4-ILVBL</i> | 1 | 1.28% |
| | <i>PTEN-PAPPA2</i> | 1 | 1.28% |
| | <i>BMPR1A-LIPF</i> | 1 | 1.28% |
| | <i>AXIN1-RFX1</i> | 1 | 1.28% |
| | <i>CUX1-PINX1</i> | 1 | 1.28% |
| | <i>FAT1-F11-AS1</i> | 1 | 1.28% |
| | <i>AKT3-CEP170</i> | 1 | 1.28% |
| | <i>FAM35A-PTEN</i> | 1 | 1.28% |
| | <i>ZNF317-KEAP1</i> | 1 | 1.28% |
| | <i>ATM-KMT5B</i> | 1 | 1.28% |
| | <i>CDH1-NFAT5</i> | 1 | 1.28% |
| | <i>ARID2-GLIPR1L2</i> | 1 | 1.28% |
| | <i>JAK2-INSL6</i> | 1 | 1.28% |
| | <i>YAF2-RYBP</i> | 1 | 1.28% |
| | Total | 15 | 19.23% |
| Cholangiocarcinoma (N = 42) | <i>FGFR2-WAC</i> | 1 | 2.38% |
| | <i>FGFR2-MKL2</i> | 1 | 2.38% |
| | <i>RALY-DNMT3B</i> | 1 | 2.38% |

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| | <i>SMAD3-IQCH</i> | 1 | 2.38% |
| | <i>SMAD3-LOC1202723481</i> | 1 | 2.38% |
| | <i>ABL1-FUBP3</i> | 1 | 2.38% |
| | <i>MELK-PAX5</i> | 1 | 2.38% |
| | <i>BMP6-MGA</i> | 1 | 2.38% |
| | Total | 8 | 19.05% |
| Neuroendocrine tumor (N = 32) | <i>BRD4-AKAP8L</i> | 1 | 3.13% |
| | <i>RB1-CKAP2</i> | 1 | 3.13% |
| | <i>ARID2-OCIAD1</i> | 1 | 3.13% |
| | <i>USP22-BRD4</i> | 1 | 3.13% |
| | <i>PAX5-ASPA</i> | 1 | 3.13% |
| | <i>SMARCA4-SIL1</i> | 1 | 3.13% |
| | Total | 6 | 18.75% |
| Salivary gland tumor (N = 22) | <i>GTF2I-CDK6</i> | 1 | 4.55% |
| | <i>NFIB-MYB</i> | 2 | 9.09% |
| | <i>NTRK3-ETV6</i> | 1 | 4.55% |
| | Total | 4 | 18.18% |
| Ovarian cancer (N = 362) | <i>YAF2-RYBP</i> | 4 | 1.11% |
| | <i>ESR1-CCDC170</i> | 2 | 0.56% |
| | <i>ASXL2-HADHA</i> | 1 | 0.28% |
| | <i>CREBBP-LOC652276</i> | 1 | 0.28% |
| | <i>CNN2-ARID3A</i> | 1 | 0.28% |
| | <i>KMT2C-LINC00358</i> | 1 | 0.28% |
| | <i>NFAT5-CDH1</i> | 1 | 0.28% |
| | <i>WBP1L-SUFU</i> | 1 | 0.28% |
| | <i>KMT2C-CNTNAP2</i> | 1 | 0.28% |
| | <i>PTPN1-PPARGC1B</i> | 1 | 0.28% |
| | <i>SNW1-ANKRD11</i> | 1 | 0.28% |
| | <i>SETD2-DFFA</i> | 1 | 0.28% |
| | <i>PPP1CB-ANKRD11</i> | 1 | 0.28% |
| | <i>EWSR1-HSCB</i> | 1 | 0.28% |
| | <i>RNF135-NF1</i> | 1 | 0.28% |
| | <i>LPAR2-BRD4</i> | 1 | 0.28% |
| | <i>RYBP-STAG2</i> | 1 | 0.28% |
| | <i>FANCD2-SETD5</i> | 1 | 0.28% |
| | <i>STARD3-RARA</i> | 1 | 0.28% |
| | <i>MECOM-TNIK</i> | 1 | 0.28% |
| | <i>GMEB2-TFE3</i> | 1 | 0.28% |
| | <i>MECOM-TBL1XR1</i> | 1 | 0.28% |
| | <i>MECOM-LRRC34</i> | 1 | 0.28% |
| | <i>SDHC-APC2</i> | 1 | 0.28% |

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| <i>ESR1-MTHFD1L</i> | 1 | 0.28% |
| <i>LOC100133091-CUX1</i> | 1 | 0.28% |
| <i>WNK1-DUSP22</i> | 1 | 0.28% |
| <i>NF1-AKAIN1</i> | 1 | 0.28% |
| <i>BRD4-CYP4F12</i> | 1 | 0.28% |
| <i>BRD4-WDR43</i> | 1 | 0.28% |
| <i>BRD4-DMBT1</i> | 1 | 0.28% |
| <i>ERBB4-GTF3C3</i> | 1 | 0.28% |
| <i>EIF4H-GTF2I</i> | 1 | 0.28% |
| <i>ERBB4-UPB1</i> | 1 | 0.28% |
| <i>ERBB4-DUSP19</i> | 1 | 0.28% |
| <i>ERBB4-FNDC3B</i> | 1 | 0.28% |
| <i>PTEN-SCRN3</i> | 1 | 0.28% |
| <i>ASXL1-BICD1</i> | 1 | 0.28% |
| <i>ASXL1-TM9SF4</i> | 1 | 0.28% |
| <i>FUBP1-USP33</i> | 2 | 0.55% |
| <i>PCM1-MET</i> | 1 | 0.28% |
| <i>HRASLS-TP63</i> | 1 | 0.28% |
| <i>PLCG1-TOP1</i> | 1 | 0.28% |
| <i>ARID4B-SLC35F3</i> | 1 | 0.28% |
| <i>CDH1-CTCF</i> | 1 | 0.28% |
| <i>NPRL3-AXIN1</i> | 1 | 0.28% |
| <i>MRPS35-RAD51</i> | 1 | 0.28% |
| <i>MLLT10-ST6GALNAC4</i> | 1 | 0.28% |
| <i>MAPRE1-DNMT3B</i> | 1 | 0.28% |
| <i>SCAF8-ESR1</i> | 1 | 0.28% |
| <i>NAP1L4-SUFU</i> | 1 | 0.28% |
| <i>ARHGAP21-MLLT10</i> | 1 | 0.28% |
| <i>SMARCA4-PODNL1</i> | 1 | 0.28% |
| <i>EED-RCOR1</i> | 1 | 0.28% |
| <i>SMARCA4-MAST1</i> | 1 | 0.28% |
| <i>KMT2B-YLPM1</i> | 1 | 0.28% |
| <i>MTMR3-NF2</i> | 1 | 0.28% |

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|--------------|-----------|---------------|
| Total | 62 | 17.13% |
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Thyroid Carcinoma (N = 41)

| | | |
|--------------------|---|-------|
| <i>CCDC6-RET</i> | 1 | 2.44% |
| <i>PICALM-BRAF</i> | 1 | 2.44% |
| <i>PAX8-PPARG</i> | 1 | 2.44% |
| <i>MKRN1-PARK2</i> | 1 | 2.44% |
| <i>ABAT-NTRK1</i> | 1 | 2.44% |
| <i>MACF1-BRAF</i> | 1 | 2.44% |
| <i>DOCK9-FOXO1</i> | 1 | 2.44% |

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|--------------|----------|---------------|
| Total | 7 | 17.07% |
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|--------------------------|------------------|-----------|---------------|
| Thymic carcinoma (N = 6) | LYPLAL1-AKT3 | 1 | 16.67% |
| | Total | 1 | 16.67% |
| Glioblastoma (N = 220) | EGFR-SEPT14 | 1 | 0.45% |
| | FGFR3-TACC3 | 3 | 1.35% |
| | FGFR3-TACC1 | 1 | 0.45% |
| | FGFR3-GRPEL1 | 1 | 0.45% |
| | CREBBP-CORO7- | | |
| | PAM16 | 1 | 0.45% |
| | CDKN2A-LINC01239 | 1 | 0.45% |
| | BCR-ABL1 | 1 | 0.45% |
| | CBL-EHD4 | 1 | 0.45% |
| | ZDHHC14-ARID1B | 1 | 0.45% |
| | NBN-LOC101929709 | 1 | 0.45% |
| | BCR-NTRK2 | 1 | 0.45% |
| | TRIM9-RAD51B | 1 | 0.45% |
| | CYLD-WWOX | 1 | 0.45% |
| | NF1-RHOT1 | 1 | 0.45% |
| | CTDSP2-AKT3 | 1 | 0.45% |
| | ARFGEF2-PTPN1 | 1 | 0.45% |
| | FAF1-ARID1A | 1 | 0.45% |
| | ARID1A-ZYG11A | 1 | 0.45% |
| | ARID1A-BSDC1 | 1 | 0.45% |
| | TMEM165-PDGFR | 1 | 0.45% |
| | RB1-GUCY1B2 | 1 | 0.45% |
| | YAP1-NTM | 1 | 0.45% |
| | PDGFR-MACROD2 | 1 | 0.45% |
| | GTF2I-AOAH | 1 | 0.45% |
| | NOTCH1-CLN6 | 1 | 0.45% |
| | CAV1-MET | 1 | 0.45% |
| | NXPH1-MET | 1 | 0.45% |
| | CAPRIN1-NTRK2 | 1 | 0.45% |
| | SESN3-CNTN5 | 1 | 0.45% |
| | BACH2-C6orf52 | 1 | 0.45% |
| | JAK1-SGIP1 | 1 | 0.45% |
| | MLH1-SRGAP3 | 1 | 0.45% |
| | SPECC1L-NTRK2 | 1 | 0.45% |
| | Total | 35 | 15.91% |
| Cervical cancer (N = 34) | FGFR2-RBMS3 | 1 | 2.94% |
| | FNDC3A-RB1 | 1 | 2.94% |
| | BIRC2-YAP1 | 1 | 2.94% |
| | MSH2-EPCAM | 1 | 2.94% |
| | NCOR1-PIK3R6 | 1 | 2.94% |

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|----------------------------------|----------------------------|-----------|---------------|
| | Total | 5 | 14.71% |
| Hepatocellular carcinoma (N = 9) | <i>ZNRF3-NF2</i> | 1 | 11.11% |
| | Total | 1 | 11.11% |
| Colorectal cancer (N = 202) | <i>ZFHX3-LINC01572</i> | 1 | 0.50% |
| | <i>INPP4B-LOC101927636</i> | 1 | 0.50% |
| | <i>CLEC16A-GRIN2A</i> | 1 | 0.50% |
| | <i>NF1-DNAJC7</i> | 1 | 0.50% |
| | <i>ATR-ATP9A</i> | 1 | 0.50% |
| | <i>ABHD17B-EPHA3</i> | 1 | 0.50% |
| | <i>FGFR2-CEP55</i> | 1 | 0.50% |
| | <i>RARA-TBCD</i> | 1 | 0.50% |
| | <i>BMPR1A-WAPL</i> | 1 | 0.50% |
| | <i>AXIN1-NPRL3</i> | 1 | 0.50% |
| | <i>CNOT7-AKT3</i> | 1 | 0.50% |
| | <i>ABCA5-SPOP</i> | 1 | 0.50% |
| | <i>PTPN2-SPIRE1</i> | 1 | 0.50% |
| | <i>SLC35E2B-SPEN</i> | 1 | 0.50% |
| | <i>FUBP3-ABL1</i> | 1 | 0.50% |
| | <i>ZC3H7A-CIITA</i> | 1 | 0.50% |
| | <i>MYO5B-SMAD4</i> | 1 | 0.50% |
| | <i>TPX2-ASXL1</i> | 1 | 0.50% |
| | <i>ATP9A-ATR</i> | 1 | 0.50% |
| | <i>RUNX1-</i> | | |
| | <i>ANKRD20A11P</i> | 1 | 0.50% |
| | <i>KDM5C-ASMTL</i> | 1 | 0.50% |
| | <i>MAMLD1-TCF7L2</i> | 1 | 0.50% |
| | Total | 22 | 10.89% |
| Head and neck cancer (N = 177) | <i>PTEN-LIPK</i> | 1 | 0.60% |
| | <i>FGFR3-TACC3</i> | 2 | 1.20% |
| | <i>FAT1-F11-AS1</i> | 1 | 0.60% |
| | <i>YAP1-ROBO3</i> | 1 | 0.60% |
| | <i>CREBBP-SYNPO2</i> | 1 | 0.60% |
| | <i>ASXL1-NOL4L</i> | 1 | 0.60% |
| | <i>TRAM2-RB1</i> | 1 | 0.60% |
| | <i>MET-CALU</i> | 1 | 0.60% |
| | <i>YAF2-RYBP</i> | 1 | 0.60% |
| | <i>SND1-TP53BP1</i> | 1 | 0.60% |
| | <i>NOTCH1-STKLD1</i> | 1 | 0.60% |
| | <i>CDC42EP4-PAX5</i> | 1 | 0.60% |
| | <i>KMT2C-FAM179B</i> | 1 | 0.60% |
| | <i>VCAM1-RUNX1</i> | 1 | 0.60% |
| | <i>BCL2-KDSR</i> | 1 | 0.60% |

| | Total | 16 | 9.04% |
|--------------------------------------|-----------------------|----|-------|
| Non-small cell lung cancer (N = 751) | <i>EML4-ALK</i> | 13 | 1.73% |
| | <i>KIF5B-RET</i> | 9 | 1.17% |
| | <i>FGFR3-TACC3</i> | 1 | 0.13% |
| | <i>CAPZA2-MET</i> | 1 | 0.13% |
| | <i>KDM4C-PTPRD</i> | 1 | 0.13% |
| | <i>TPM3-NTRK1</i> | 1 | 0.13% |
| | <i>NT5M-NCOR1</i> | 1 | 0.13% |
| | <i>SELENOT-PAX5</i> | 1 | 0.13% |
| | <i>SMARCA4-DNM2</i> | 1 | 0.13% |
| | <i>CREBBP-ADCY9</i> | 1 | 0.13% |
| | <i>DICER1-KCNB1</i> | 1 | 0.13% |
| | <i>NF1-C4orf22</i> | 1 | 0.13% |
| | <i>CHEK2-NF2</i> | 1 | 0.13% |
| | <i>MDK-NRG1</i> | 1 | 0.13% |
| | <i>CNOT2-GRIN2A</i> | 1 | 0.13% |
| | <i>PICALM-EED</i> | 1 | 0.13% |
| | <i>ZDHHC18-ARID1A</i> | 1 | 0.13% |
| | <i>FOXP1-KIF5A</i> | 1 | 0.13% |
| | <i>FOXP1-ROBO2</i> | 1 | 0.13% |
| | <i>GTF2I-GTF2IRD1</i> | 1 | 0.13% |
| | <i>ABL1-FUBP3</i> | 1 | 0.13% |
| | <i>TET1-ADK</i> | 1 | 0.13% |
| | <i>MED1-CDK12</i> | 1 | 0.13% |
| | <i>FXR2-TP53</i> | 1 | 0.13% |
| | <i>MYC-PVT1</i> | 1 | 0.13% |
| | <i>CUX1-PAN3</i> | 1 | 0.13% |
| | <i>GLIS3-PAX5</i> | 1 | 0.13% |
| | <i>SLC3A2-NRG1</i> | 1 | 0.13% |
| | <i>IARS-FANCC</i> | 1 | 0.13% |
| | <i>RSBN1-PIK3R3</i> | 1 | 0.13% |
| | <i>CAMKMT-ALK</i> | 1 | 0.13% |
| | <i>YAF2-RYBP</i> | 1 | 0.13% |
| | <i>PTPRS-SLC38A10</i> | 1 | 0.13% |
| | <i>MTAP-PTRD</i> | 1 | 0.13% |
| | <i>MECOM-PCOLCE2</i> | 1 | 0.13% |
| | Total | 55 | 7.32% |
| Small cell lung cancer (N = 14) | <i>DTNB-ASXL2</i> | 1 | 7.14% |
| | Total | 1 | 7.14% |
| Melanoma (N = 138) | <i>RSF1-EED</i> | 1 | 0.72% |
| | <i>CDKN2A-NTM</i> | 1 | 0.72% |
| | <i>BPTF-BRIP1</i> | 1 | 0.72% |

| | | | |
|------------------------------------------|------------------------|---|-------|
| | <i>AGAP3-BRAF</i> | 1 | 0.72% |
| | <i>YAP1-CNTN5</i> | 1 | 0.72% |
| | <i>AHCTF1-TSC1</i> | 1 | 0.72% |
| | <i>ARID4A-TENM4</i> | 1 | 0.72% |
| | <i>SPRED1-GPR176</i> | 1 | 0.72% |
| | <i>SLMAP-SOX9</i> | 1 | 0.72% |
| | Total | 9 | 6.52% |
| Kidney cancer (N = 18) | <i>EIF3H-RAD21</i> | 1 | 5.56% |
| | Total | 1 | 5.56% |
| Low grade glioma (N = 22) | <i>ATG5-PARK2</i> | 1 | 4.55% |
| | Total | 1 | 4.55% |
| Gastrointestinal stromal tumors (N = 24) | <i>ZFHX3-LINC01572</i> | 1 | 4.17% |
| | Total | 1 | 4.17% |
| Pancreatic adenocarcinoma (N = 186) | <i>NF1-RHOT1</i> | 1 | 0.54% |
| | <i>INPP4B-BANK1</i> | 1 | 0.54% |
| | <i>SMARCA4-LSM14A</i> | 1 | 0.54% |
| | <i>SKIL-MECOM</i> | 1 | 0.54% |
| | <i>MAP3K5-ALK</i> | 1 | 0.54% |
| | <i>DIAPH3-BRCA2</i> | 1 | 0.54% |
| | <i>SMAD3-PLEKHG3</i> | 1 | 0.54% |
| | Total | 7 | 3.76% |
| Gastric adenocarcinoma (N =33) | <i>MECOM-PHC3</i> | 1 | 3.03% |
| | Total | 1 | 3.03% |

Supplemental Table S2. Breakpoints and topology of recurrent unclassified fusions.

| Fusion | Junction Reads | Breakpoint | In Frame | Topology |
|----------------------|----------------|----------------------------------------------------------------------------------------------|----------|---------------|
| <i>BMPR1B-PDLIM5</i> | 3 | Intron 2 of <i>BMPR1B</i> with exon 13 of <i>PDLIM5</i> (chr4:95679219:+/chr4:95561427:+) | No | Deletion |
| <i>BMPR1B-PDLIM5</i> | 3 | Exon 10 of <i>BMPR1B</i> with exon 4 of <i>PDLIM5</i> (chr4:96073924:+/chr4:95496767:+) | Yes | Deletion |
| <i>BMPR1B-PDLIM5</i> | 9 | Exon 1 of <i>BMPR1B</i> with exon 3 of <i>PDLIM5</i> (chr4:95679219:+/chr4:95444875:+) | No | Deletion |
| <i>NIPBL-RAI14</i> | 19 | Exon 1 of <i>NIPBL</i> with exon 4 of <i>RAI14</i> (chr5:36877280:+/chr5:34796044:+) | No | Deletion |
| <i>NIPBL-PIEZO1</i> | 9 | Exon 10 of <i>NIPBL</i> with exon 23 of <i>PIEZO1</i> (chr5:36985500:+/chr16:88794069:-) | Yes | Translocation |
| <i>NIPBL-SLC1A3</i> | 5 | Exon 1 of <i>NIPBL</i> with exon 4 of <i>SLC1A3</i> (chr5:36877280:+/chr5:36608431:+) | No | Deletion |
| <i>TTC6-MIPOL1</i> | 4 | Exon 3 of <i>TTC6</i> with exon 13 of <i>MIPOL1</i> (chr14:38092208:+/chr14:37892060:+) | No | Deletion |
| <i>TTC6-MIPOL1</i> | 17 | Exon 5 of <i>TTC6</i> with exon 14 of <i>MIPOL1</i> (chr14:38152169:+/chr14:37969113:+) | No | Deletion |

| | | | | |
|--------------------------|----|-------------------------------------------------------------------------------------------------|----|---------------|
| <i>MIPOL1-TTC6</i> | 12 | Exon 13 of <i>MIPOL1</i> with exon 4 of <i>TTC6</i> (chr14:37892154:+/chr14:38149356:+) | No | Deletion |
| <i>PAK1-TEX14</i> | 82 | Exon1 of <i>PAK1</i> with exon 2 of <i>TEX14</i> (chr11:77184597:-/chr17:56729363:-) | No | Translocation |
| <i>PAK1-MMP20</i> | 7 | Exon 1 of <i>PAK1</i> and exon 6 of <i>MMP20</i> (chr11:77184597:-/chr11:102477407:-) | No | Deletion |
| <i>PAK1-LOC101928896</i> | 4 | Exon 1 of <i>PAK1</i> and exon 4 of <i>LOC101928896</i> (chr11:77184597:-/chr11:78269310:+) | No | Inversion |