### Supplementary Table S1. Loadings of the first sPCs, by sPCA, for selected blocks.

| DNA          | mRNA           | miRNA        |
|--------------|----------------|--------------|
| **D4**       |                |              |
| ALK_E183_R   | BCL3_E71_F     | GLP1R        |
| KRAS_P951_F  | COL6A1_P425_F  | PTPRZ1       |
| JNFRG2_E164_F| MCAI_P265_R    | NCR2         |
| RASA1_E107_F | INHA_P1144_R   | KIAA0953     |
| CCKR6_P361_R | CD34_E20_R     | SLCA3        |
| TGFP9_P682_R | EPS8_E231_F    | GRI3         |
| PTCH1_E42_F  | IGSR4C_E65_F   | CNGB1        |
| APC_E117_R   | BCAI_P305_F    | AVPR1A       |
| WNT5A_E43_F  | KLF5_E190_R    | RBM35B       |
| EFNK3_E17_F  | LAMB1_E144_R   | SOX2         |
| CDKNIC_P6_R  | ITGB1_P451_F   | hsa-miR-602  |
| GAS1_P754_R  | PCCF4_P760_R   | hsa-miR-563  |
| CDKN2B_E220_F| FGFR1_E377_F   | hsa-miR-648  |
| FES_E34_R    | UGT1A1_P315_R  | hsa-miR-604  |
| FAS_P65_F    | GNMT_E126_F    | hsa-miR-612  |
| CAFM_P126_F  | ESRI_P162_F    | kshv-miR-K12-9|
| TRIP6_E33_F  | TRK6_E33_F     | hsa-miR-611  |
| CTNNAC1_P382_R| KNCN4_E13_F   | hsa-miR-639  |
| FRS2B_P460_F | BLK_P14_F      | hsa-miR-617  |
| FES_P224_R   | SMARCB1_P220_R | hsa-miR-618  |
| ILR7R_E164_R | DGK1_P207_F    | hsa-miR-664  |
| ZMYND10_E77_F| TGF7_P44_F     | kshv-miR-BART8-3p|
| PLAUR_E123_F | DNA5E111_P39_R | hsa-miR-664  |
| FRZB_E166_R  | DCLRE1A_P382   | kshv-miR-K12-12|
| TIMP3_seq7_S38_F| BIRC4_P122_R | hsa-miR-658  |
| POX1L1_P341_R| GLA_P112_F     | hsa-miR-629  |
| LYN_P241_F   | GLD3_P435_R    | hsa-miR-630  |
| GLD3_P435_R  | PTP7K1        | kshv-miR-631  |
| 3.56E-04     | 3.26E-01       | 1.1E-07      |
| 1.78E-04     | 5.99E-01       | 1.00E+00     |
| **D5**       |                |              |
| ILR7R_E164_R | TGF7_P44_F     |                |
| FES_P224_R   | DNA5E111_P39_R |                |
| ILR7R_E164_R | DCLRE1A_P382   |                |
| ZMYND10_E77_F| BIRC4_P122_R   |                |
| PLAUR_E123_F | GLA_P112_F     |                |
| FRZB_E166_R  | PTP7K1        |                |
| TIMP3_seq7_S38_F| BIRC4_P122_R |                |
| POX1L1_P341_R| GLA_P112_F     |                |
| LYN_P241_F   | GLD3_P435_R    |                |
| GLD3_P435_R  | PTP7K1        |                |
| 3.56E-04     | 3.26E-01       | 1.1E-07      |
| 1.78E-04     | 5.99E-01       | 1.00E+00     |
Supplementary Table S2. List of variables in the first SPC

Variables are listed by the order of the absolute value of their factor loadings. Variables with high absolute factor loadings come first, and those with factor loadings close to 0, are listed at the end.

| Cluster | DNA | Variables |
|---------|-----|-----------|
| D1      |     | S100A4_P887_R, DMP1_E194_F, TDGFI_E53_R, PLG_P370_F, GABRG3_E123_R, APOC1_P406_R, TDG_E129_F, SPI1_P48_F, XPC_P226_R, CTAG2_P1426_F, IL18BP_E285_F, NDN_E131_R |
| D2      |     | NOS2A_P288_R, SPI1_P929_F, MMP7_P613_F, ITK_P114_F, IFNG_P188_F, TRPM5_E87_F, WRN_P969_F, ACTG2_E98_R, HLA-DOB_E432_R, GPR116_P850_F, HLA-DOB_P114_R, EPSX1_P22_F, PMP22_P975_F, KKL11_P1290_F, KIAA0125_E29_F, IL4_P262_R, NID1_P677_F |
| D3      |     | MUC1_E18_R, APBA2_P305_R, UGT1A7_P751_R, CPA4_P1265_R |
| D4      |     | ALK_E183_R, KRAS_P651_F, IFNGR2_E164_F, RASA1_E107_R, CCKBR_P361_R, FG9_P862_R, PTCH_E42_F, APC_E117_R, WNT5A_E43_F, EFN3_E17_R, CDKN1C_P6_R, GAS1_P754_R, CDKN2B_E220_F |
| D5      |     | FES_E34_R, FAS_P65_F, GNMT_E126_F, ESR2_P162_F, TRP6_E33_F, CTNNAA1_P382_R, FRZB_P406_F, FES_P223_R, GNMT_P197_F, IL17RB_E164_R, ZMYND10_E77_R, PLAUR_E123_F, FRZB_E186_R, TIMP3_seq_7_S38_F, PODXL_P1341_R, LYN_P241_F, GLI3_P453_R, PTCH2_P37_F, MET_E333_F |
| D6      |     | BCL3_E71_F, COL6A1_P425_R, MCAM_P265_R, INHA_P1144_R, CD34_E20_R, EPS8_E213_F, IGSF4C_E65_F, BCMAD_P205_F, KLF5_E190_R, LAMB1_E144_R, ITGB1_P451_F, PCGF4_P760_R, FGFR1_E317_F, DAB2IP_E18_R, KLF5_P13_F |
| D7      |     | GATA6_P21_R, B3M3_E147_F, PENK_P447_R, FLT3_E326_R, ISL1_P379_F, NPY_P91_F, NPY_E31_R, NEFL_P209_R, TUSC3_E29_R, FZD9_P175_F, DSP_P36_F, ZNF264_P397_F, TPEF_seq_44_S88_R, RASGRF1_E16_F |
| D8      |     | CD2_P68_F, BMP4_P123_R, TNFSF8_P184_F, CEACAM1_E57_R, PECA1_P135_F, DCL1_E276_F, SEPT9_P374_F, SLC22A18_P216_R, LCNA2_P141_R, HHP5_P578_R, PTHHL_H_P15_R |
| D9      |     | UGT1A1_P315_R, ACVR1_P983_F, GFAP_P56_R, KCNK4_E3_F, BLK_P14_F, SMARC_B1_P220_R, FGFR7_P44_F |
| MR1     | mRNA | C6orf134, NCAM1, IL15RA, TRH, SFTPB, AGER, GPR4, SLIT3, ICAM2, CRBR4, SULT1A2, IKBKE, GGA2, GCH1, GLS, SLCA6A4 |
| MR2     |     | PSMD12, ZNF207, VDAC1, IMMT, HAT1, ZBTB11, WDR12, ALG8 |
| MR3     |     | CCT4, POLE3, DIMTL1, POLR3K, UTP11L, NUP37, COX7A2L, TFB2M, GTF2B, CKL_F, MRPL9, EMG1 |
| MR4     |     | GLP1R, NCR2, KIAA0953, SLC9A3, CNGB1, AVPR1A, MYLC2PL, NMR11, BNL8, FUT6, PRO1768, GNRHR, ADRB3, PDK1, PDCL3, CALML3, C5orf5, OR7C1, TRAK2 |
| MR5     |     | PTPRZ1, EB4114B, JAM3, GRIA3, MAPK13, RBM35B, SOX2, SPINT1, CLIP3, CLD_N3, BHLH89, ABHD4, BA13, LLG2L, PSRC1, NGLN4X |
| MR6     |     | KININS220, ZNF532, PABPN1, KHDRBS1, WIPF2, RNF126, PRPF40A, PEKIP1, PUM1, SCRN1, SYSN1, CHMP1A, BOP1 |
| MR7     |     | STT3A, PIGA6, AGPS, ITCH, KIAA0692, GANAB, NIPBL, DNAJC7, NRBP1, NCL, HYOU1 |
| MR8     |     | DUSP3, TP1P1, LPR10, TRIP6, COPZ2, LOX, TXNDC15, ACTN1, IFITM3, FAM46A, RPX2, RNASE4 |
| MR9     |     | LAIR1, MND4, SLAMF8, FES, FCGR2B, CIQB |
| MR10 | HMGB3, ECT2, C10orf18, DCLRE1A, PAPD1, BCL7A, TAF5 |
|------|-----------------------------------------------|
| **miRNA** | **miRNA** |
| MI1 | hsa-miR-553, hsa-miR-544, hsa-miR-384, ebv-miR-BART15, hsa-miR-626, hsa-miR-33b, hsa-miR-591, hsa-miR-802, hsa-miR-518d |
| MI2 | hsa-miR-609, hsa-miR-595, ebv-miR-BART16, hsa-miR-647 |
| MI3 | hsa-miR-602, kshv-miR-K12-9, hsa-miR-563 |
| MI4 | hsa-miR-765, hsa-miR-188, hsa-miR-198, hsa-miR-630, hsa-miR-671, hsa-miR-100, hsa-miR-622, hsa-miR-583, hsa-miR-560, hsa-miR-638, hsa-miR-557, hsa-miR-572, hsv1-miR-H1, hsa-miR-575, hsa-miR-659 |
| MI5 | hsa-miR-648, ebv-miR-BART8-3p, hsa-miR-604, kshv-miR-K12-2, hsa-miR-658, hsa-miR-629, hsa-miR-639, ebv-miR-BART17-5p |
| MI6 | hcmv-miR-US25-2-5p, hsa-miR-128a, hsa-miR-128b, hcmv-miR-UL36 |
| MI7 | hsa-miR-17-5p, hsa-miR-106a, hsa-miR-20a, hsa-miR-20b, hsa-miR-19b, hsa-miR-19a |
| MI8 | hsa-miR-377, hsa-miR-376a |
| MI9 | hsa-miR-429 |
| MI10 | hsa-miR-518f, hsa-miR-517b |