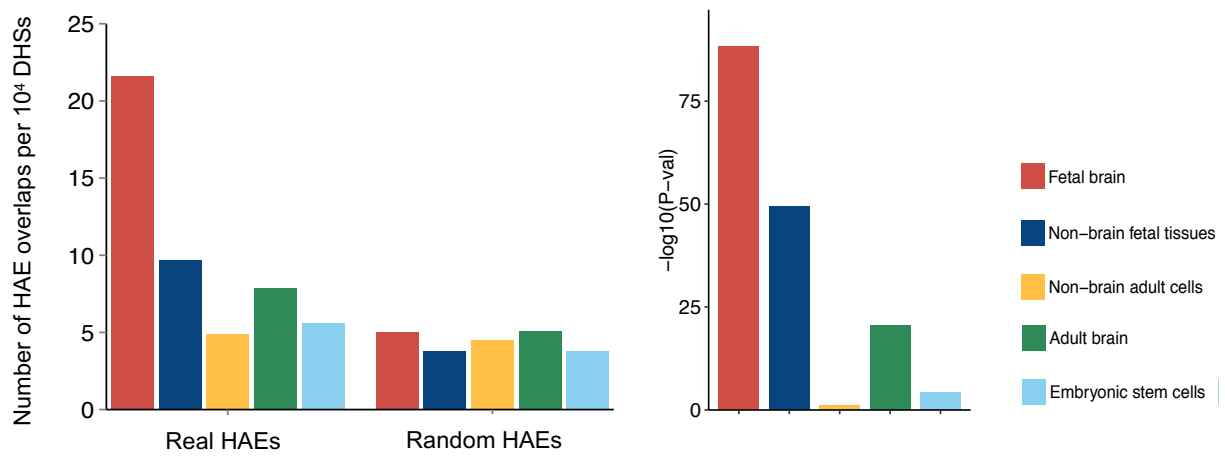
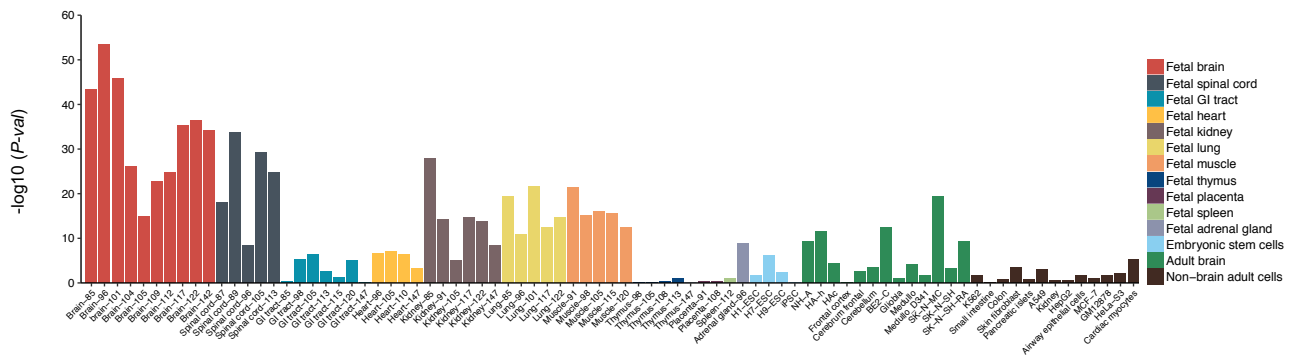


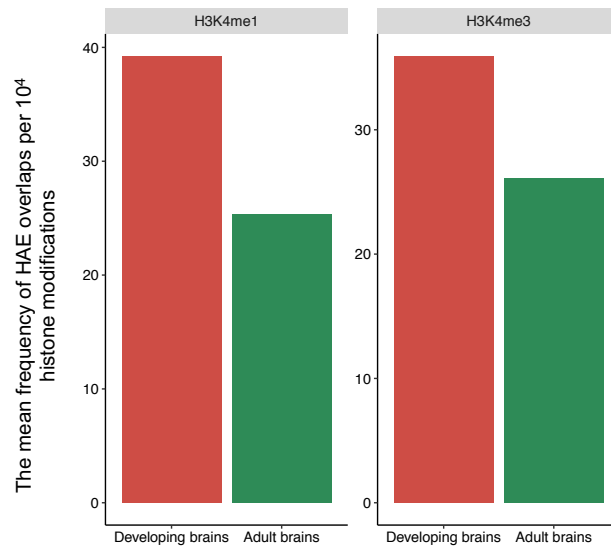
**Supplementary Fig. S1.** Pie chart showing the ratio of HAE overlaps with DHSs with many different origins.



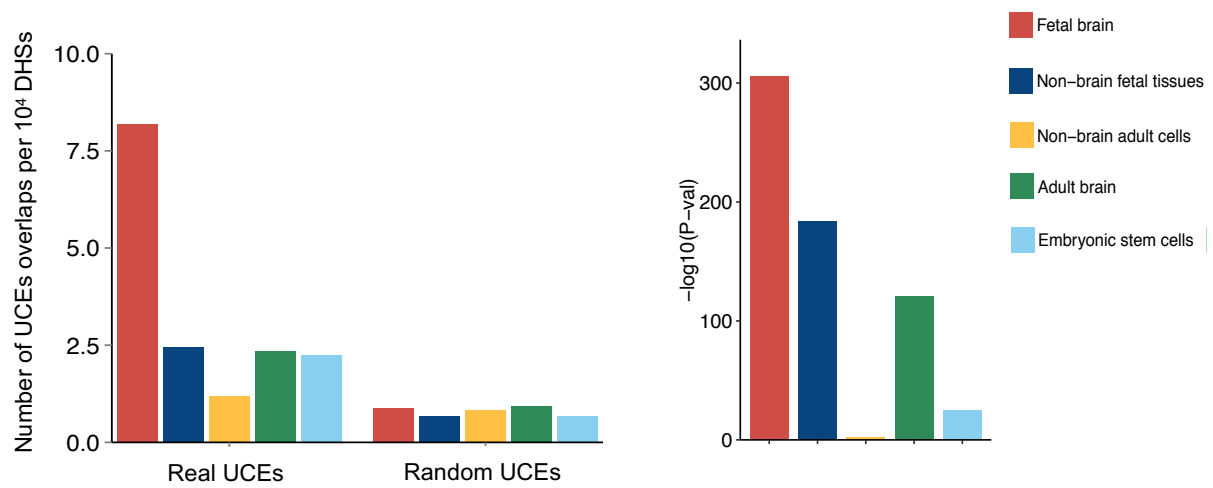
**Supplementary Fig. S2. The number of HAE overlaps per 10<sup>4</sup> DHSs combined according to cell- or tissue-origin.** The same number of DNA segments with the same size distribution as the HAEs was randomly captured from each chromosome to generate a false set of HAEs. The frequency of DHS overlapping was obtained repeatedly for a set of 1000 random HAEs in the same manner. Odds ratios (ORs) were obtained for each cell type using the Fisher's exact test (right bar plot).



**Supplementary Fig. S3. Statistical enrichment test of HAE overlaps per 10<sup>4</sup> DHSs in each tissue or cell type.** The same number of DNA segments with the same size distribution as the DHSs was randomly captured from each chromosome to generate a false set of DHSs. The number of DHS overlaps was obtained repeatedly for a set of 1000 random DHSs. *P* values calculated with Fisher's exact test.



**Supplementary Fig. S4.** The mean frequency of the number of HAE overlaps per  $10^4$  peaks for each histone modification in developing brains (Fetal Brain, Germinal Matrix, Neurosphere Cultured Cells Ganglionic Eminence Derived, Neurosphere Cultured Cells Cortex Derived) and adult brains (Substantia Nigra, Mid Frontal Lobe, Inferior Temporal Lobe, Hippocampus Middle, Cingulate Gyrus, Anterior Caudate, Angular Gyrus).



**Supplementary Fig. S5. The number of UCE overlaps per 10<sup>4</sup> DHSs combined according to cell- or tissue-origin.** The same number of DNA segments with the same size distribution as the UCEs was randomly captured from each chromosome to generate a false set of UCEs. The frequency of DHS overlapping was obtained repeatedly for a set of 1000 random UCEs in the same manner. Odds ratios (ORs) were obtained for each cell type using the Fisher's exact test (right bar plot).

**Supplementary Table S1.** The number of overlapped HAEs with DHSs

Tissue types	Samples-age	# of overlapped HAEs	# of total DHSs	Frequency
Brain	Fetal Brain-85	351	152791	22.973
Brain	Fetal Brain-96	291	153163	18.999
Brain	Fetal Brain-101	341	181210	18.818
Brain	Fetal Brain-104	279	185062	15.076
Brain	Fetal Brain-105	167	39871	41.885
Brain	Fetal Brain-109	225	142650	15.773
Brain	Fetal Brain-112	194	97619	19.873
Brain	Fetal Brain-117	285	158383	17.994
Brain	Fetal Brain-122	406	239660	16.941
Brain	Fetal Brain-142	230	101465	22.668
Spinal cord	Fetal Spinalcord-87	159	42243	37.639
Spinal cord	Fetal Spinalcord-89	274	147489	18.578
Spinal cord	Fetal Spinalcord-96	97	35470	27.347
Spinal cord	Fetal Spinalcord-105	204	107794	18.925
Spinal cord	Fetal Spinalcord-113	279	194428	14.350
GI	Fetal GI-85	26	54425	4.777
GI	Fetal GI-98	124	203808	6.084
GI	Fetal GI-105	83	120365	6.896
GI	Fetal GI-113	70	125624	5.572
GI	Fetal GI-115	63	94901	6.638
GI	Fetal GI-120	79	143670	5.499
GI	Fetal GI-147	38	112339	3.383
Heart	Fetal Heart-96	101	127961	7.893
Heart	Fetal Heart-105	131	204299	6.412
Heart	Fetal Heart-110	114	135337	8.423
Heart	Fetal Heart-147	75	91448	8.201
Kidney	Fetal Kidney-85	186	104688	17.767
Kidney	Fetal Kidney-91	166	110760	14.987
Kidney	Fetal Kidney-105	77	71561	10.760
Kidney	Fetal Kidney-117	136	96132	14.147
Kidney	Fetal Kidney-122	154	118610	12.984
Kidney	Fetal Kidney-147	134	93858	14.277
Lung	Fetal Lung-85	199	162488	12.247
Lung	Fetal Lung-96	143	114026	12.541
Lung	Fetal Lung-101	224	187417	11.952
Lung	Fetal Lung-117	145	116570	12.439
Lung	Fetal Lung-122	151	125030	12.077
Muscle	Fetal Muscle-91	231	238532	9.684
Muscle	Fetal Muscle-98	168	136382	12.318
Muscle	Fetal Muscle-105	226	221303	10.212
Muscle	Fetal Muscle-115	179	124923	14.329
Muscle	Fetal Muscle-120	134	142930	9.375
Muscle	Fetal Muscle-120	140	146759	9.539
Thymus	Fetal Thymus-98	24	70929	3.384
Thymus	Fetal Thymus-98	34	121380	2.801
Thymus	Fetal Thymus-105	23	82174	2.799
Thymus	Fetal Thymus-108	26	63075	4.122
Thymus	Fetal Thymus-113	32	61791	5.179
Thymus	Fetal Thymus-147	32	67628	4.732
Placenta	Fetal Placenta-91	27	135137	1.998
Placenta	Fetal Placenta-108	72	186827	3.854
Spleen	Fetal Spleen-112	56	128033	4.374
Adrenal	Fetal Adrenal-96	29	47376	6.121
ESC	H1-ESC	116	258188	4.493
ESC	H7-ESC	174	266731	6.523
ESC	H9-ESC	98	163824	5.982
ESC	iPS	83	203810	4.072

Supplementary Table S1. Continued

Tissue types	Samples-age	# of overlapped HAEs	# of total DHSs	Frequency
adultBrain	NH-A	287	429788	6.678
adultBrain	HA-h	215	240585	8.937
adultBrain	HAc	171	196507	8.702
adultBrain	Frontal_cortex_OC	211	378445	5.575
adultBrain	Cerebrum_frontal_OC	141	135930	10.373
adultBrain	Cerebellum_OC	131	104575	12.527
adultBrain	BE2-C	189	205874	9.180
adultBrain	Gliobla	202	305860	6.604
adultBrain	Medullo	356	553183	6.435
adultBrain	Medullo_D341	149	154728	9.630
adultBrain	SK-N-MC	230	187226	12.285
adultBrain	SK-N-SH	117	101878	11.484
adultBrain	SK-N-SH-RA	136	133705	10.172
otherTissue	K562	118	247441	4.769
otherTissue	Small intestine	73	213646	3.417
otherTissue	Colon	86	258813	3.323
otherTissue	Skin fibroblast	182	352169	5.168
otherTissue	Pancreatic islets	253	536270	4.718
otherTissue	A549	216	391213	5.521
otherTissue	Kidney	100	287593	3.477
otherTissue	HepG2	118	306113	3.855
otherTissue	Airway epithelial cells	110	216251	5.087
otherTissue	MCF-7	101	256802	3.933
otherTissue	GM12878	125	365758	3.418
otherTissue	HeLa-S3	265	736240	3.599
otherTissue	Cardiac myocytes	139	211215	6.581

**Supplementary Table S2.** The number of overlapped HAEs with histone modification

Brain samples	Histone modification	# of overlapped HAEs	# of total histone modification peaks	Frequency
Fetal Brain	H3K36me3	102	109760	9.293
Fetal Brain	H3K9me3	74	135757	5.451
Fetal Brain	H3K9ac	150	85497	17.544
Fetal Brain	H3K4me1	614	159004	38.615
Fetal Brain	H3K4me3	241	73998	32.568
Fetal Brain	H3K27me3	351	141989	24.720
Germinal Matrix	H3K4me3	158	39603	39.896
Germinal Matrix	H3K4me1	541	122055	44.324
Germinal Matrix	H3K36me3	90	80739	11.147
Germinal Matrix	H3K9me3	46	119569	3.847
Germinal Matrix	H3K27me3	107	57782	18.518
Angular Gyrus	H3K4me3	164	64376	25.475
Angular Gyrus	H3K9ac	170	85551	19.871
Angular Gyrus	H3K27ac	228	101995	22.354
Angular Gyrus	H3K27me3	148	84101	17.598
Angular Gyrus	H3K4me1	419	168360	24.887
Angular Gyrus	H3K9me3	29	92184	3.146
Angular Gyrus	H3K36me3	94	113191	8.305
Anterior Caudate	H3K4me3	227	76598	29.635
Anterior Caudate	H3K9ac	198	83179	23.804
Anterior Caudate	H3K36me3	121	115010	10.521
Anterior Caudate	H3K27me3	230	143092	16.074
Anterior Caudate	H3K27ac	262	104015	25.189
Anterior Caudate	H3K9me3	49	117729	4.162
Anterior Caudate	H3K4me1	539	184995	29.136
Cingulate Gyrus	H3K9me3	14	64210	2.180
Cingulate Gyrus	H3K4me1	360	142789	25.212
Cingulate Gyrus	H3K36me3	73	95251	7.664
Cingulate Gyrus	H3K4me3	141	53636	26.288
Cingulate Gyrus	H3K9ac	180	94068	19.135
Hippocampus Middle	H3K4me1	361	158979	22.707
Hippocampus Middle	H3K27me3	99	83209	11.898
Hippocampus Middle	H3K9me3	28	95512	2.932
Hippocampus Middle	H3K27ac	195	100386	19.425
Hippocampus Middle	H3K4me3	157	70559	22.251
Hippocampus Middle	H3K36me3	97	112467	8.625
Hippocampus Middle	H3K9ac	169	87502	19.314
Inferior Temporal Lobe	H3K9me3	44	105153	4.184
Inferior Temporal Lobe	H3K4me1	442	168512	26.230
Inferior Temporal Lobe	H3K36me3	96	110987	8.650
Inferior Temporal Lobe	H3K27me3	190	118260	16.066
Inferior Temporal Lobe	H3K4me3	177	64338	27.511
Inferior Temporal Lobe	H3K9ac	163	85887	18.978
Inferior Temporal Lobe	H3K27ac	266	116235	22.885
Mid Frontal Lobe	H3K27me3	146	92100	15.852
Mid Frontal Lobe	H3K36me3	108	117568	9.186
Mid Frontal Lobe	H3K4me1	301	136627	22.031
Mid Frontal Lobe	H3K9me3	48	101071	4.749
Mid Frontal Lobe	H3K9ac	159	85503	18.596
Mid Frontal Lobe	H3K4me3	140	49379	28.352
Substantia Nigra	H3K27me3	177	110201	16.062
Substantia Nigra	H3K4me1	428	157185	27.229
Substantia Nigra	H3K9ac	185	86825	21.307
Substantia Nigra	H3K9me3	28	97993	2.857
Substantia Nigra	H3K4me3	188	80665	23.306
Substantia Nigra	H3K36me3	79	87945	8.983



Supplementary Table S2. Continued

Brain samples	Histone modification	# of overlapped HAEs	# of total histone modification peaks	Frequency
Neurosphere Cultured Cells Cortex Derived	H3K27me3	224	103669	21.607
Neurosphere Cultured Cells Cortex Derived	H3K9me3	39	99535	3.918
Neurosphere Cultured Cells Cortex Derived	H3K4me1	528	136068	38.804
Neurosphere Cultured Cells Cortex Derived	H3K4me3	89	26970	33.000
Neurosphere Cultured Cells Cortex Derived	H3K36me3	122	87986	13.866
Neurosphere Cultured Cells Ganglionic Eminence Derived	H3K4me1	495	140860	35.141
Neurosphere Cultured Cells Ganglionic Eminence Derived	H3K4me3	149	39010	38.195
Neurosphere Cultured Cells Ganglionic Eminence Derived	H3K36me3	104	84256	12.343
Neurosphere Cultured Cells Ganglionic Eminence Derived	H3K27me3	119	81200	14.655
Neurosphere Cultured Cells Ganglionic Eminence Derived	H3K9me3	42	112571	3.731