

Labels of aberrant Clusters of Differentiation gene expression in a compendium of systemic lupus erythematosus patients

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Background

This author manuscript serves as an extended annotation of gene expression for all known clusters of differentiation (CD) within a compendium of systemic lupus erythematosus (SLE) patients. The overarching goal for this line of research is to enrich the perspective of the CD transcriptome with upstream gene expression features.

Introduction

CDs are cell surface biomarkers that denote key biological differences between cell types and disease state. For each of the >400 known CDs¹, distinct monoclonal antibodies (mABs) enable robust immunophenotyping and serve as scalable biomarkers for translational research. Annotation of CD molecules have been organized through a series of international meetings known as the Human Leucocyte Differentiation Antigens (HLDA) Workshops, affiliated with the Human Cell Differentiation Molecules (HCDM) organization.

CD nomenclature <<http://www.hcdm.org/>>

Methods

A compendium containing human SLE gene expression data was previously collected, aggregated, and normalized by collaborators in the Greene Lab at the University of Pennsylvania. <<https://github.com/greenelab/rheum-plier-data/tree/master/sle-wb>> This compendium was slightly modified to include basic demographic information and exclude patients not belonging to classifications of healthy control, treatment naïve SLE, or SLE with exposure to various treatments – the modified dataset represents our ‘**SLE Compendium**’. Entrez gene ID to CD mapping was provided by HCDM¹. The SLE Compendium dataset and R code corresponding to data pre-processing can be found on the Breitenstein Lab Github page.

SLE Compendium: <<https://breitensteinlab.github.io/SLE-Compendium-2018/>>

Within our SLE Compendium, all known CDs gene expression of , were categorized as ‘aberrant’ or ‘non-aberrant’ based on the following criteria: *i*) two-tailed normalization at 20th and 80th percentile of relative gene expression. Specifically, the two tails encompassed ‘aberrant’ CD expression, whereas the middle distribution served as ‘non-aberrant’. Following visual inspection of all histograms, specific CDs were deemed to require manual adjustments. *ii*) Manually adjustment of two-tail normalization was applied when CDs followed apparent normal distribution but would require slight modification of thresholds to characterization feature variation. *iii*) Binarization CD features was applied when an obvious non-normal distribution was observed. Thresholds separated the expression values into low/high groups (instead of non-aberrant/aberrant) to capture apparent patterns in the expression distributions.

In future research, CDs will be enriched with perspective of interdependent gene expression features using the integrated machine learning pipeline for aberrant biomarker enrichment (**i-mAB pipeline**).

i-mAB pipeline: <<https://breitensteinlab.github.io/i-mAB/>>

Results

Within the original study cohorts, multiple observations were generated for most patients. Observation characteristics of the SLE Compendium, including PMID for the 6 original studies^{2,3,4,5,6,7}, can be found in **Table 1**. Additional sample/cohort can be ascertained from the Gene Expression Omnibus via GSE or GEO accession ID.

Gene Expression Omnibus: <<https://www.ncbi.nlm.nih.gov/geo/query/acc.cgi>>

Table 1. SLE Compendium characteristics as ascertained from study of origin

	<u>Cohort 1</u> ²	<u>Cohort 2</u> ³	<u>Cohort 3</u> ⁴	<u>Cohort 4</u> ⁵	<u>Cohort 5</u> ⁶	<u>Cohort 6</u> ⁷	<u>Overall</u>
Study PMID	18631455	23203821	24644022	25736140	27040498	26138472	---
Study GEO identifier	GSE11907	GSE39088	GSE49454	GSE61635	GSE65391	GSE78193	---
Healthy control*	0	46	0	30	72	12	160
median age (range)	---	34.5 (19-50)	---	---	12 (6-21)	---	16 (6-50)
gender - female/male	---	34	---	---	57	---	91
SLE-treatment naïve*	37	21	177	99	924	32	1290
median age (range)	14 (8-17)	43 (20-50)	40 (18-71)	---	15 (6-19)	---	16 (6-71)
gender - female	35	21	148	---	817	---	1021
SLE-various treatments*	0	57	0	0	0	69	126
median age (range)	---	36 (19-50)	---	---	---	---	36 (19-50)
gender - female/male	---	57	---	---	---	---	57

*observation characteristics include multiple observations per patient

By default, CD gene expression thresholds were labeled as ‘aberrant’ or ‘non-aberrant’, with ‘aberrant’ being further delineated as ‘low’ or ‘high’. Gene expression was stratified at 20 and 80 percentiles, with low expression being between 0 and 20, average between 20 and 80, and high between 80 and 100. Descriptive statistics of CD gene expression with corresponding Entrez ID can be found in **Supplement 1, Table 2**.

Overall the default two-tailed thresholds provided satisfactory characterization of ‘aberrant’ (including ‘low’ and ‘high’) vs. ‘non-aberrant’ normal gene expression distributions. However, some CDs required manual adjustment, including shifting of thresholds (n=3) and binary transformation for non-normal distributions (n=85) (**Supplement 2, Table 3**). Amongst CD genes requiring binary transformation, no clear data-driven hypothesis of ‘aberrant’ vs ‘average’ was practical so gene expression was labeled simply as ‘low’ or ‘high’ (i.e. no clear baseline comparison is available). Consensus review by the research team determined manual revisions of thresholds. Detailed labelling of all CD features (n=351) identified within the SLE Compendium can be found in **Supplement 3, Figures 1-290**. Included are histograms of CD gene expression distribution and descriptive statistics of expression and variation.

References

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Supplement 1. Table 2. CD expression characteristics with the SLE Compendium

Cluster of Differentiation	Entrez ID	1 st quartile	Median	Mean	Standard error	3 rd quartile
CD1A	909	0.2877	0.4131	0.4306	0.0049	0.5418
CD1B	910	0.0429	0.2810	0.2859	0.0067	0.4699
CD1C	911	0.4298	0.4847	0.5165	0.0046	0.6191
CD1D	912	0.4725	0.5790	0.5669	0.0047	0.6692
CD1E	913	0.0808	0.3933	0.3550	0.0072	0.5690
CD2	914	0.5507	0.6660	0.6479	0.0045	0.7567
CD3D	915	0.5816	0.6579	0.6517	0.0037	0.7393
CD3E	916	0.3478	0.4621	0.4756	0.0050	0.5963
CD3G	917	0.4454	0.5510	0.5513	0.0045	0.6593
CD4	920	0.4148	0.5369	0.5325	0.0055	0.6743
CD5	921	0.4914	0.6062	0.5890	0.0047	0.7053
CD6	923	0.5397	0.6628	0.6438	0.0048	0.7728
CD7	924	0.4072	0.5400	0.5347	0.0052	0.6661
CD8A	925	0.4365	0.5553	0.5594	0.0049	0.6907
CD8B	926	0.3612	0.4399	0.4622	0.0044	0.5634
CD9	928	0.2634	0.4078	0.4108	0.0056	0.5510
CD10	4311	0.3475	0.4486	0.4754	0.0053	0.5955
CD11A	3683	0.3848	0.4876	0.4934	0.0047	0.5992
CD11B	3684	0.4461	0.5705	0.5660	0.0049	0.6893
CD11C	3687	0.3237	0.4352	0.4567	0.0051	0.5685
CD13	290	0.4166	0.5281	0.5234	0.0048	0.6361
CD14	929	0.4937	0.6117	0.5974	0.0047	0.7128
CD15	2526	0.3056	0.3946	0.4032	0.0041	0.4802
CD16B	2215	0.6375	0.7064	0.6900	0.0039	0.7744
CD18	3689	0.2797	0.3487	0.3843	0.0047	0.4451
CD19	930	0.3390	0.4880	0.4796	0.0057	0.6270
CD20	931	0.4250	0.5417	0.5368	0.0045	0.6543
CD21	1380	0.4267	0.5343	0.5282	0.0051	0.6581
CD22	933	0.2415	0.3850	0.3967	0.0051	0.5316
CD23	2208	0.3318	0.3686	0.4186	0.0052	0.5378
CD25	3559	0.3142	0.3952	0.4048	0.0042	0.4792
CD26	1803	0.3800	0.4833	0.4955	0.0048	0.6179

CD27	939	0.4434	0.5544	0.5574	0.0049	0.6732
CD28	940	0.5163	0.6076	0.5988	0.0042	0.6912
CD30	943	0.4002	0.5314	0.5164	0.0049	0.6416
CD31	5175	0.5092	0.6208	0.6047	0.0047	0.7196
CD33	945	0.4531	0.5563	0.5536	0.0045	0.6564
CD34	947	0.0888	0.2385	0.3193	0.0072	0.5643
CD35	1378	0.2969	0.3960	0.4141	0.0048	0.5101
CD36	948	0.5503	0.6644	0.6425	0.0046	0.7539
CD37	951	0.4015	0.5194	0.5212	0.0048	0.6362
CD38	952	0.2643	0.3496	0.3615	0.0042	0.4382
CD39	953	0.4219	0.5449	0.5388	0.0048	0.6571
CD40	958	0.4295	0.5178	0.5264	0.0049	0.6269
CD41	3674	0.2975	0.4246	0.4302	0.0051	0.5517
CD42A	2815	0.4343	0.5542	0.5424	0.0049	0.6606
CD42B	2811	0.2818	0.4168	0.4206	0.0055	0.5492
CD43	6693	0.4208	0.5204	0.5248	0.0046	0.6187
CD44	960	0.4447	0.5468	0.5461	0.0044	0.6526
CD45	5788	0.4831	0.5932	0.5897	0.0049	0.7097
CD46	4179	0.3236	0.4766	0.4776	0.0056	0.6164
CD47	961	0.3421	0.4422	0.4758	0.0051	0.6049
CD48	962	0.5302	0.6346	0.6206	0.0045	0.7340
CD49B	3673	0.0505	0.0692	0.2157	0.0057	0.3656
CD49C	3675	0.0874	0.1118	0.2535	0.0065	0.4513
CD49D	3676	0.4888	0.5827	0.5825	0.0044	0.6847
CD49E	3678	0.4647	0.5786	0.5710	0.0044	0.6751
CD49F	3655	0.4701	0.5373	0.5076	0.0043	0.5757
CD50	3385	0.4232	0.5380	0.5340	0.0050	0.6507
CD51	3685	0.4443	0.5668	0.5565	0.0046	0.6670
CD52	1043	0.5706	0.6869	0.6614	0.0046	0.7794
CD53	963	0.4696	0.5772	0.5712	0.0045	0.6843
CD54	3383	0.4393	0.4668	0.4858	0.0041	0.5453
CD55	1604	0.3661	0.4807	0.4874	0.0048	0.5927
CD56	4684	0.4322	0.5026	0.4613	0.0043	0.5338
CD57	27087	0.0730	0.1057	0.2654	0.0066	0.4719
CD58	965	0.4668	0.5758	0.5660	0.0045	0.6744

CD59	966	0.3650	0.4031	0.4285	0.0038	0.4862
CD61	3690	0.3290	0.4558	0.4583	0.0051	0.5751
CD62E	6401	0.0770	0.0991	0.2399	0.0067	0.4248
CD62L	6402	0.7253	0.8035	0.7461	0.0049	0.8507
CD62P	6403	0.3499	0.3783	0.4157	0.0043	0.4860
CD63	967	0.3594	0.4536	0.4675	0.0049	0.5648
CD66A	634	0.2915	0.3878	0.4013	0.0045	0.5012
CD66B	1088	0.1388	0.2813	0.3267	0.0057	0.4510
CD66C	4680	0.1392	0.2528	0.2982	0.0058	0.4030
CD66D	1084	0.4487	0.5544	0.5490	0.0047	0.6591
CD66E	1048	0.0563	0.0711	0.1684	0.0054	0.2331
CD66F	5669	0.0613	0.0806	0.2017	0.0063	0.3510
CD68	968	0.3514	0.4872	0.4973	0.0055	0.6275
CD69	969	0.3740	0.4842	0.4911	0.0048	0.6100
CD70	970	0.2230	0.2760	0.3463	0.0050	0.4596
CD71	7037	0.3510	0.4346	0.4396	0.0038	0.5131
CD72	971	0.3064	0.4160	0.4328	0.0049	0.5519
CD73	4907	0.4912	0.5631	0.5156	0.0051	0.5975
CD74	972	0.4180	0.5258	0.5255	0.0048	0.6352
CD79A	973	0.3382	0.4927	0.4903	0.0055	0.6265
CD79B	974	0.3125	0.4823	0.4761	0.0058	0.6293
CD80	941	0.0514	0.1602	0.2415	0.0063	0.4027
CD81	975	0.5014	0.6132	0.6063	0.0045	0.7234
CD82	3732	0.3397	0.4747	0.4727	0.0051	0.5940
CD83	9308	0.3623	0.4244	0.4407	0.0040	0.5118
CD84	8832	0.3429	0.4340	0.4523	0.0045	0.5422
CD85A	11025	0.6931	0.7578	0.7279	0.0038	0.8070
CD85C	10990	0.0850	0.4020	0.3630	0.0067	0.5531
CD85D	10288	0.3225	0.4431	0.4598	0.0053	0.5779
CD85F	353514	0.3677	0.5059	0.5027	0.0053	0.6397
CD85G	23547	0.4090	0.4471	0.4459	0.0041	0.4722
CD85H	11027	0.5010	0.6070	0.5915	0.0044	0.7014
CD85J	10859	0.3159	0.4139	0.4257	0.0046	0.5250
CD85K	11006	0.4451	0.5721	0.5530	0.0049	0.6757
CD85M	79166	0.0732	0.0925	0.1941	0.0058	0.2385

CD86	942	0.4575	0.5648	0.5551	0.0046	0.6661
CD87	5329	0.3865	0.5033	0.5014	0.0048	0.6157
CD88	728	0.4475	0.5733	0.5605	0.0048	0.6804
CD89	2204	0.2910	0.3992	0.4156	0.0049	0.5191
CD90	7070	0.4564	0.5648	0.5543	0.0046	0.6762
CD91	4035	0.3538	0.3758	0.4351	0.0045	0.5273
CD92	23446	0.2598	0.3575	0.3815	0.0048	0.4715
CD93	22918	0.5621	0.6614	0.6459	0.0043	0.7482
CD94	3824	0.3531	0.4708	0.4715	0.0051	0.5947
CD95	355	0.2904	0.3998	0.4154	0.0050	0.5267
CD96	10225	0.4582	0.5713	0.5583	0.0046	0.6695
CD97	976	0.6236	0.6971	0.6633	0.0046	0.7619
CD98	6520	0.3606	0.4524	0.4941	0.0051	0.5967
CD99	4267	0.4504	0.5680	0.5712	0.0050	0.6912
CD100	10507	0.3385	0.4490	0.4607	0.0050	0.5779
CD101	9398	0.2724	0.3138	0.3420	0.0047	0.3551
CD102	3384	0.4566	0.5730	0.5620	0.0049	0.6810
CD103	3682	0.4387	0.5648	0.5500	0.0050	0.6722
CD104	3691	0.0816	0.1027	0.2067	0.0057	0.2799
CD105	2022	0.3528	0.3820	0.4359	0.0046	0.5444
CD106	7412	0.0866	0.1180	0.2716	0.0065	0.4658
CD107A	3916	0.4480	0.5595	0.5639	0.0050	0.6827
CD107B	3920	0.4848	0.6087	0.5944	0.0050	0.7172
CD108	8482	0.0407	0.0579	0.2029	0.0058	0.3577
CD109	135228	0.0000	0.0000	0.1030	0.0052	0.1858
CD110	4352	0.3177	0.4492	0.4495	0.0054	0.5842
CD111	5818	0.0928	0.1236	0.2683	0.0066	0.4653
CD112	5819	0.3224	0.4273	0.4002	0.0044	0.4934
CD113	25945	0.0681	0.0913	0.2426	0.0064	0.4338
CD114	1441	0.5753	0.6686	0.6467	0.0043	0.7422
CD115	1436	0.5198	0.6335	0.6169	0.0047	0.7290
CD116	1438	0.4898	0.6032	0.5869	0.0048	0.7041
CD117	3815	0.3513	0.4393	0.4171	0.0048	0.5119
CD118	3977	0.0659	0.0853	0.1629	0.0050	0.1796
CD119	3459	0.4095	0.5120	0.5233	0.0048	0.6231

CD120A	7132	0.5005	0.6198	0.6110	0.0047	0.7361
CD120B	7133	0.4559	0.5577	0.5536	0.0043	0.6504
CD121A	3554	0.0190	0.0244	0.1232	0.0049	0.1807
CD121B	7850	0.2424	0.3407	0.3743	0.0052	0.4773
CD122	3560	0.3886	0.5172	0.5126	0.0052	0.6399
CD123	3563	0.3700	0.4103	0.3952	0.0043	0.4318
CD124	3566	0.2042	0.2736	0.3085	0.0043	0.3769
CD125	3568	0.3568	0.4262	0.4325	0.0041	0.5189
CD126	3570	0.3755	0.4928	0.4965	0.0051	0.6100
CD127	3575	0.5461	0.6411	0.6247	0.0040	0.7205
CD130	3572	0.3375	0.4164	0.4160	0.0041	0.5015
CD131	1439	0.4445	0.5347	0.5372	0.0041	0.6284
CD132	3561	0.3418	0.4780	0.4704	0.0053	0.5944
CD133	8842	0.0488	0.0621	0.1466	0.0050	0.1944
CD134	7293	0.3926	0.4894	0.4966	0.0045	0.5970
CD135	2322	0.0291	0.0373	0.1480	0.0057	0.2172
CD136	4486	0.0000	0.0000	0.1381	0.0070	0.1647
CD137	3604	0.3478	0.4435	0.4429	0.0045	0.5422
CD138	6382	0.3120	0.3694	0.3835	0.0044	0.4721
CD140A	5156	0.0972	0.1263	0.2032	0.0053	0.2115
CD140B	5159	0.3238	0.3561	0.4020	0.0049	0.4690
CD141	7056	0.2608	0.2839	0.3207	0.0043	0.3411
CD142	2152	0.0865	0.1460	0.2883	0.0067	0.4879
CD143	1636	0.0946	0.1203	0.2143	0.0056	0.2871
CD144	1003	0.1160	0.1465	0.2313	0.0054	0.2808
CD146	4162	0.0703	0.0887	0.1900	0.0058	0.2591
CD147	682	0.3429	0.4740	0.4832	0.0055	0.6138
CD148	5795	0.4195	0.5279	0.5285	0.0045	0.6324
CD150	6504	0.4758	0.6168	0.5923	0.0048	0.7180
CD151	977	0.3240	0.4176	0.4358	0.0045	0.5333
CD152	1493	0.5168	0.5735	0.5624	0.0046	0.6629
CD153	944	0.2956	0.3934	0.3992	0.0045	0.4975
CD154	959	0.3712	0.4881	0.4943	0.0053	0.6246
CD155	5817	0.4646	0.5331	0.5162	0.0043	0.5983
CD156A	101	0.4237	0.5389	0.5380	0.0050	0.6521

CD156C	102	0.4647	0.5321	0.5452	0.0039	0.6233
CD157	683	0.3466	0.4645	0.4743	0.0051	0.5949
CD158E	3811	0.3143	0.4080	0.4189	0.0043	0.5066
CD158I	3809	0.0000	0.0000	0.1134	0.0060	0.1442
CD158K	3812	0.3227	0.4613	0.4677	0.0053	0.6060
CD160	11126	0.3611	0.4916	0.4939	0.0048	0.6118
CD161	3820	0.4143	0.5328	0.5259	0.0049	0.6424
CD162	6404	0.3945	0.5122	0.5080	0.0047	0.6193
CD163	9332	0.2490	0.3195	0.3529	0.0043	0.4156
CD164	8763	0.3328	0.4739	0.4945	0.0050	0.6267
CD166	214	0.3513	0.4532	0.4597	0.0048	0.5668
CD167A	780	0.3657	0.4349	0.4419	0.0043	0.5196
CD167B	4921	0.0842	0.1105	0.2371	0.0063	0.3681
CD168	3161	0.0473	0.1676	0.2173	0.0056	0.3415
CD169	6614	0.0290	0.1402	0.2449	0.0072	0.4275
CD170	8778	0.4018	0.5207	0.5186	0.0049	0.6382
CD171	3897	0.0649	0.0819	0.2025	0.0061	0.3430
CD172A	140885	0.4620	0.5746	0.5634	0.0045	0.6771
CD172G	55423	0.3642	0.4814	0.4895	0.0049	0.6088
CD174	2525	0.0000	0.0000	0.1298	0.0063	0.2475
CD177	57126	0.0226	0.0311	0.1232	0.0047	0.1642
CD178	356	0.4686	0.5054	0.5078	0.0044	0.5625
CD179A	7441	0.0409	0.0523	0.1288	0.0045	0.1056
CD179B	3543	0.5017	0.5881	0.5847	0.0044	0.6935
CD180	4064	0.0896	0.3274	0.3306	0.0066	0.5309
CD181	3577	0.5136	0.6410	0.6177	0.0049	0.7477
CD182	3579	0.5253	0.6211	0.6064	0.0041	0.7002
CD183	2833	0.4208	0.5164	0.5323	0.0046	0.6433
CD184	7852	0.4024	0.4948	0.5076	0.0045	0.6019
CD185	643	0.3929	0.5298	0.5033	0.0047	0.6156
CD186	10663	0.4005	0.4329	0.4296	0.0042	0.4769
CD191	1230	0.4444	0.5803	0.5620	0.0051	0.6919
CD193	1232	0.4625	0.5722	0.5543	0.0049	0.6712
CD194	1233	0.0459	0.0605	0.1963	0.0064	0.3592
CD195	1234	0.3732	0.4295	0.4471	0.0042	0.5207

CD196	1235	0.3381	0.4530	0.4578	0.0050	0.5753
CD197	1236	0.4787	0.6108	0.5969	0.0050	0.7204
CD199	10803	0.3392	0.4020	0.3840	0.0038	0.4403
CD200	4345	0.0567	0.0819	0.2404	0.0062	0.4174
CD201	10544	0.2714	0.3164	0.3688	0.0048	0.4618
CD202B	7010	0.0674	0.2322	0.2739	0.0064	0.4369
CD203C	5169	0.0818	0.1037	0.1722	0.0046	0.1822
CD204	4481	0.0663	0.0921	0.2563	0.0064	0.4345
CD205	4065	0.4357	0.5313	0.5450	0.0040	0.6345
CD206	4360	0.0625	0.0808	0.1978	0.0054	0.3369
CD207	50489	0.0724	0.0917	0.2102	0.0060	0.3352
CD208	27074	0.2642	0.3410	0.3676	0.0043	0.4326
CD209	30835	0.0000	0.0000	0.1070	0.0056	0.1425
CD210	3587	0.4240	0.5205	0.5219	0.0044	0.6222
CDW210B	3588	0.5186	0.6042	0.5920	0.0041	0.6832
CD212	3594	0.4045	0.5213	0.5310	0.0049	0.6489
CD213A1	3597	0.4451	0.5561	0.5489	0.0048	0.6578
CD213A2	3598	0.0658	0.0828	0.1504	0.0045	0.1479
CD215	3601	0.0744	0.0945	0.1943	0.0057	0.2438
CD217A	23765	0.3543	0.4847	0.4848	0.0053	0.6106
CD218A	8809	0.2310	0.3237	0.3634	0.0053	0.4489
CD218B	8807	0.3551	0.4772	0.4696	0.0049	0.5795
CD220	3643	0.0558	0.0707	0.1690	0.0054	0.2508
CD221	3480	0.3040	0.3717	0.3908	0.0041	0.4642
CD222	3482	0.3865	0.4883	0.4928	0.0047	0.5964
CD223	3902	0.3208	0.4433	0.4631	0.0048	0.5783
CD225	8519	0.6660	0.7433	0.7008	0.0047	0.7958
CD226	10666	0.4493	0.5699	0.5684	0.0046	0.6877
CD227	4582	0.2539	0.2935	0.3209	0.0038	0.3633
CD228	4241	0.0977	0.1279	0.2904	0.0067	0.5091
CD229	4063	0.4910	0.6255	0.6065	0.0049	0.7315
CD230	5621	0.4669	0.5790	0.5668	0.0047	0.6783
CD231	7102	0.0694	0.1267	0.1527	0.0038	0.2059
CD232	10154	0.3927	0.5165	0.5161	0.0050	0.6311
CD233	6521	0.3742	0.4941	0.4807	0.0052	0.5946

CD234	2532	0.2298	0.2971	0.3469	0.0051	0.4538
CD235A	2993	0.0264	0.0336	0.0949	0.0040	0.1100
CD235B	2994	0.2290	0.3563	0.3744	0.0056	0.5058
CD236	2995	0.4735	0.5625	0.5534	0.0043	0.6455
CD238	3792	0.2072	0.2995	0.3301	0.0045	0.4292
CD239	4059	0.1152	0.1459	0.2366	0.0059	0.2638
CD240CE	6006	0.1861	0.2264	0.2542	0.0041	0.2675
CD240D	6007	0.0252	0.0322	0.1400	0.0050	0.2184
CD241	6005	0.0282	0.0361	0.1449	0.0051	0.2316
CD242	3386	0.3286	0.3667	0.3986	0.0041	0.4481
CD243	5243	0.3582	0.4697	0.4731	0.0050	0.5995
CD244	51744	0.5086	0.5471	0.5625	0.0044	0.6383
CD246	238	0.0540	0.0687	0.1963	0.0064	0.3157
CD247	919	0.5804	0.6672	0.6598	0.0039	0.7547
CD248	57124	0.3734	0.4714	0.4798	0.0047	0.5894
CD249	2028	0.0632	0.0860	0.2344	0.0064	0.4235
CD252	7292	0.2576	0.3412	0.3685	0.0047	0.4500
CD253	8743	0.3552	0.4537	0.4613	0.0046	0.5625
CD254	8600	0.0778	0.1061	0.2277	0.0060	0.3639
CD257	10673	0.4844	0.6047	0.5812	0.0048	0.6959
CD258	8740	0.3544	0.5111	0.5044	0.0057	0.6435
CD262	8795	0.3919	0.5091	0.5013	0.0049	0.6212
CD263	8794	0.3718	0.4614	0.4833	0.0048	0.5685
CD264	8793	0.0537	0.0768	0.2575	0.0069	0.4421
CD265	8792	0.0607	0.0770	0.1617	0.0049	0.2216
CD266	51330	0.2305	0.2770	0.3496	0.0051	0.4592
CD267	23495	0.3001	0.3167	0.3391	0.0042	0.3625
CD269	608	0.2179	0.3244	0.3582	0.0049	0.4692
CD270	8764	0.3937	0.5311	0.5315	0.0053	0.6555
CD271	4804	0.0484	0.0626	0.1994	0.0059	0.3569
CD272	151888	0.3200	0.4516	0.4583	0.0049	0.5837
CD273	80380	0.0000	0.0000	0.0919	0.0048	0.1376
CD274	29126	0.0346	0.0441	0.1299	0.0049	0.1768
CD276	80381	0.0618	0.0801	0.2286	0.0069	0.3964
CD277	11119	0.3237	0.4063	0.4270	0.0044	0.5089

CD278	29851	0.4065	0.5303	0.5204	0.0051	0.6423
CD279	5133	0.0390	0.0499	0.1709	0.0061	0.2742
CD280	9902	0.0455	0.2031	0.2347	0.0058	0.3882
CD281	7096	0.3368	0.4997	0.4942	0.0060	0.6577
CD282	7097	0.2973	0.4055	0.4288	0.0050	0.5405
CD283	7098	0.0974	0.1225	0.2435	0.0059	0.3783
CD284	7099	0.3382	0.4540	0.4687	0.0051	0.5907
CD286	10333	0.3518	0.4914	0.4930	0.0054	0.6335
CD288	51311	0.4240	0.5298	0.5305	0.0048	0.6437
CD289	54106	0.3317	0.3715	0.3772	0.0042	0.3984
CD290	81793	0.4269	0.5439	0.5341	0.0046	0.6416
CD292	657	0.0928	0.1299	0.2889	0.0065	0.4903
CDW293	658	0.0771	0.1042	0.2290	0.0054	0.3880
CD294	11251	0.2721	0.2885	0.3274	0.0045	0.3827
CD295	3953	0.4433	0.5012	0.5038	0.0041	0.5759
CD296	417	0.3463	0.3758	0.4412	0.0044	0.5359
CD297	420	0.0485	0.0637	0.2164	0.0062	0.3780
CD298	483	0.3326	0.4407	0.4449	0.0047	0.5547
CD299	10332	0.0339	0.0427	0.1953	0.0067	0.3262
CD300A	11314	0.4993	0.6021	0.5909	0.0045	0.6974
CD300C	10871	0.4161	0.5457	0.5341	0.0051	0.6624
CD301	10462	0.4865	0.5319	0.5278	0.0044	0.6119
CD304	8829	0.0821	0.1085	0.2568	0.0065	0.4547
CD305	3903	0.3634	0.4618	0.4744	0.0044	0.5776
CD306	3904	0.2039	0.2878	0.3070	0.0044	0.3783
CD307A	115350	0.0862	0.1091	0.1929	0.0053	0.2121
CD307B	79368	0.3870	0.5031	0.4953	0.0047	0.6056
CD307C	115352	0.4221	0.5118	0.5191	0.0044	0.6154
CD307D	83417	0.0523	0.0663	0.1390	0.0046	0.1500
CD307E	83416	0.2651	0.3560	0.3732	0.0044	0.4562
CD308	2321	0.1455	0.1845	0.2555	0.0054	0.2298
CD309	3791	0.0792	0.1003	0.1694	0.0045	0.1944
CD312	30817	0.4273	0.5262	0.5254	0.0046	0.6323
CD315	5738	0.0863	0.1089	0.1899	0.0050	0.2524
CD316	93185	0.1475	0.5214	0.4480	0.0070	0.6486

CD317	684	0.4043	0.5385	0.5355	0.0054	0.6746
CD318	64866	0.0909	0.2574	0.3190	0.0070	0.5427
CD319	57823	0.3282	0.4635	0.4620	0.0048	0.5813
CD320	51293	0.4975	0.5343	0.5618	0.0042	0.6432
CD321	50848	0.3659	0.4622	0.4825	0.0047	0.5838
CD322	58494	0.0578	0.0736	0.2095	0.0065	0.3546
CD324	999	0.0830	0.1046	0.1786	0.0048	0.1851
CD325	1000	0.1798	0.2115	0.2514	0.0044	0.2504
CD326	4072	0.0374	0.0473	0.1227	0.0043	0.1631
CD327	946	0.1152	0.4171	0.3868	0.0067	0.5691
CD328	27036	0.3945	0.4399	0.4761	0.0041	0.5506
CD329	27180	0.3735	0.4845	0.4874	0.0050	0.5985
CD331	2260	0.0623	0.0815	0.1848	0.0057	0.2825
CD332	2263	0.1078	0.1379	0.1910	0.0046	0.1685
CD333	2261	0.0938	0.1198	0.2726	0.0064	0.4759
CD334	2264	0.1030	0.1317	0.2100	0.0055	0.1767
CD335	9437	0.0930	0.1176	0.2136	0.0056	0.3205
CD336	9436	0.0406	0.0514	0.1626	0.0057	0.2566
CD337	259197	0.3529	0.4894	0.4933	0.0046	0.6105
CD338	9429	0.0000	0.0000	0.0981	0.0052	0.0917
CD339	182	0.0478	0.0622	0.1937	0.0061	0.3276
CD340	2064	0.4351	0.4842	0.4856	0.0044	0.5603
CD344	8322	0.0000	0.0000	0.1506	0.0071	0.3500
CD349	8326	0.0453	0.0572	0.1384	0.0049	0.1556
CD350	11211	0.0368	0.0508	0.2128	0.0066	0.3945
CD351	8395	0.2458	0.3268	0.3550	0.0044	0.4425
CD353	56833	0.0388	0.0496	0.1923	0.0060	0.3306
CD354	54210	0.4307	0.5610	0.5460	0.0052	0.6796
CD355	56253	0.0568	0.0724	0.1858	0.0061	0.2610
CD357	8784	0.0684	0.0893	0.2214	0.0061	0.3834
CD358	27242	0.3184	0.3443	0.3893	0.0049	0.4793
CD360	50615	0.5752	0.6418	0.6174	0.0045	0.7088
CD361	2124	0.2721	0.3649	0.3831	0.0047	0.4680
CD362	6383	0.2068	0.2533	0.3137	0.0050	0.3991
CD363	1901	0.4069	0.5292	0.5368	0.0051	0.6612

CD364	221476	0.4220	0.4661	0.4906	0.0047	0.5900
CD366	84868	0.4126	0.5178	0.5167	0.0046	0.6249
CD367	50856	0.5184	0.6120	0.6118	0.0042	0.7098
CD369	64581	0.4805	0.5836	0.5811	0.0049	0.6980

By default, CD gene expression was stratified at 20 and 80 percentiles, with low expression being between 0 and 20, average between 20 and 80, and high between 80 and 100. Two-tailed thresholds were labeled as 'aberrant' or 'non-aberrant', with 'aberrant' being further delineated as 'low' or 'high'.

Supplement 2. Table 3. Clusters of differentiation gene expression requiring. Feature transformation included threshold shifting (n=3) or binary dichotomization (n=85).

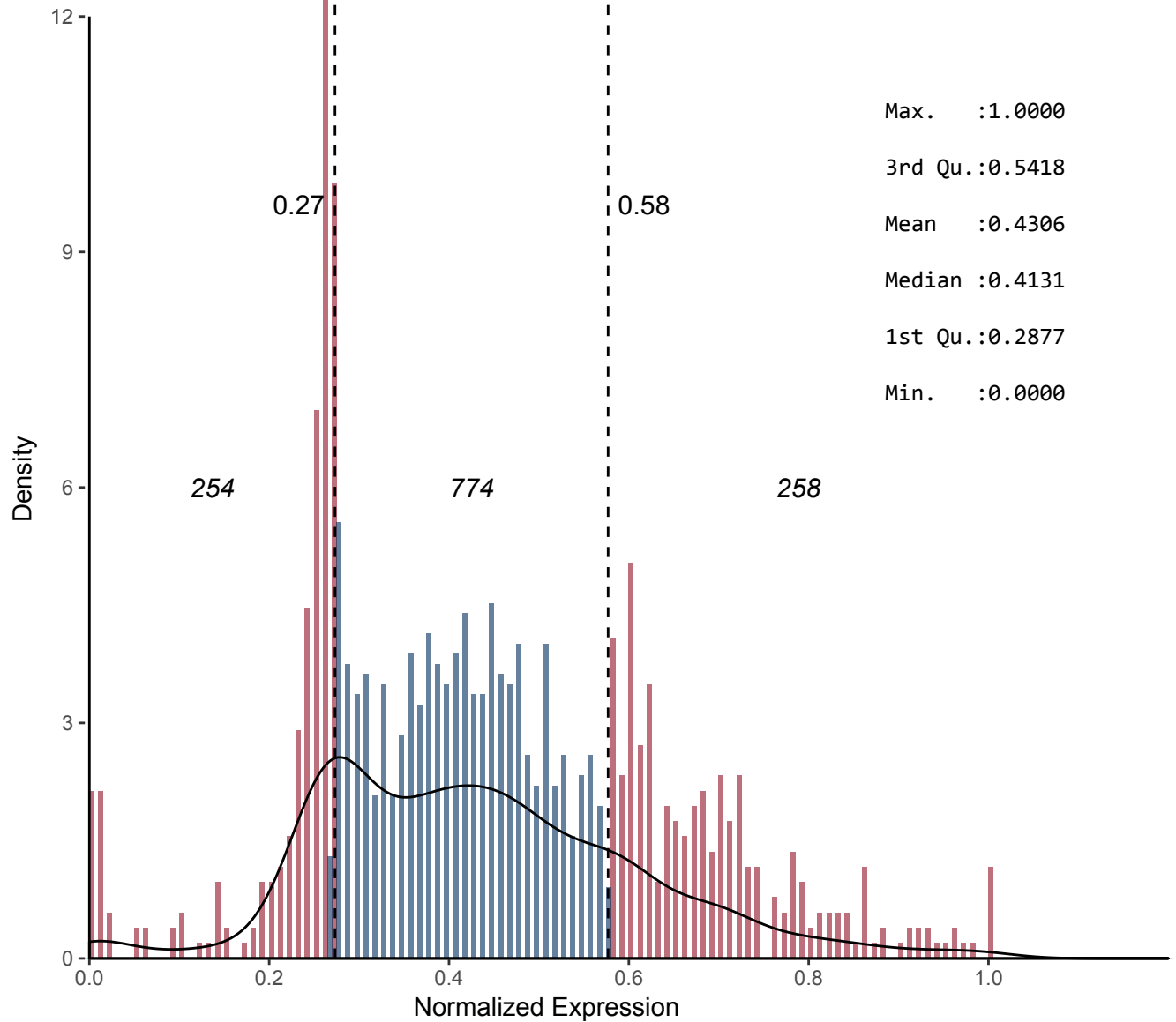
Cluster of Differentiation	Entrez ID	Feature transformation	Threshold	Figure #
CD34	947	Dichotomization	0.18	38
CD49B	3673	Dichotomization	0.1	54
CD49C	3675	Dichotomization	0.18	55
CD57	27087	Dichotomization	0.2	66
CD62E	6401	Dichotomization	0.2	70
CD62L	6402	Dichotomization	0.7	71
CD66E	1048	Dichotomization	0.12	78
CD66F	5669	Dichotomization	0.15	79
CD72	971	First threshold shifted	0.35	84
CD80	941	Dichotomization	0.1	89
CD85C	10990	Dichotomization	0.2	95
CD85M	79166	Dichotomization	0.2	102
CD91	4035	Dichotomization	0.45	108
CD104	3691	Dichotomization	0.2	121
CD105	2022	First threshold shifted	0.3	122
CD106	7412	Dichotomization	0.2	123
CD108	8482	Dichotomization	0.15	126
CD111	5818	Dichotomization	0.2	129
CD113	25945	Dichotomization	0.15	131
CD118	3977	Dichotomization	0.18	136
CD121A	3554	Dichotomization	0.1	140
CD133	8842	Dichotomization	0.1	151
CD135	2322	Dichotomization	0.1	153
CD140A	5156	Dichotomization	0.2	157
CD142	2152	Dichotomization	0.2	160
CD143	1636	Dichotomization	0.2	161
CD144	1003	Dichotomization	0.25	162
CD146	4162	Dichotomization	0.2	163
CD154	959	Dichotomization	0.35	170
CD167B	4921	Dichotomization	0.2	185
CD168	3161	Dichotomization	0.15	186
CD169	6614	Dichotomization	0.1	187
CD171	3897	Dichotomization	0.2	189
CD179A	7441	Dichotomization	0.15	195
CD180	4064	Dichotomization	0.2	197

CD194	1233	Dichotomization	0.1	206
CD200	4345	Dichotomization	0.2	211
CD202B	7010	Dichotomization	0.15	213
CD203C	5169	Dichotomization	0.18	214
CD204	4481	Dichotomization	0.2	215
CD206	4360	Dichotomization	0.15	217
CD207	50489	Dichotomization	0.15	218
CD213A2	3598	Dichotomization	0.15	225
CD215	3601	Dichotomization	0.2	226
CD220	3643	Dichotomization	0.15	230
CD225	8519	Dichotomization	0.63	234
CD228	4241	Dichotomization	0.2	237
CD231	7102	First threshold shifted	0.05	240
CD235A	2993	Dichotomization	0.07	244
CD239	4059	Dichotomization	0.2	248
CD240D	6007	Dichotomization	0.1	250
CD241	6005	Dichotomization	0.1	251
CD246	238	Dichotomization	0.2	255
CD249	2028	Dichotomization	0.2	258
CD254	8600	Dichotomization	0.2	261
CD264	8793	Dichotomization	0.15	266
CD265	8792	Dichotomization	0.15	267
CD271	4804	Dichotomization	0.15	272
CD274	29126	Dichotomization	0.1	275
CD276	80381	Dichotomization	0.2	276
CD279	5133	Dichotomization	0.1	279
CD280	9902	Dichotomization	0.15	280
CD283	7098	Dichotomization	0.2	283
CD292	657	Dichotomization	0.2	289
CD297	420	Dichotomization	0.2	290
CD299	10332	Dichotomization	0.1	294
CD304	8829	Dichotomization	0.2	296
CD307A	115350	Dichotomization	0.2	300
CD307D	83417	Dichotomization	0.1	303
CD309	3791	Dichotomization	0.2	306
CD315	5738	Dichotomization	0.2	309
CD316	93185	Dichotomization	0.2	311
CD318	64866	Dichotomization	0.2	312
CD322	58494	Dichotomization	0.15	314

CD324	999	Dichotomization	0.2	318
CD326	4072	Dichotomization	0.1	319
CD331	2260	Dichotomization	0.2	321
CD333	2261	Dichotomization	0.2	325
CD334	2264	Dichotomization	0.2	327
CD335	9437	Dichotomization	0.2	328
CD336	9436	Dichotomization	0.1	329
CD339	182	Dichotomization	0.1	330
CD349	8326	Dichotomization	0.1	333
CD350	11211	Dichotomization	0.1	336
CD353	56833	Dichotomization	0.1	337
CD355	56253	Dichotomization	0.15	339
CD357	8784	Dichotomization	0.15	341
CDW293	658	Dichotomization	0.2	342

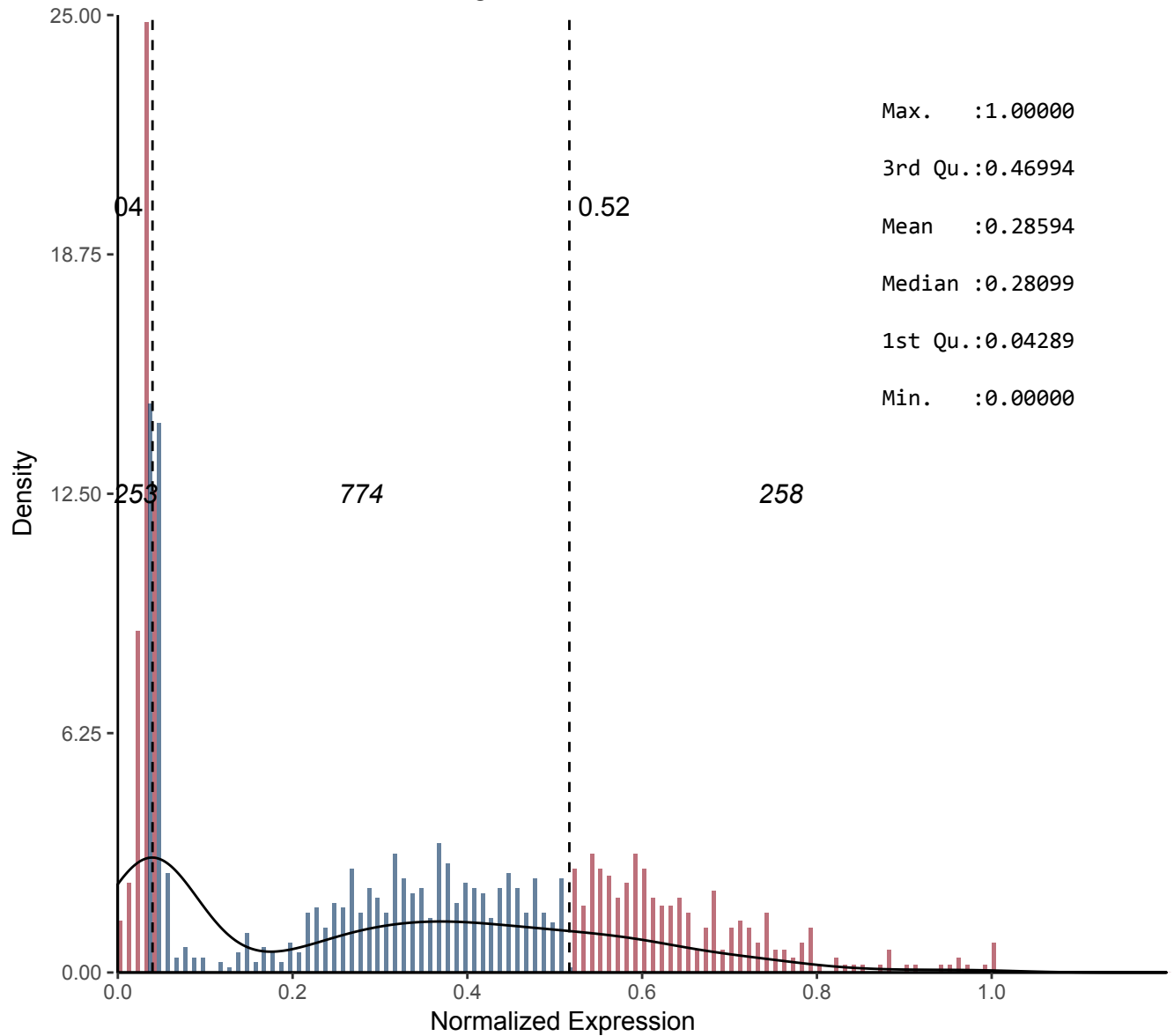
Supplement 3. Figures 1 – 351. Distributions Clusters of Differentiation and labels of aberrant gene expression.

Figure 1 - CD1A



Aberrant TRUE FALSE

Figure 2 - CD1B



Aberrant ■ TRUE ■ FALSE

Figure 3 - CD1C

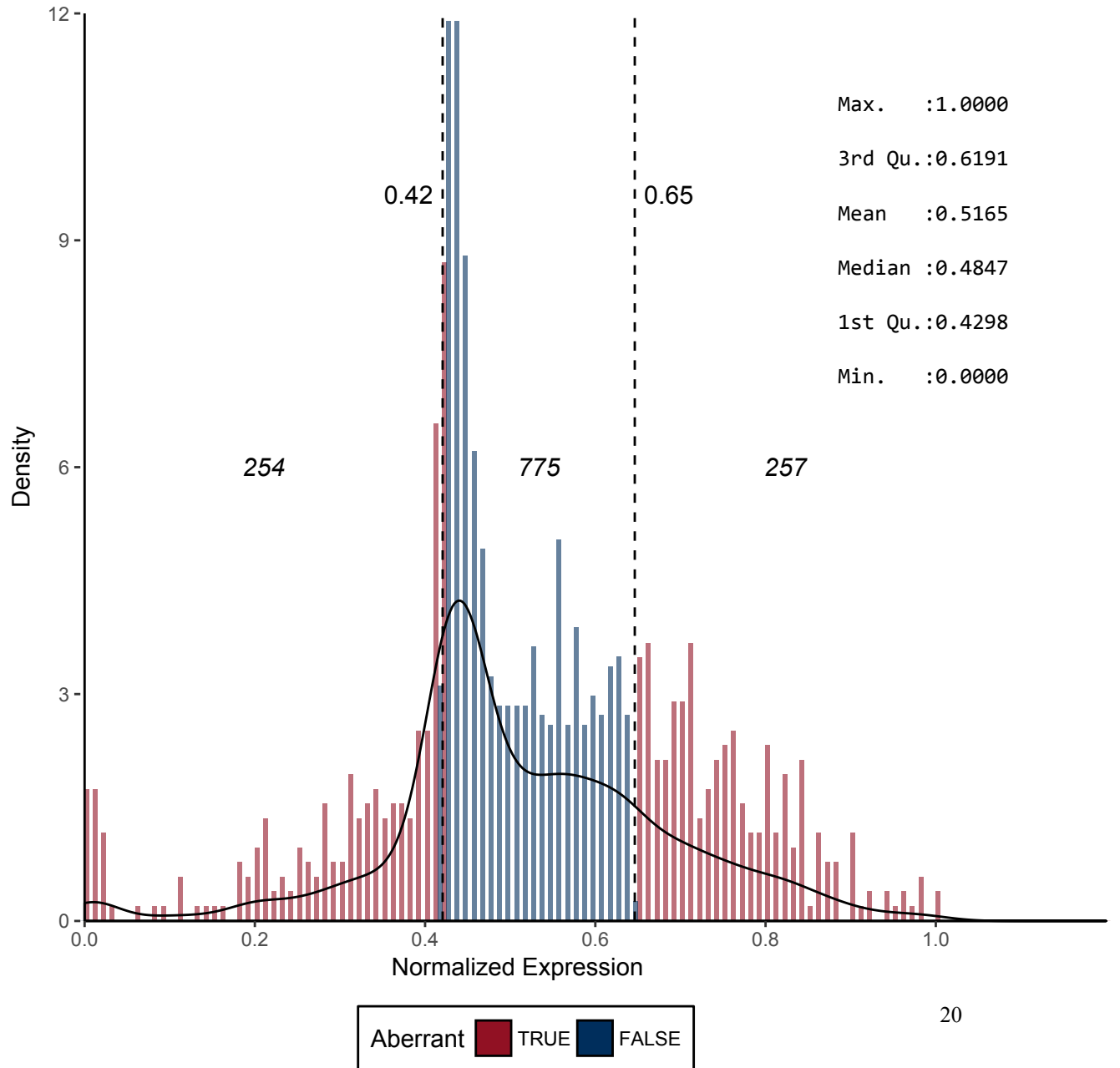
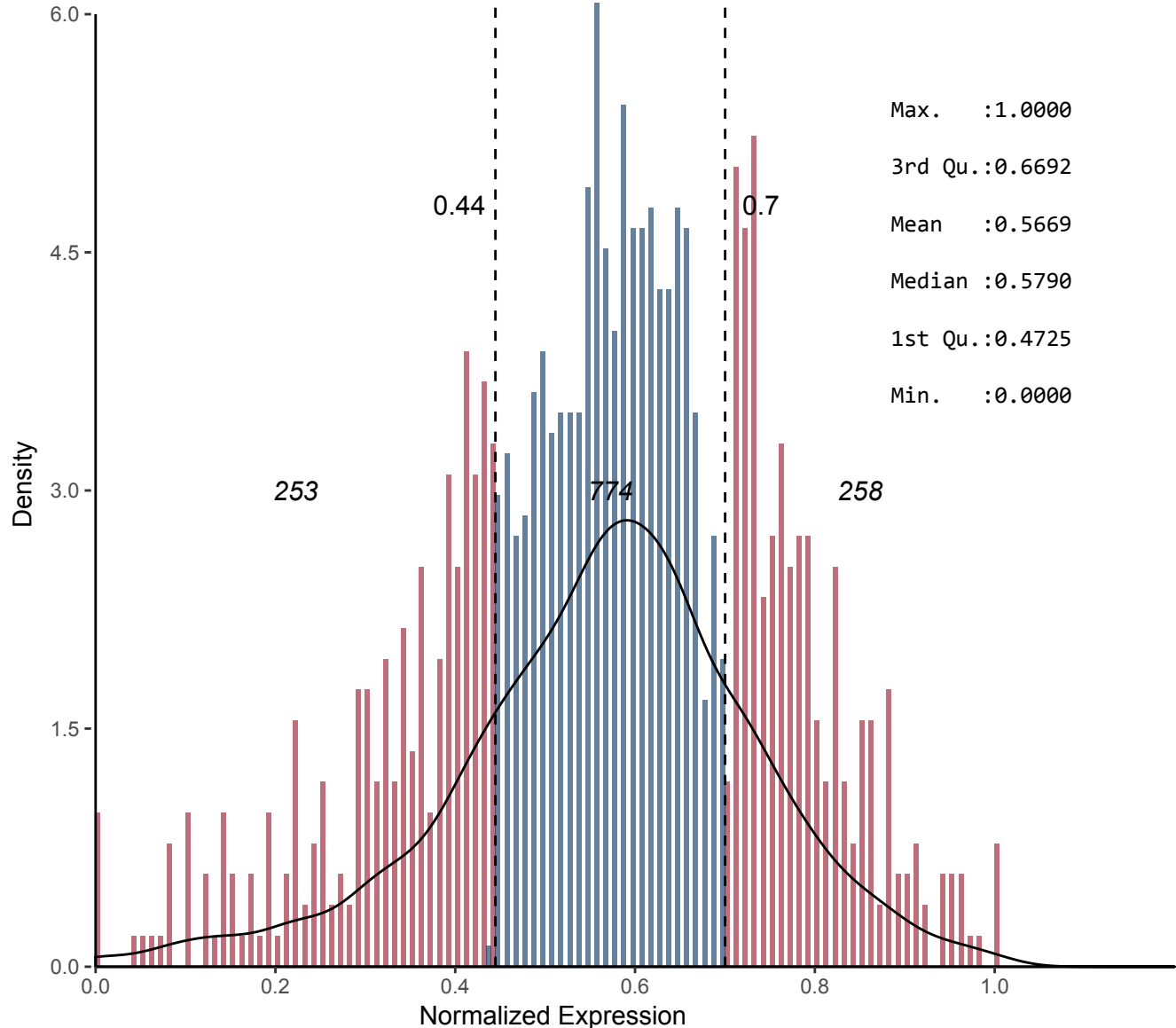


Figure 4 - CD1D



Aberrant TRUE FALSE

Figure 5 - CD1E

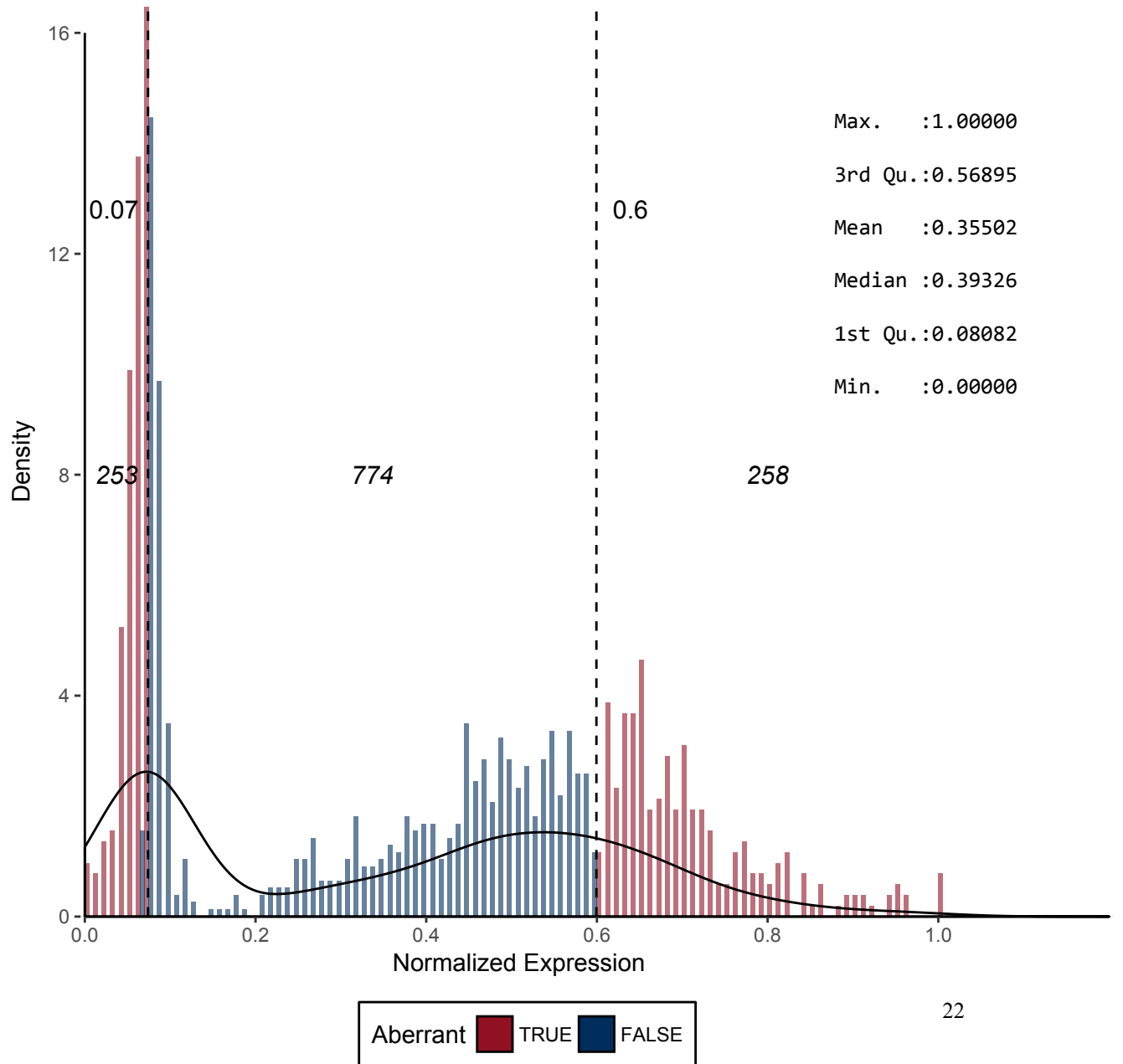
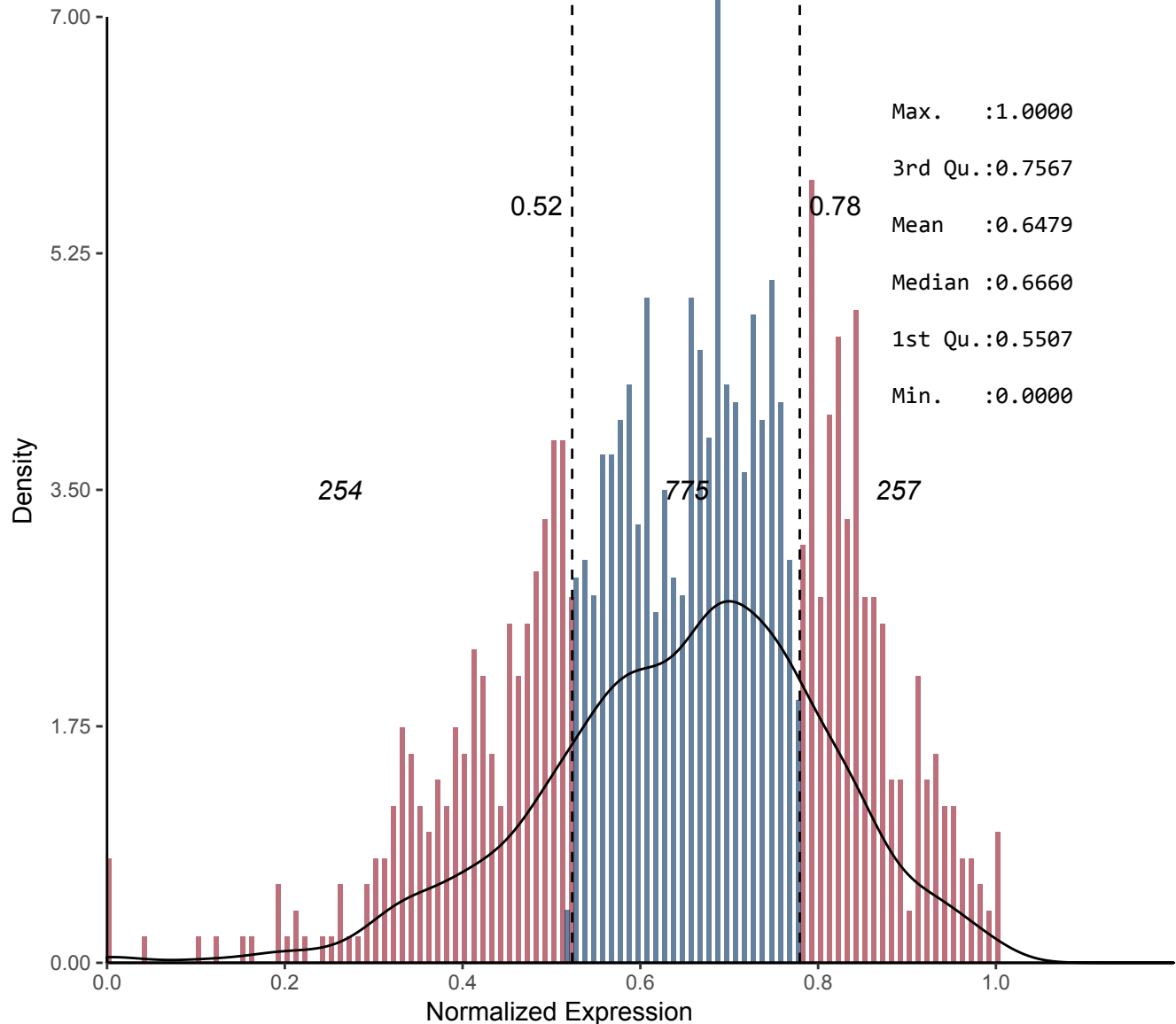


Figure 6 - CD2



Aberrant TRUE FALSE

Figure 7 - CD3D

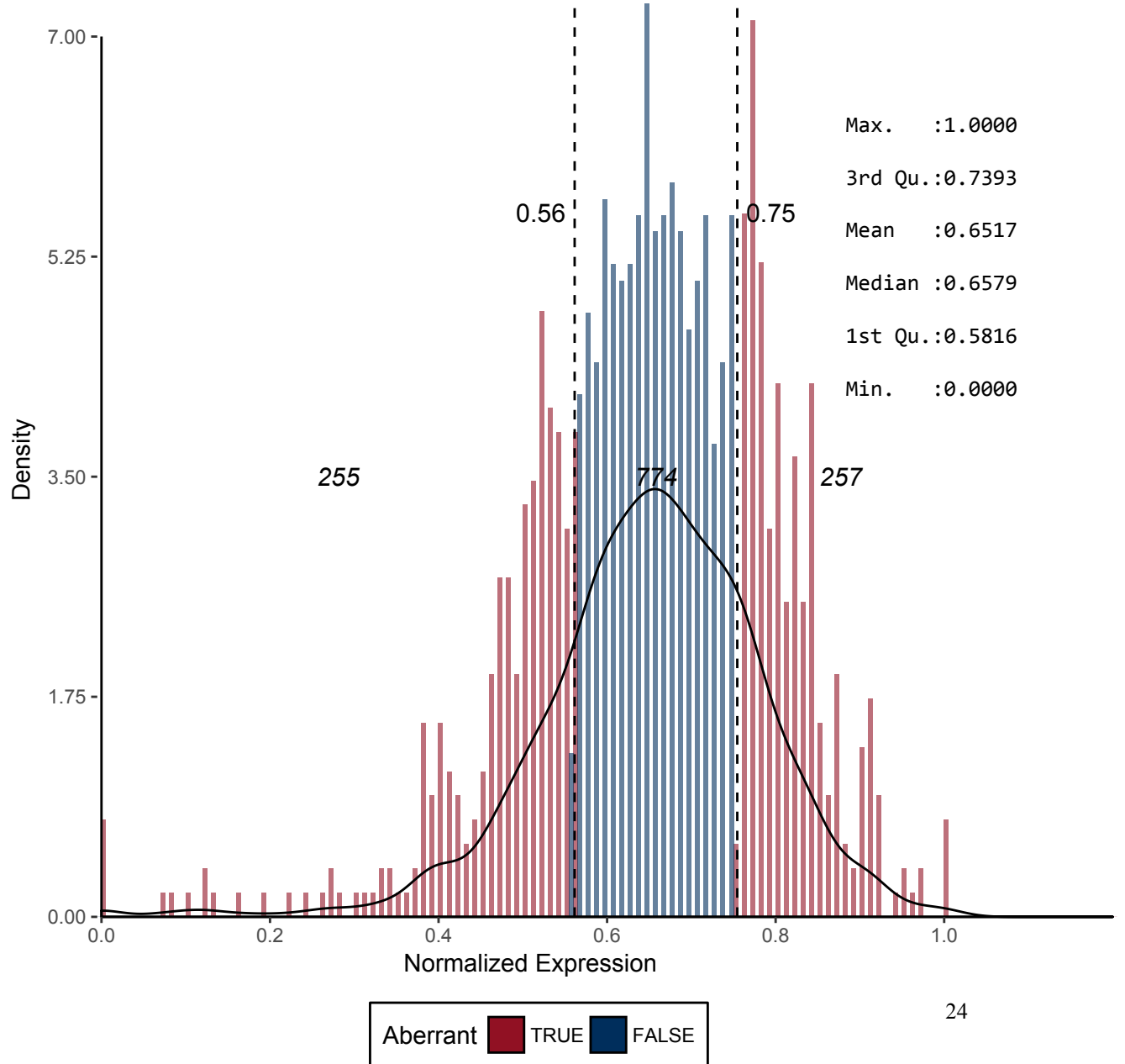


Figure 8 - CD3E

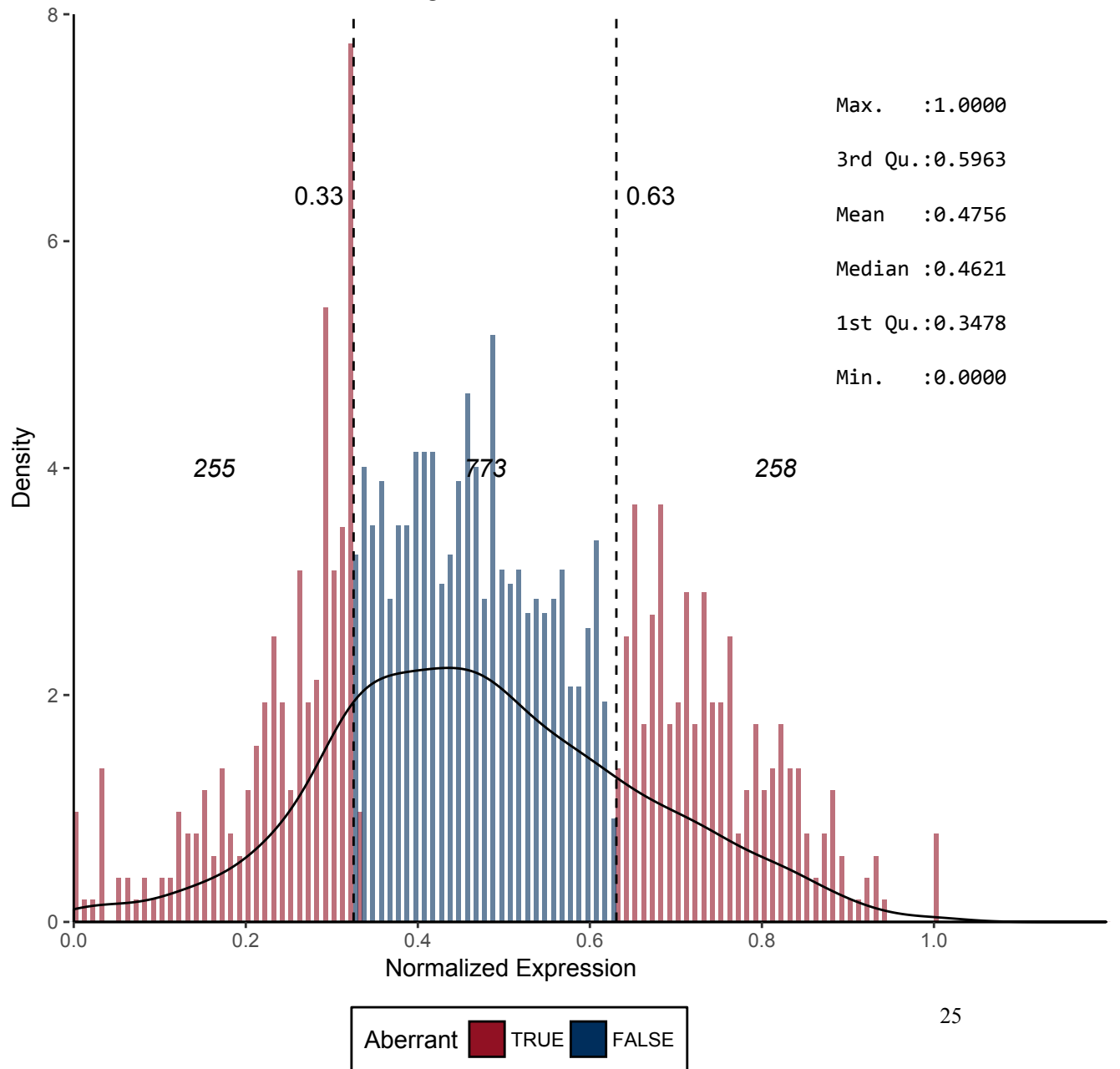


Figure 9 - CD3G

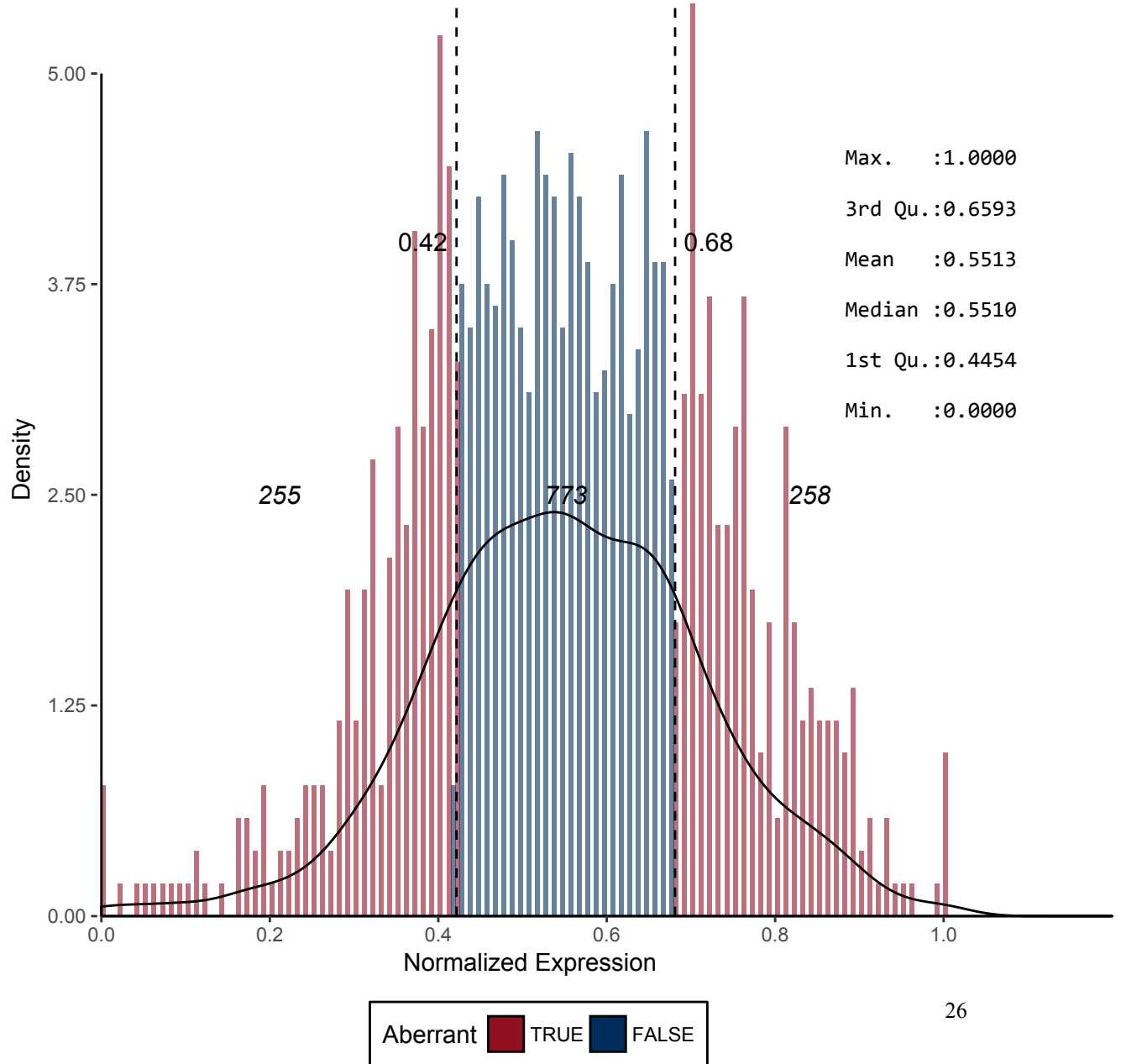
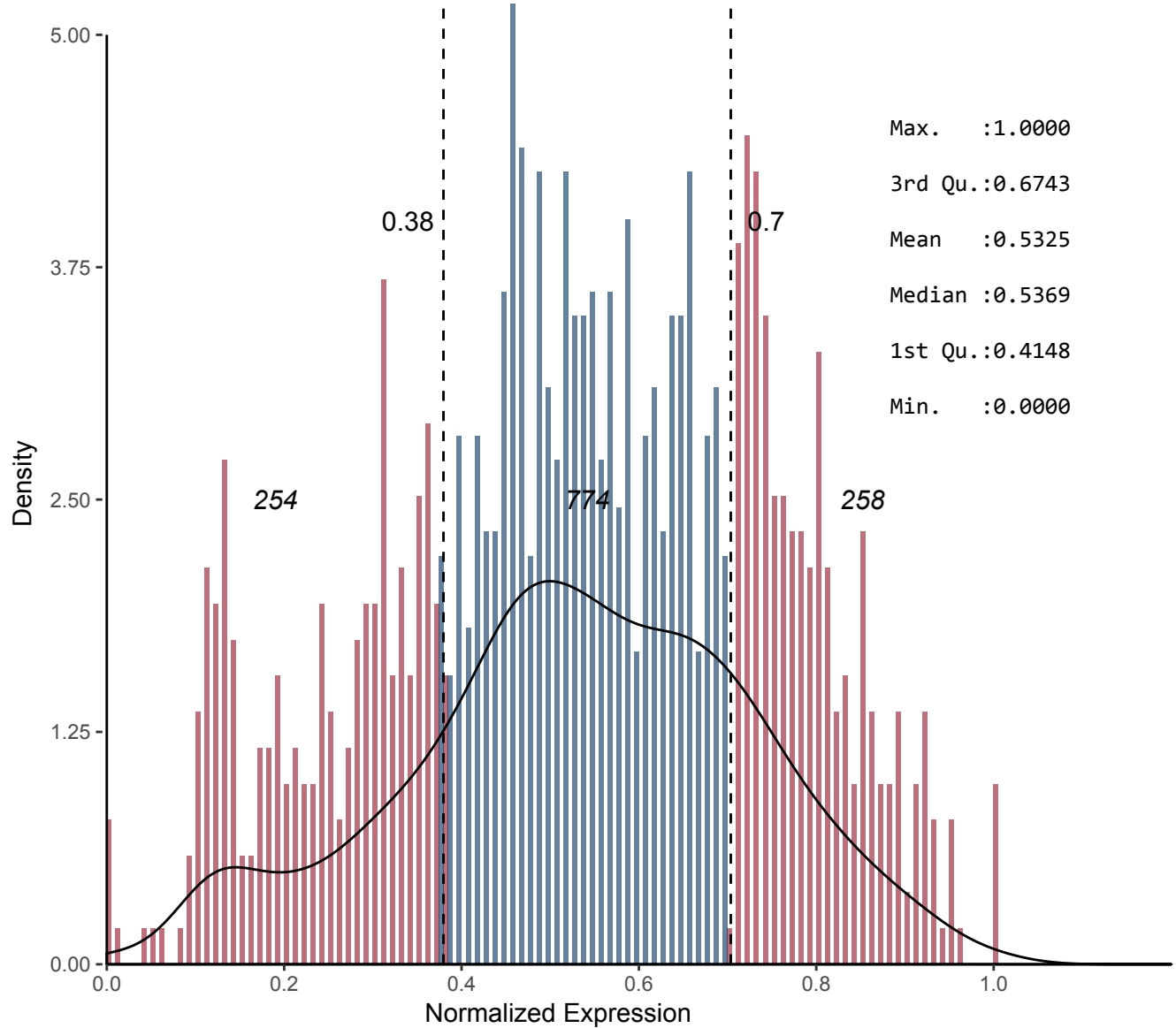


Figure 10 - CD4



Aberrant TRUE FALSE

Figure 11 - CD5

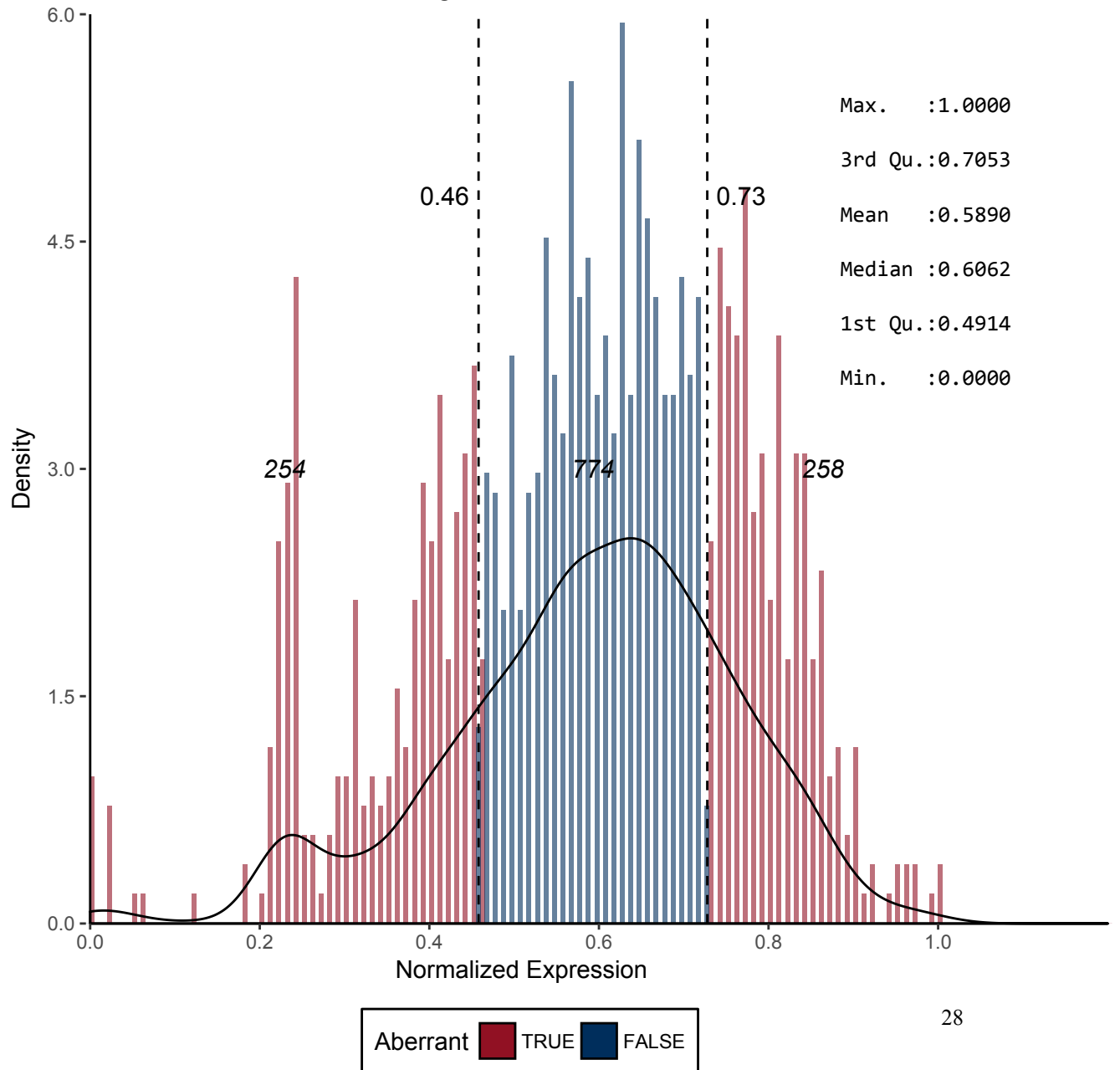
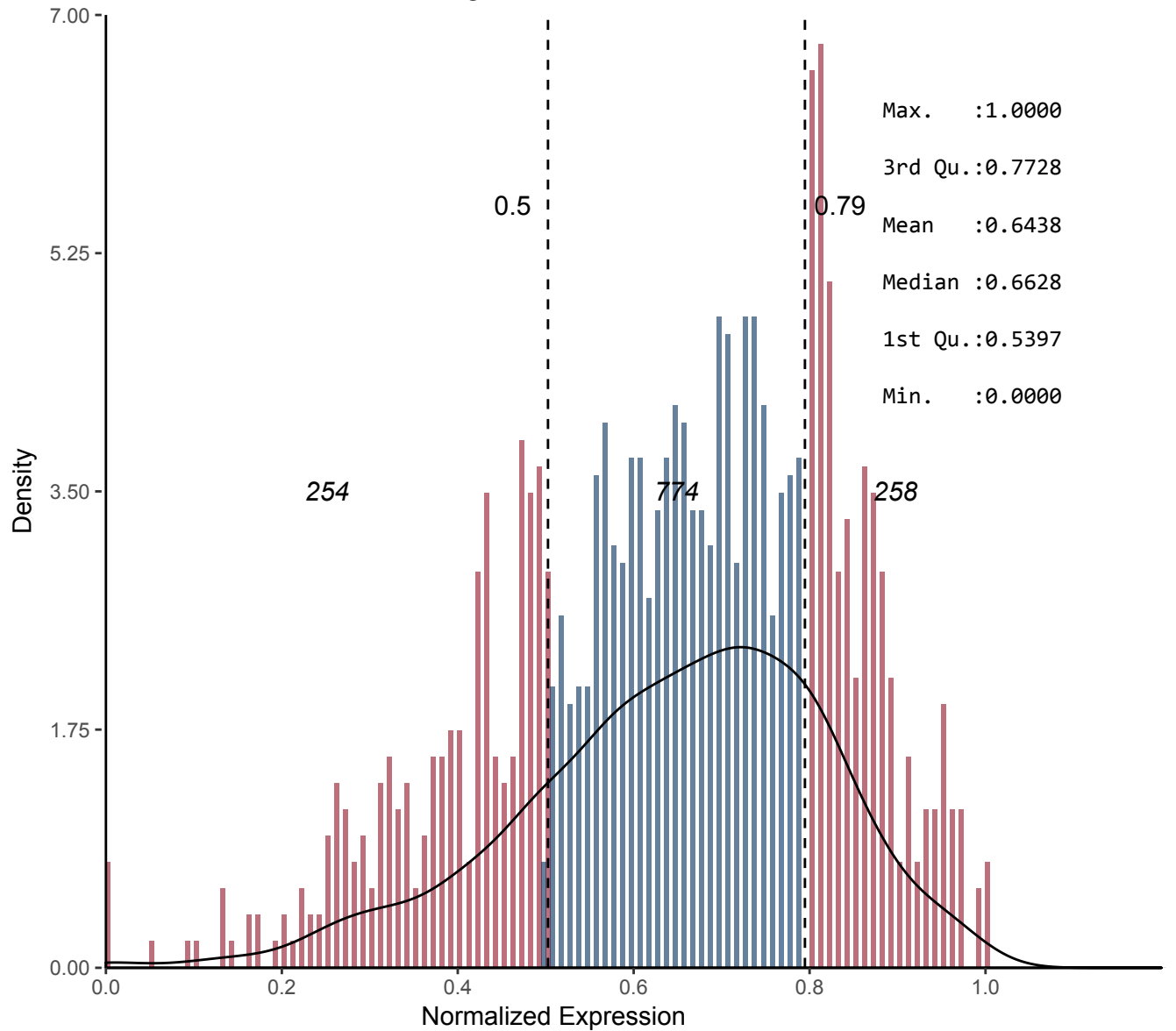


Figure 12 - CD6



Aberrant TRUE FALSE

Figure 13 - CD7

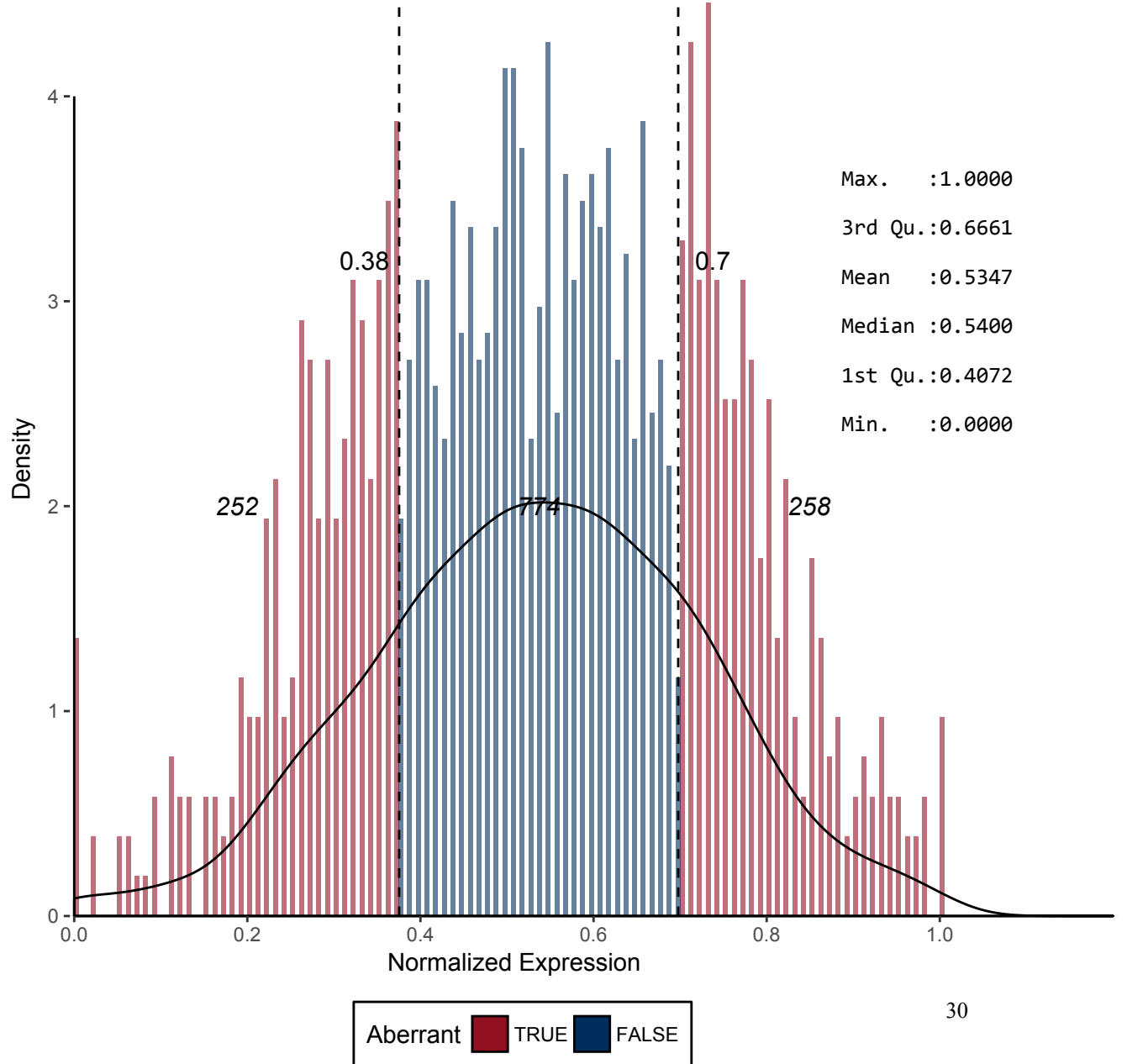


Figure 14 - CD8A

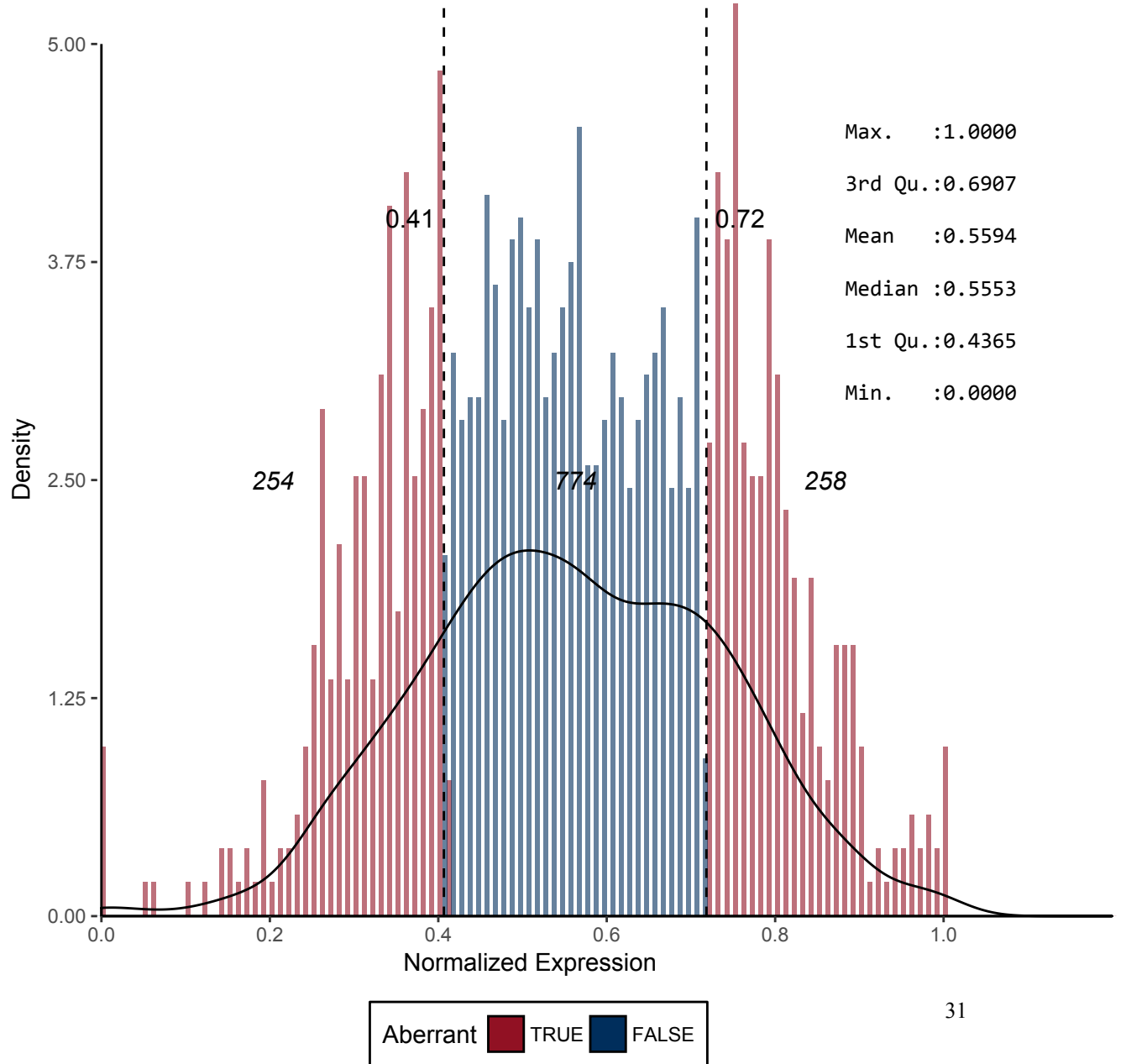


Figure 15 - CD8B

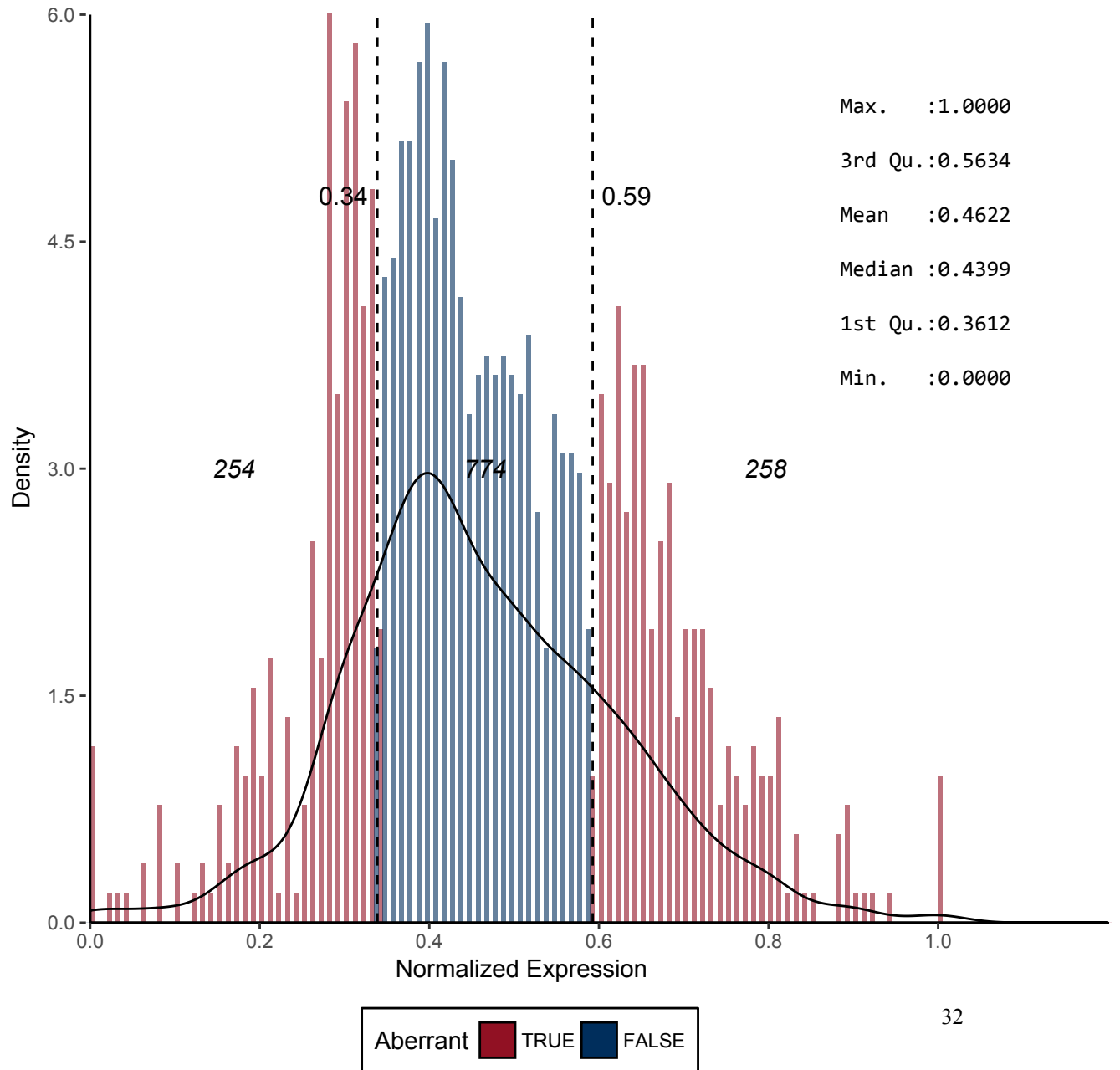
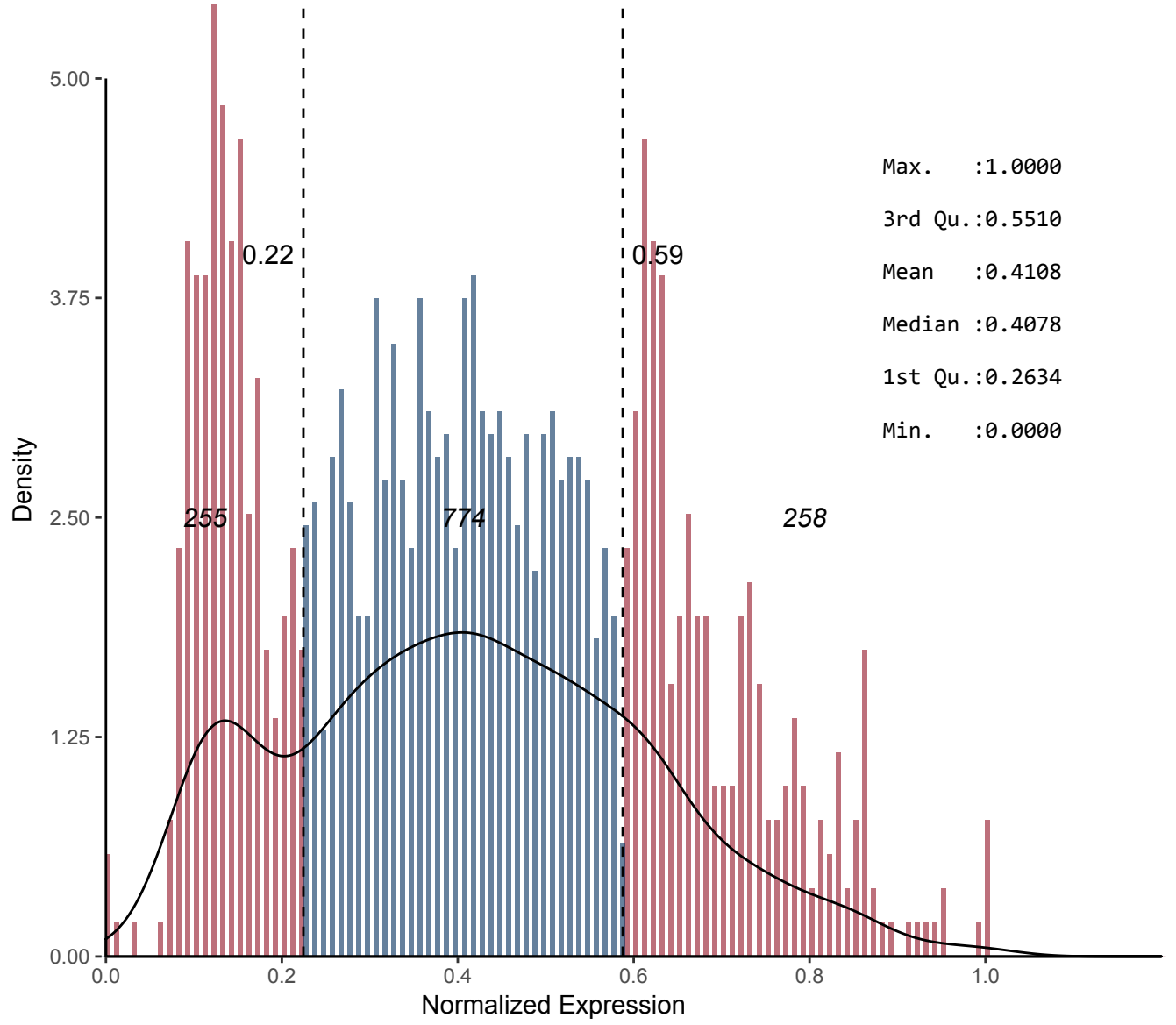
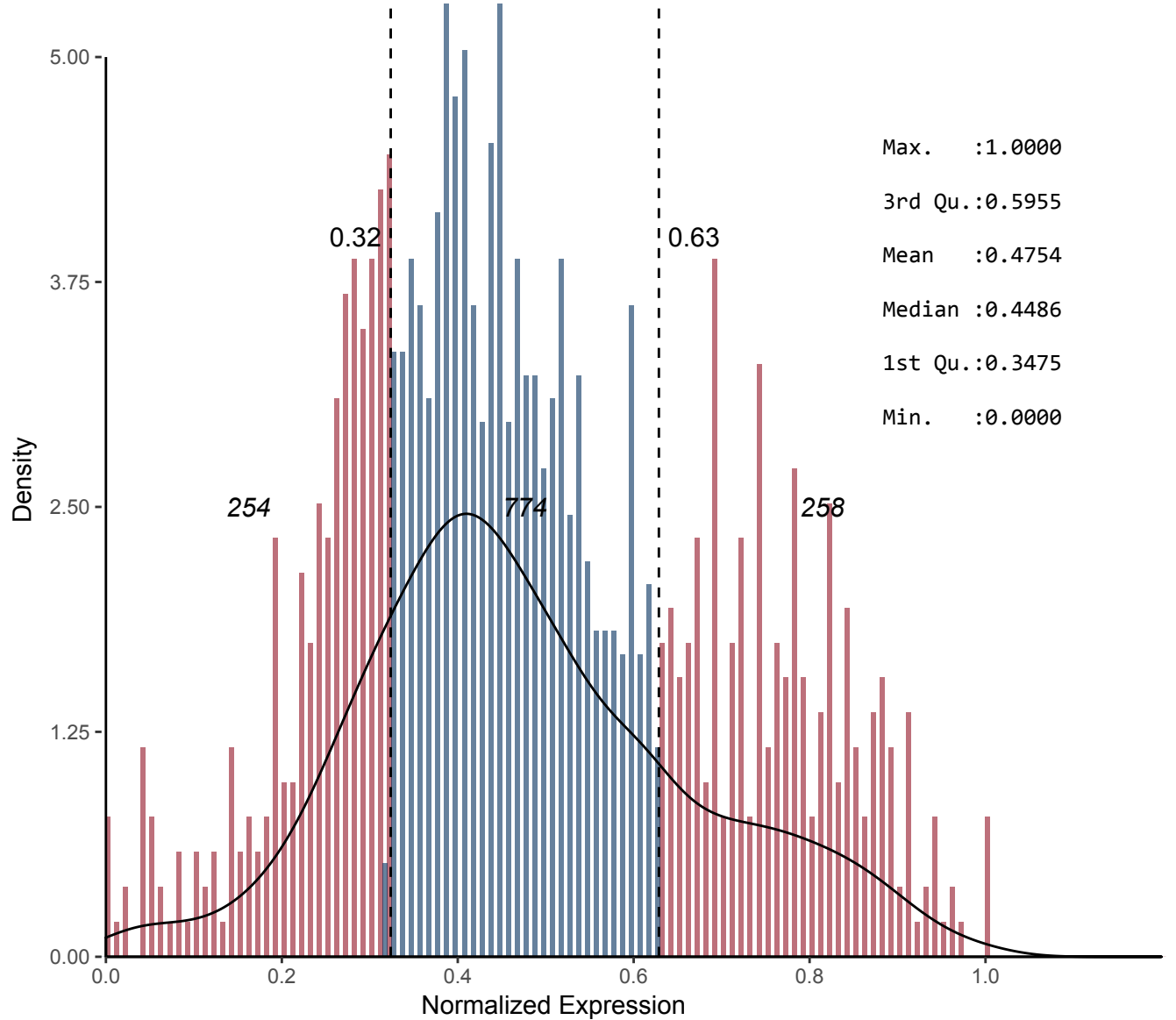


Figure 16 - CD9



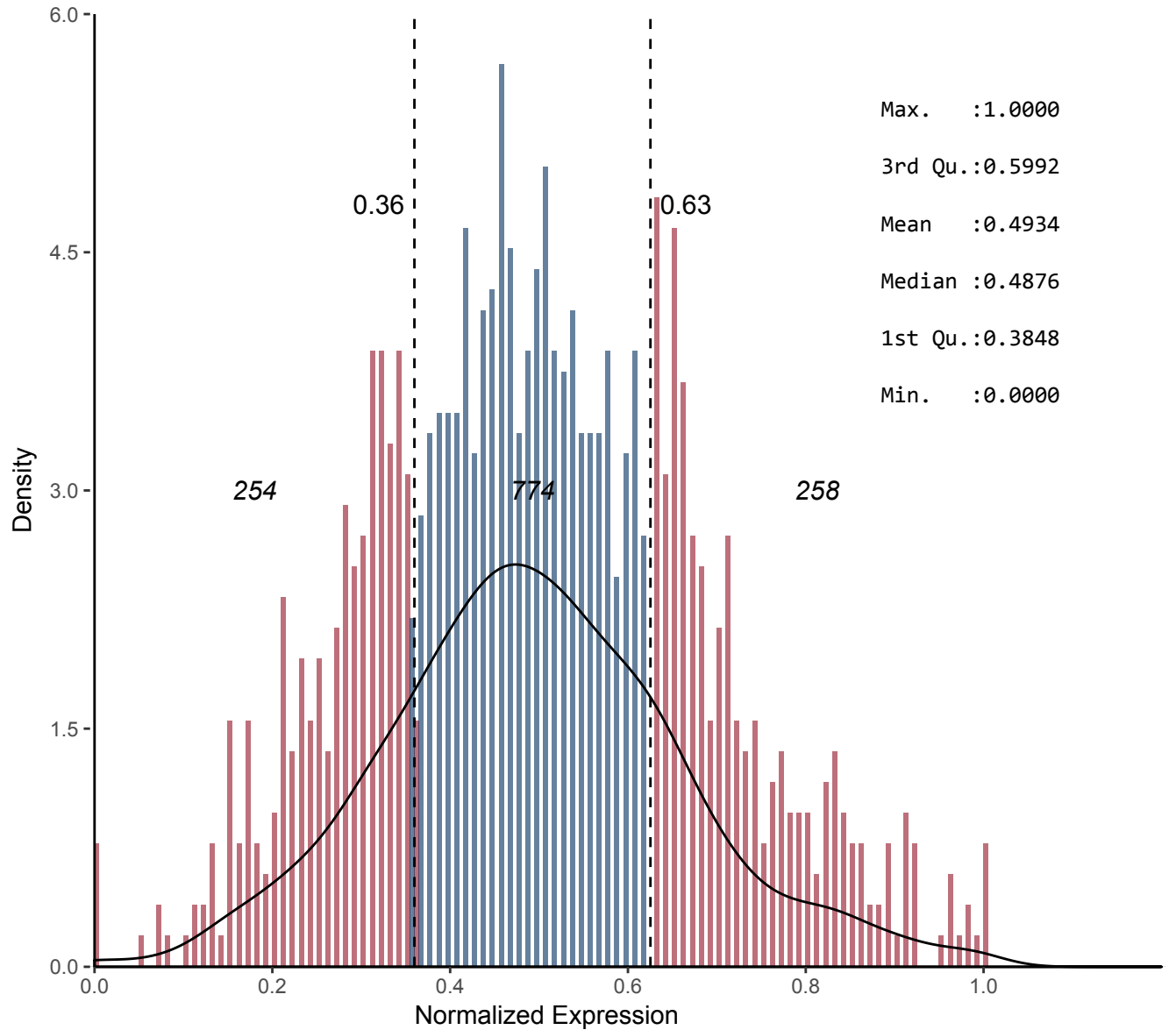
Aberrant TRUE FALSE

Figure 17 - CD10



Aberrant TRUE FALSE

Figure 18 - CD11A



Aberrant TRUE FALSE

Figure 19 - CD11B

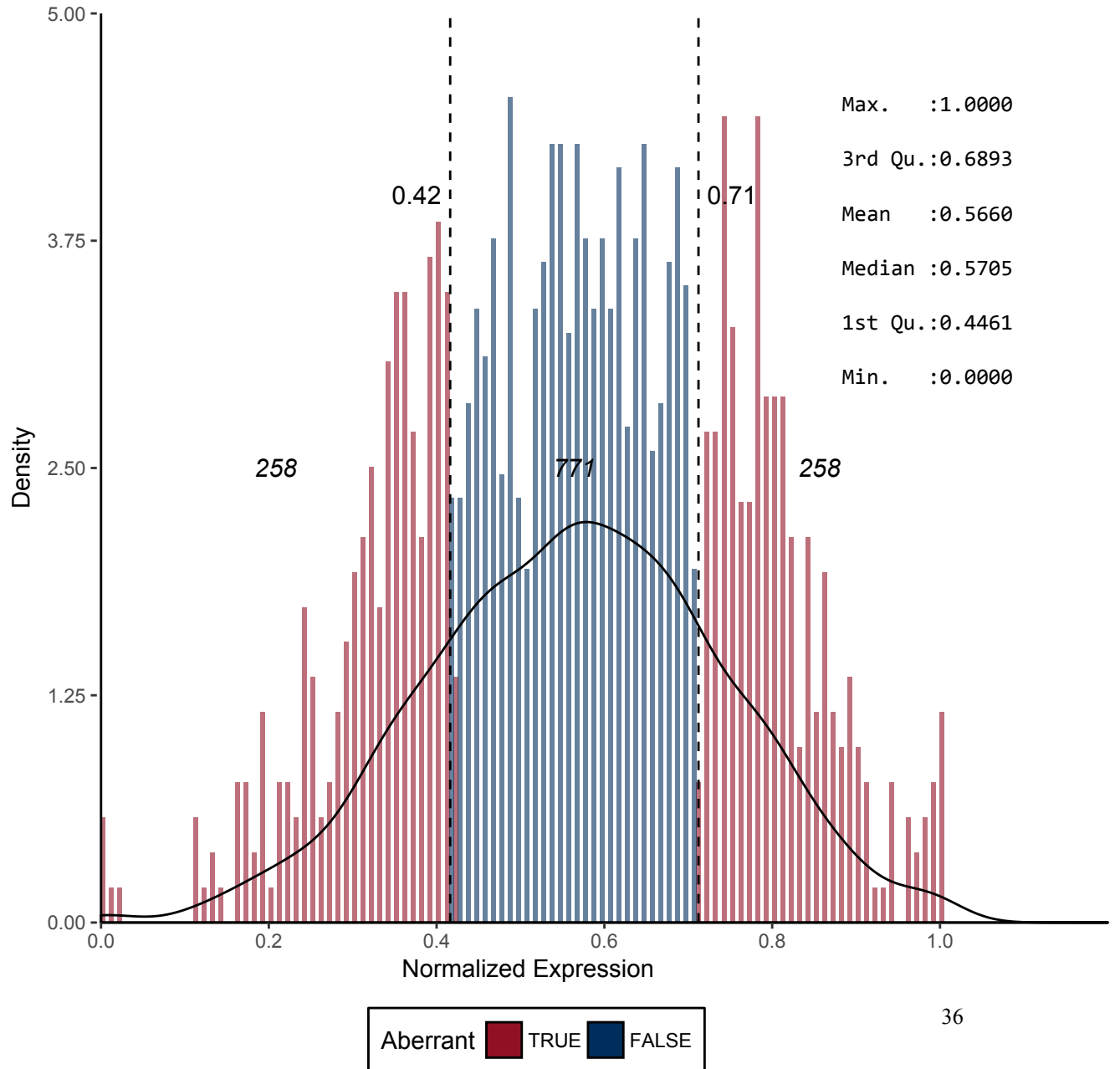


Figure 20 - CD11C

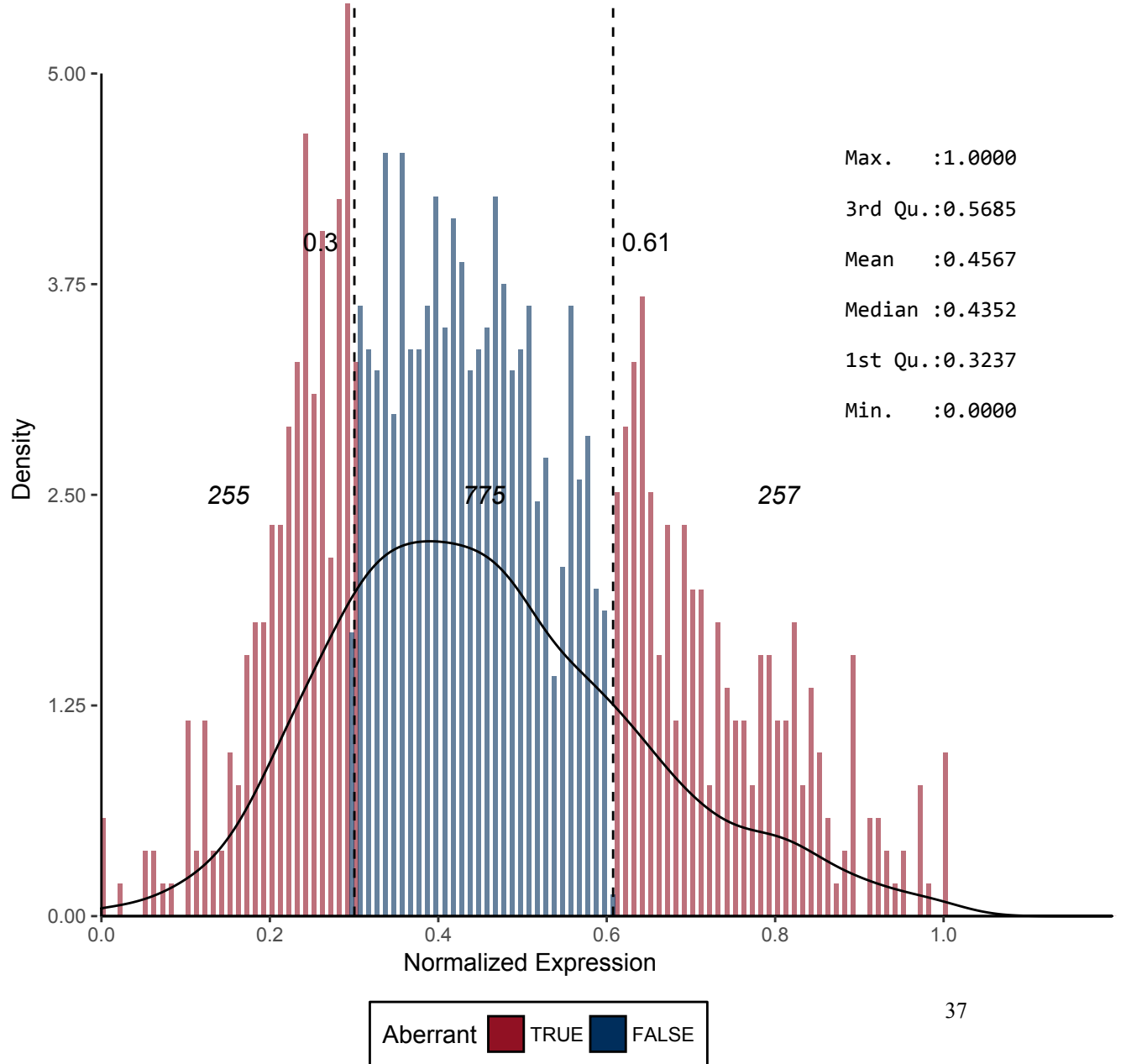
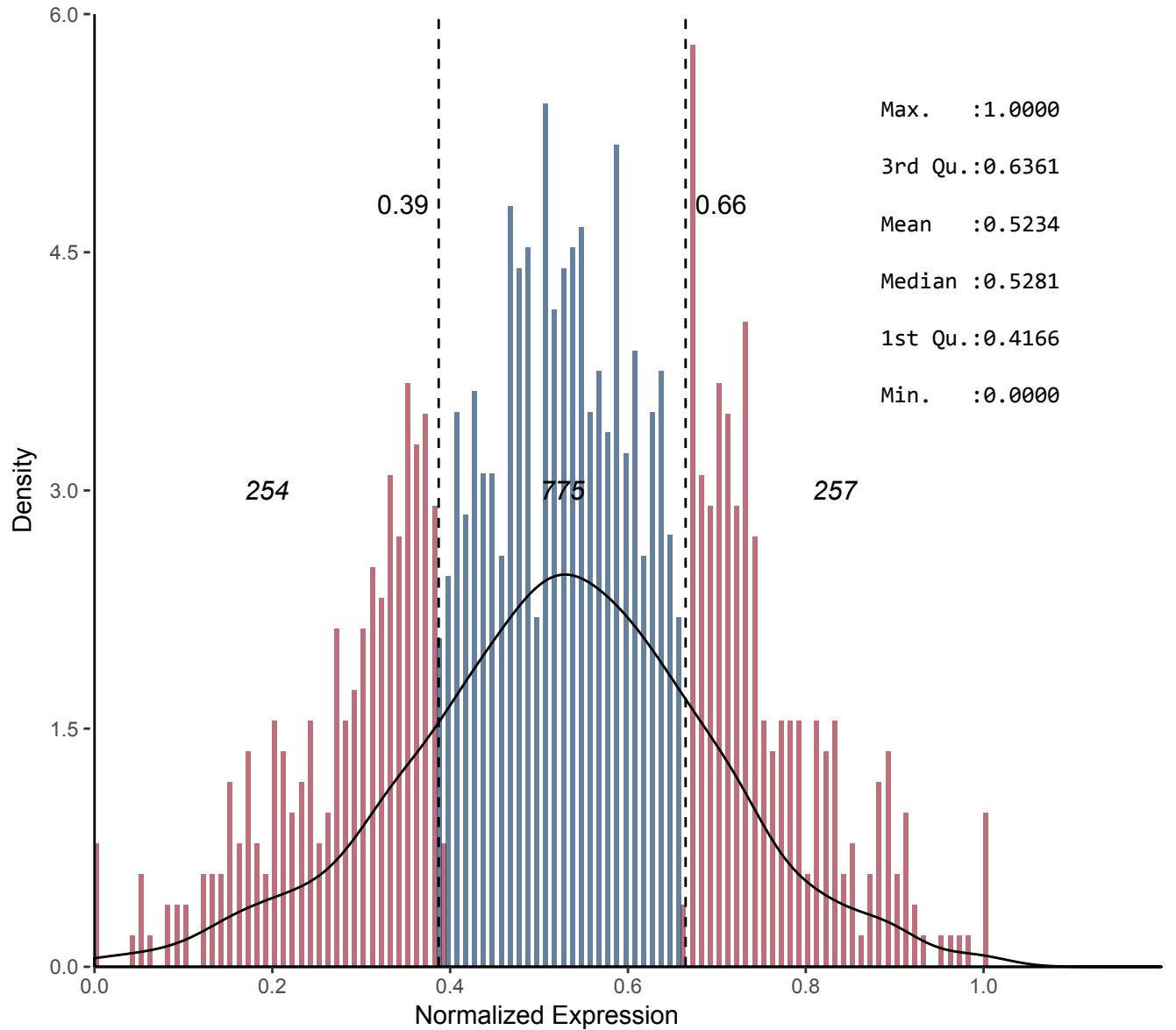


Figure 21 - CD13



Aberrant TRUE FALSE

Figure 22 - CD14

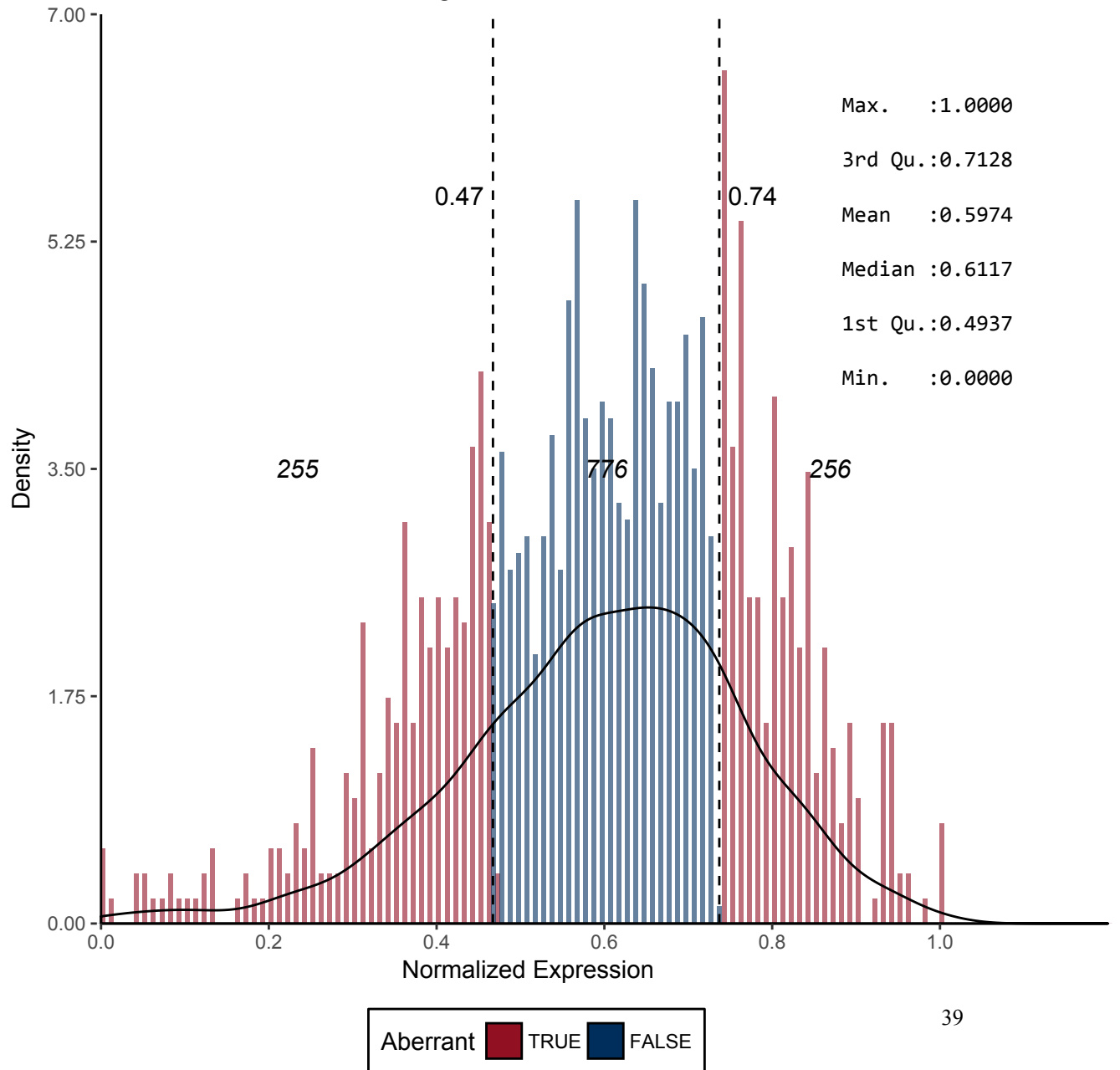
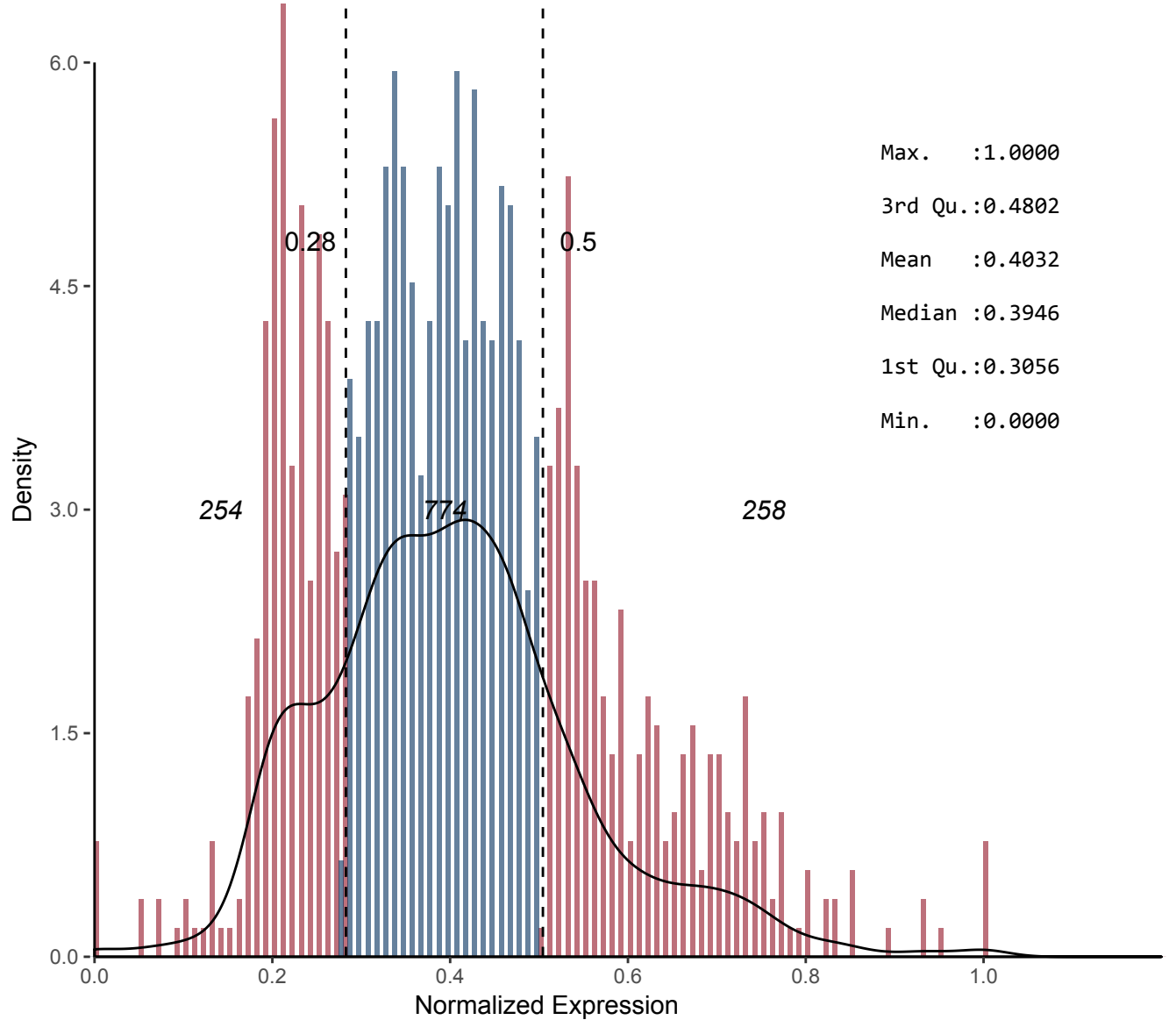


Figure 23 - CD15



Aberrant TRUE FALSE

Figure 24 - CD16B

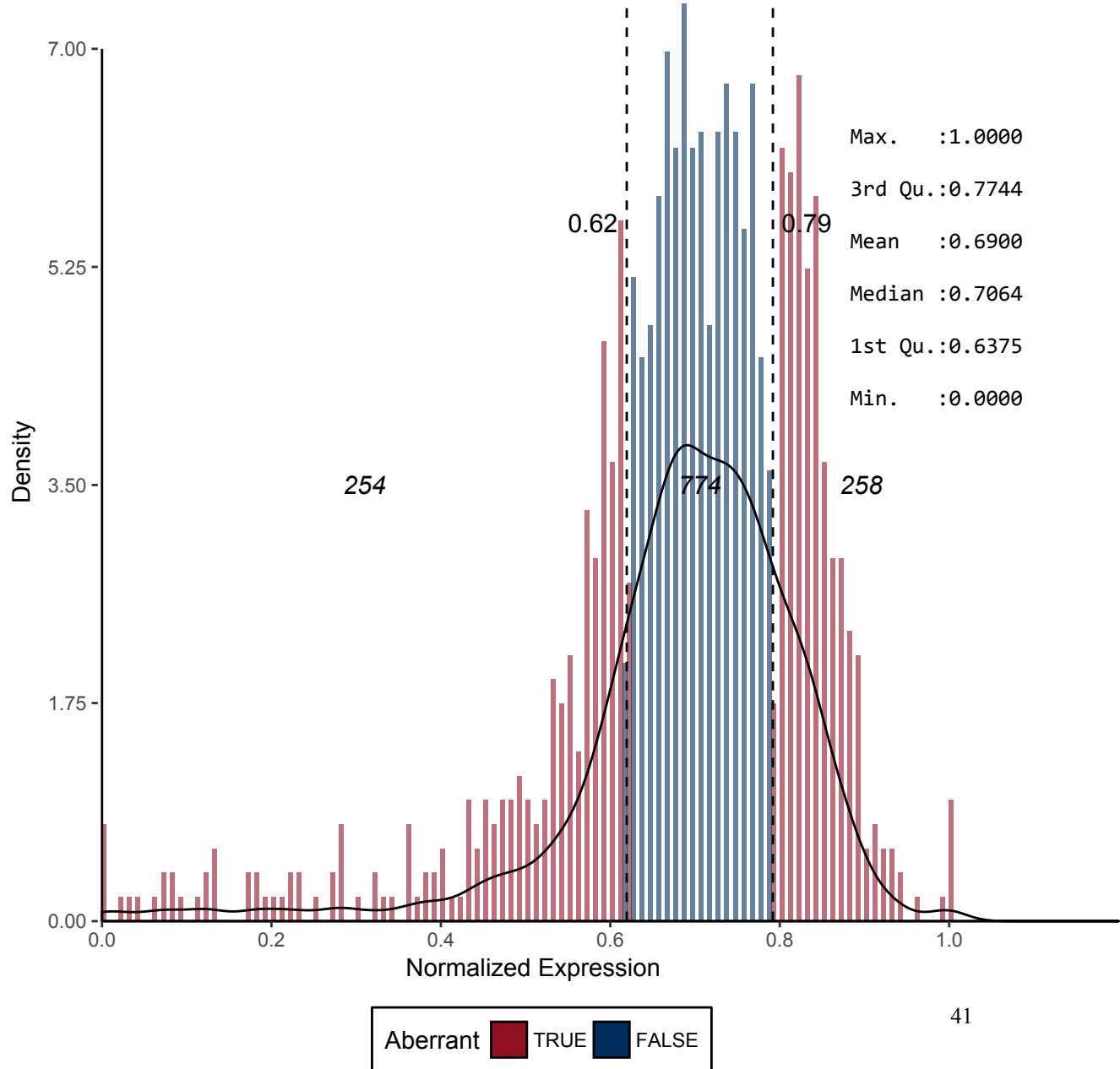


Figure 25 - CD18

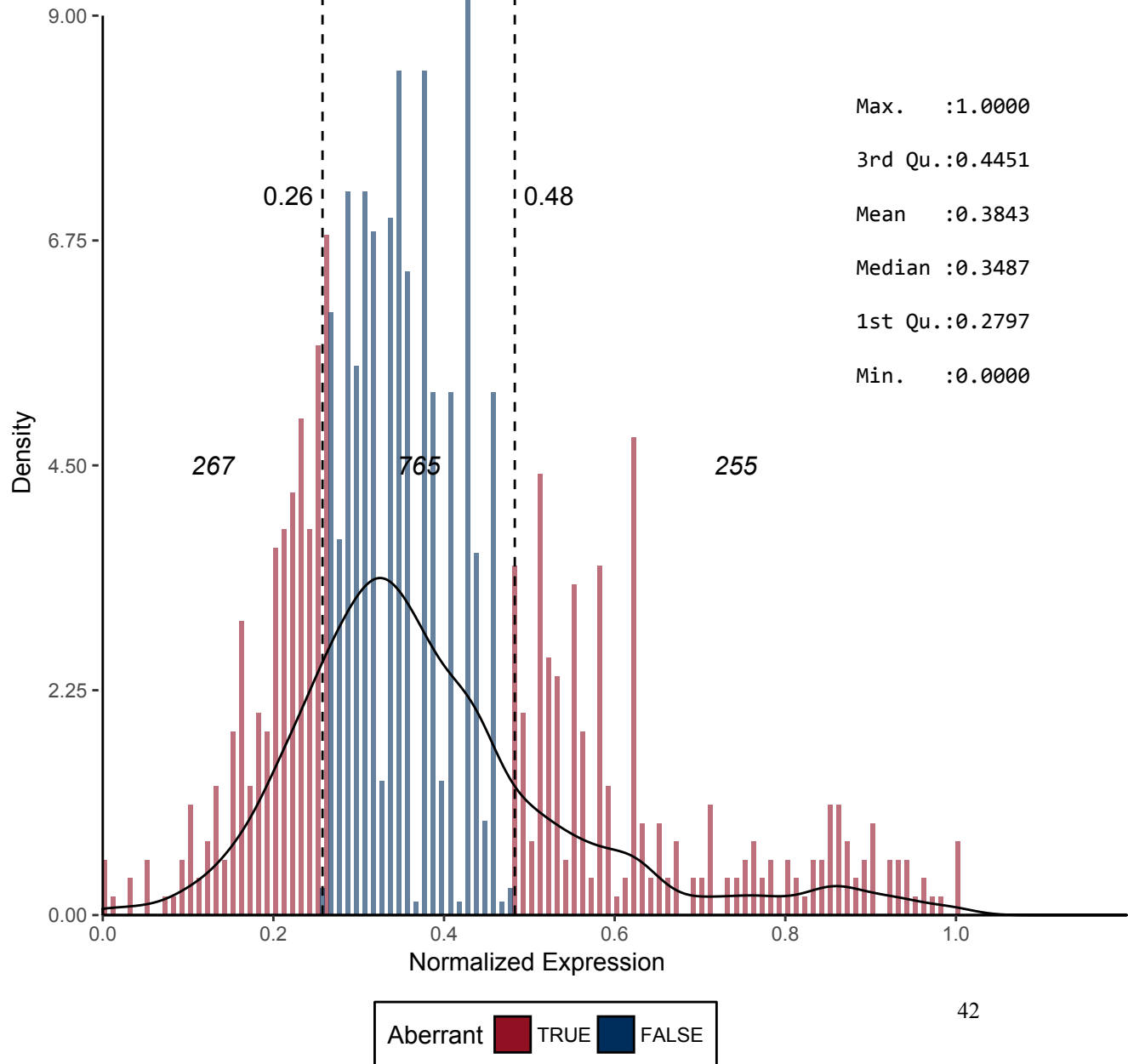


Figure 26 - CD19

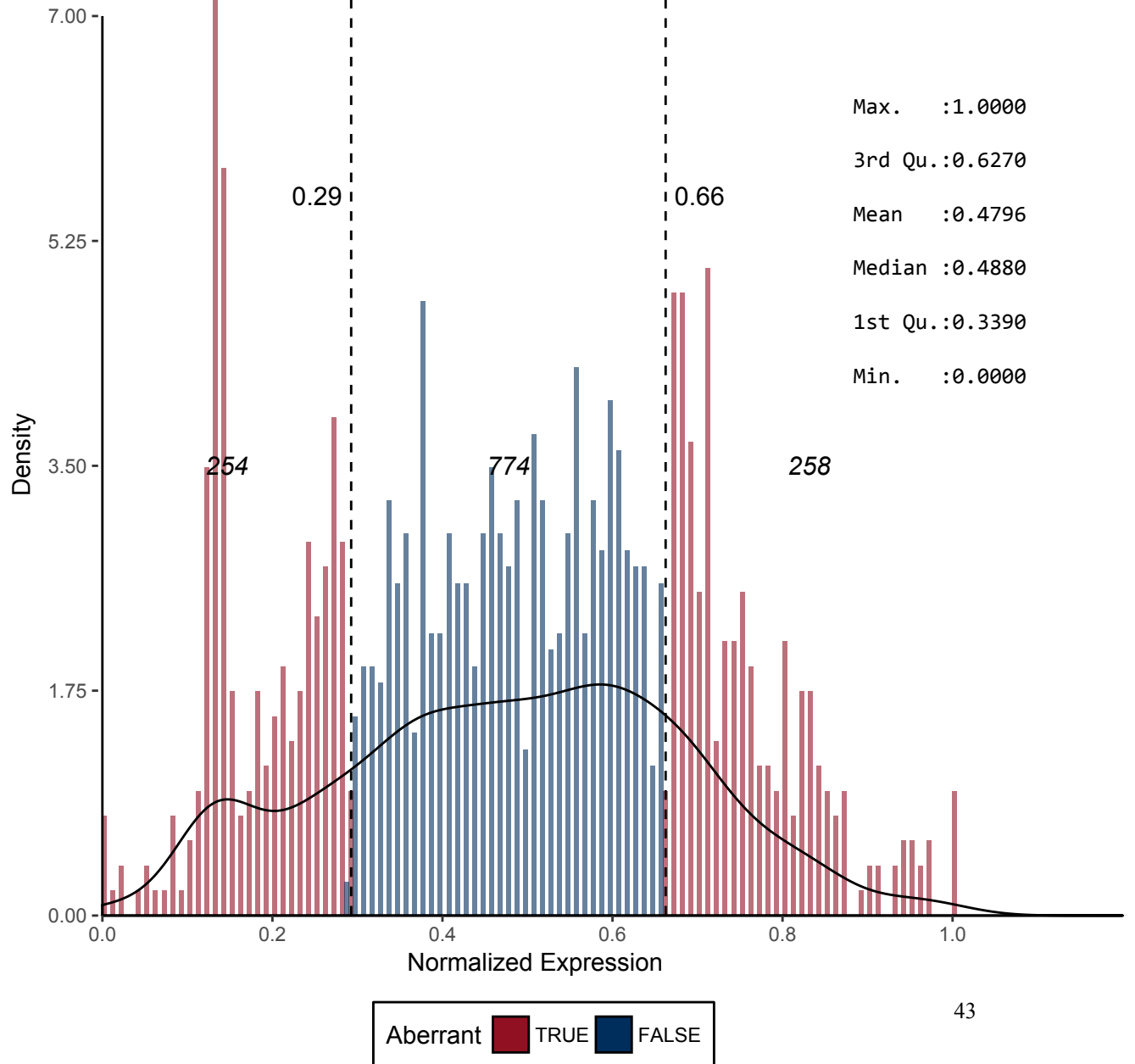


Figure 27 - CD20

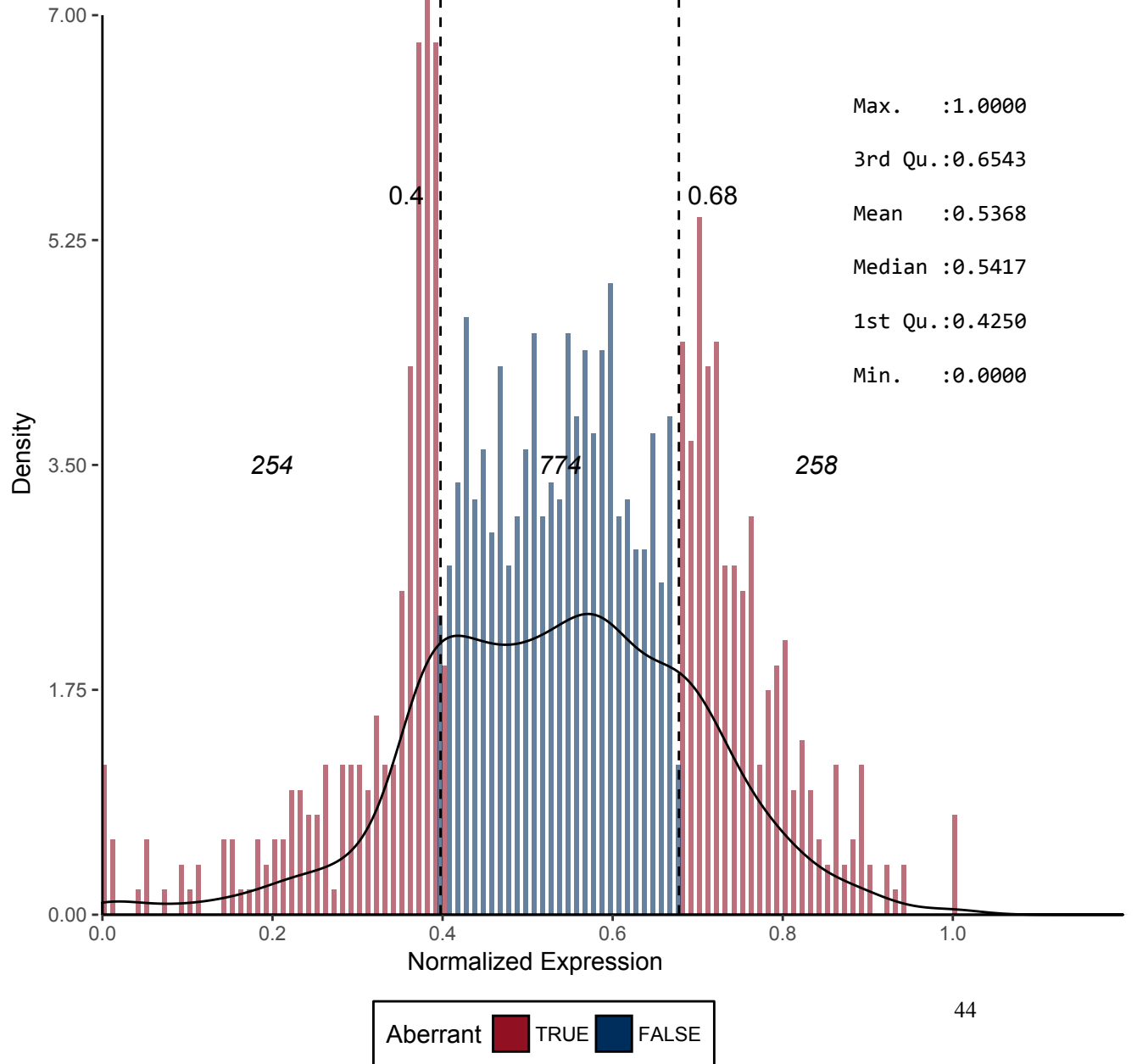


Figure 28 - CD21

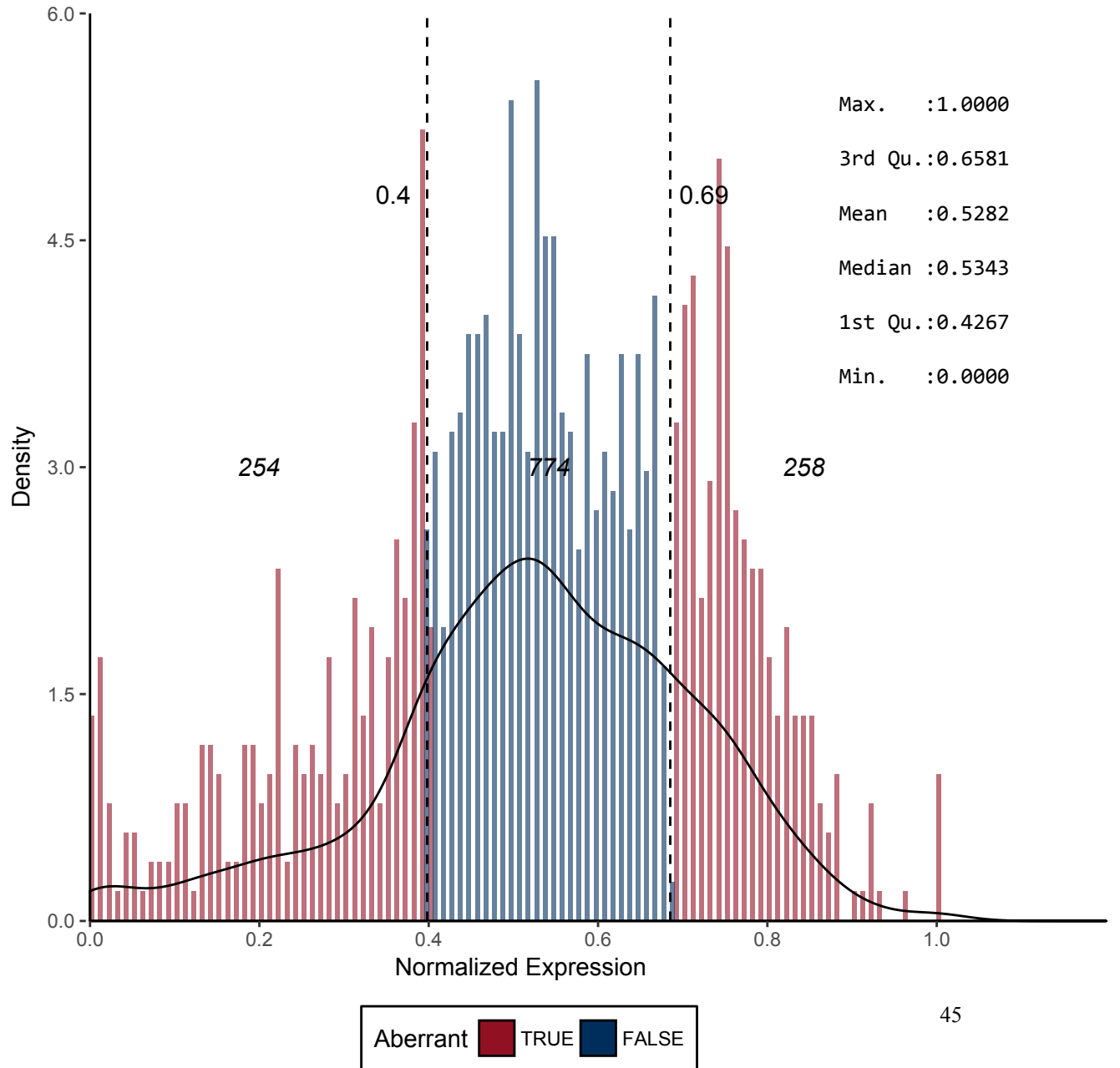


Figure 29 - CD22

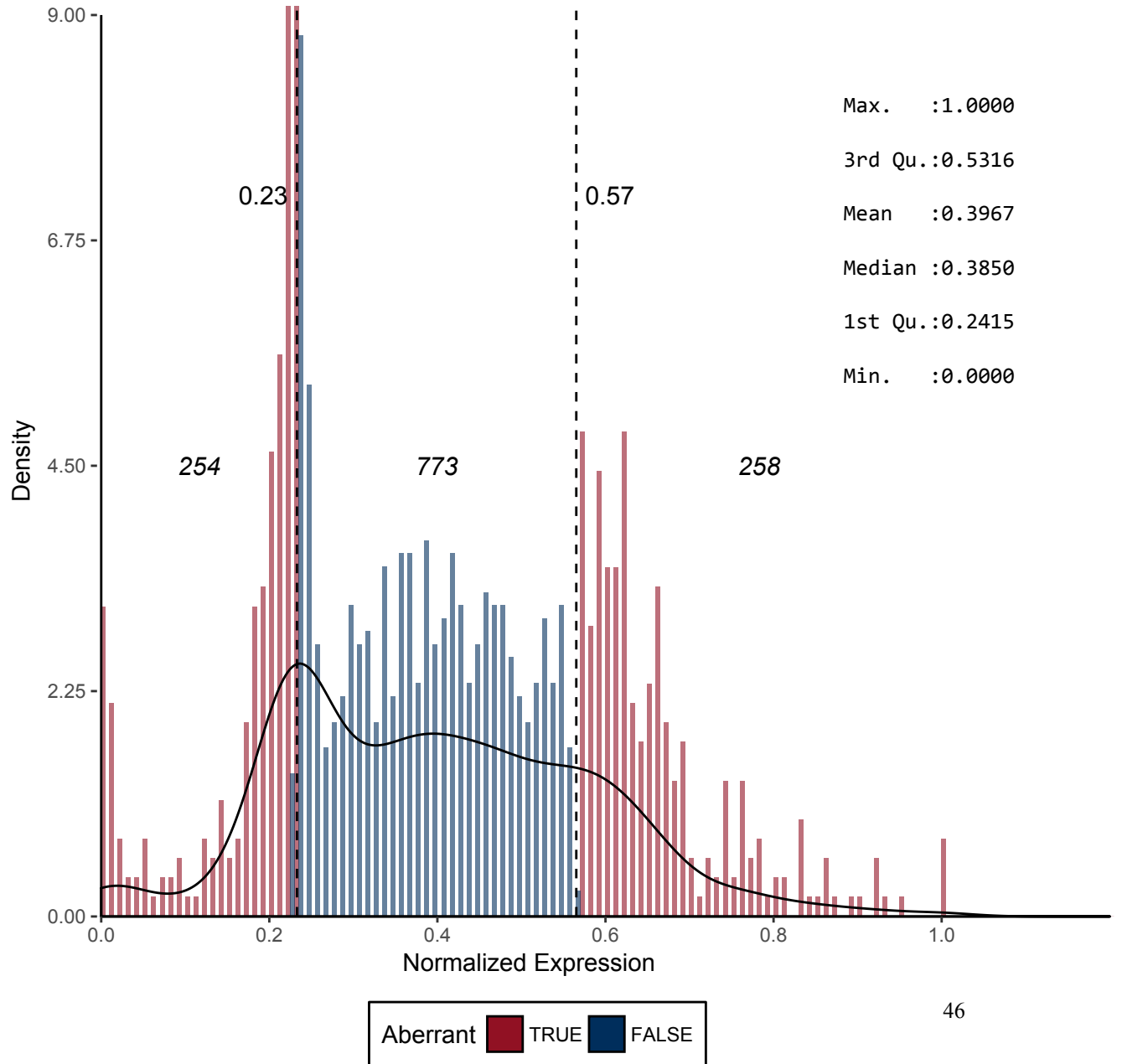


Figure 30 - CD23

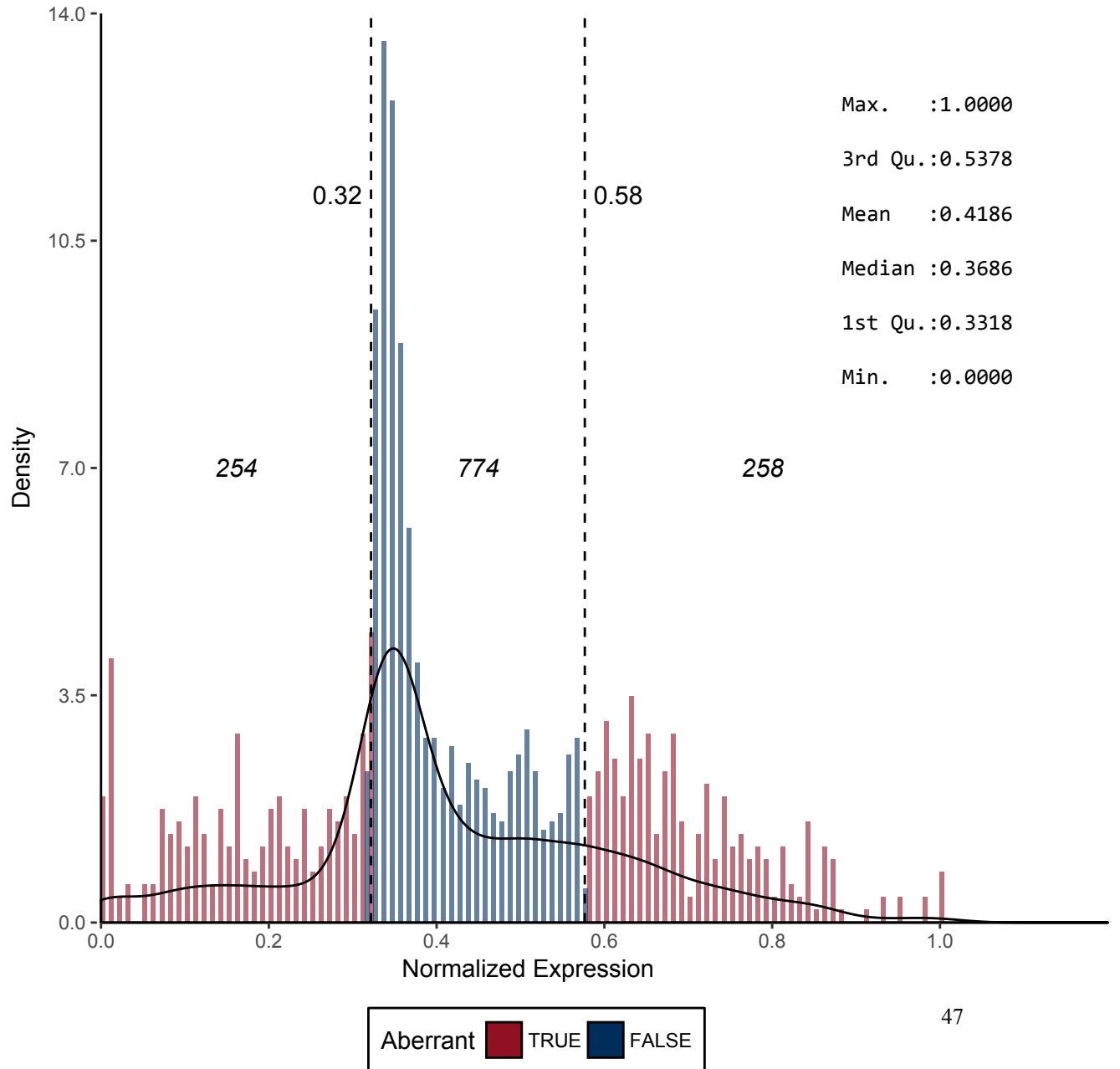


Figure 31 - CD25

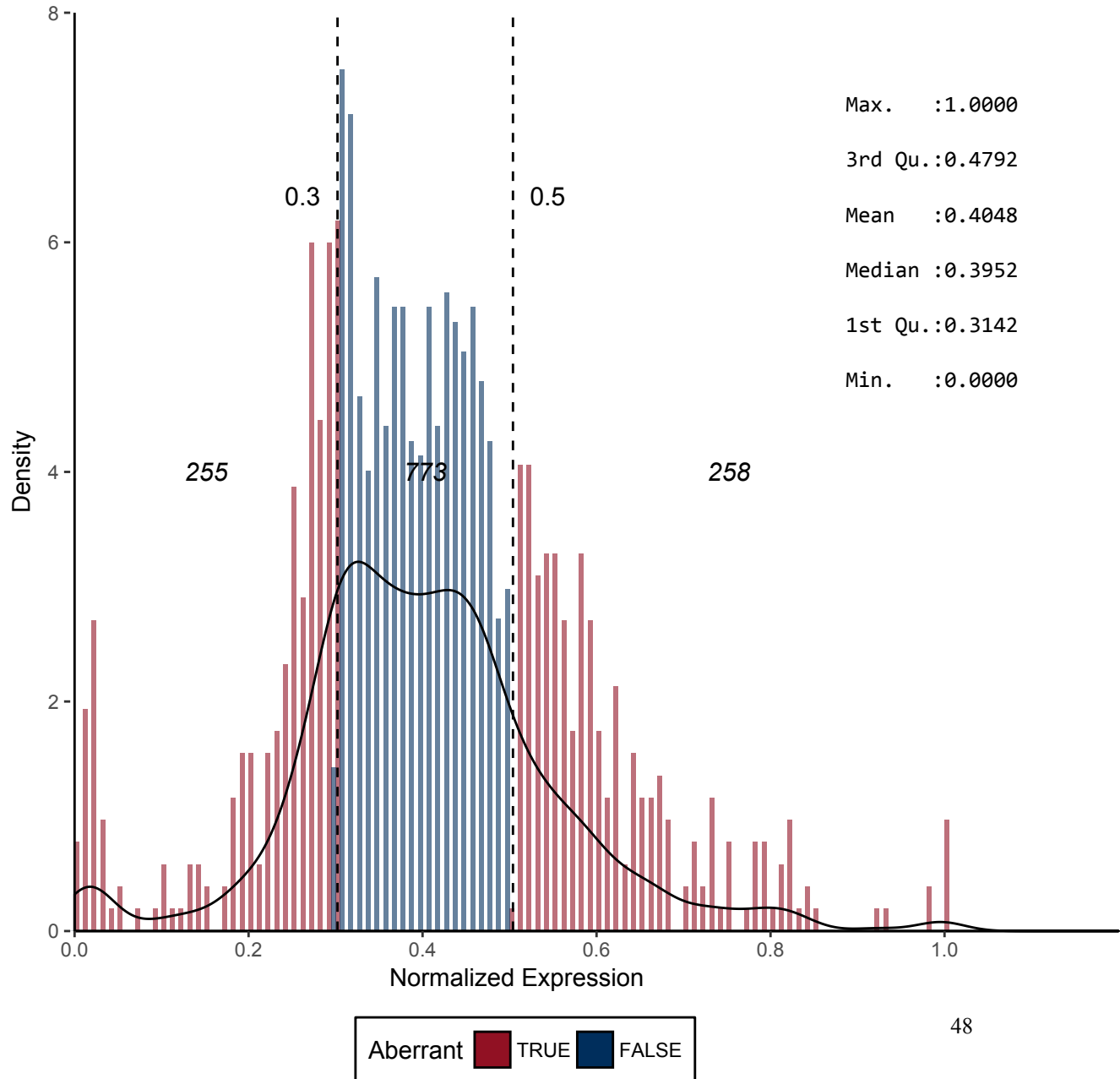


Figure 32 - CD26

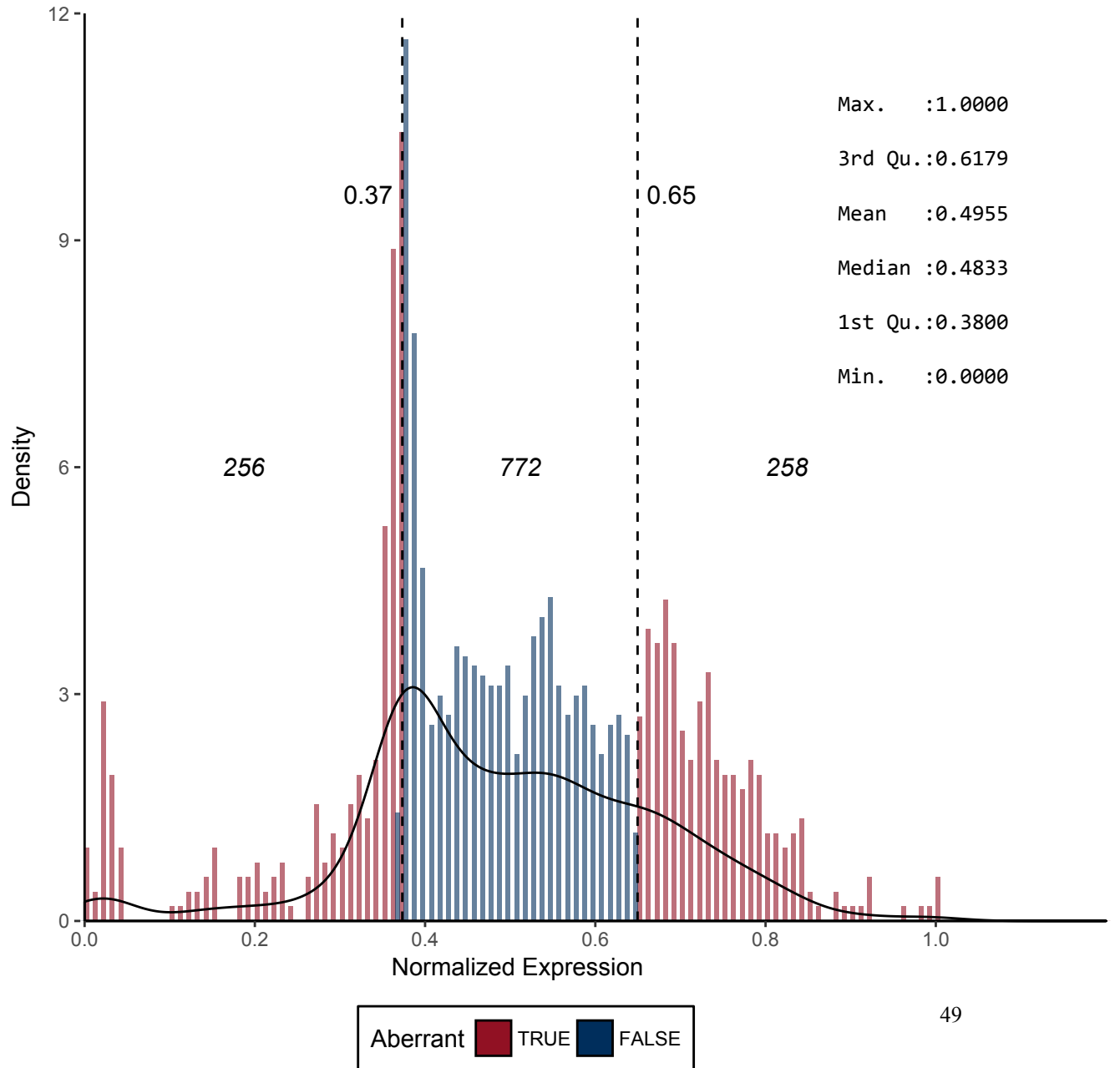
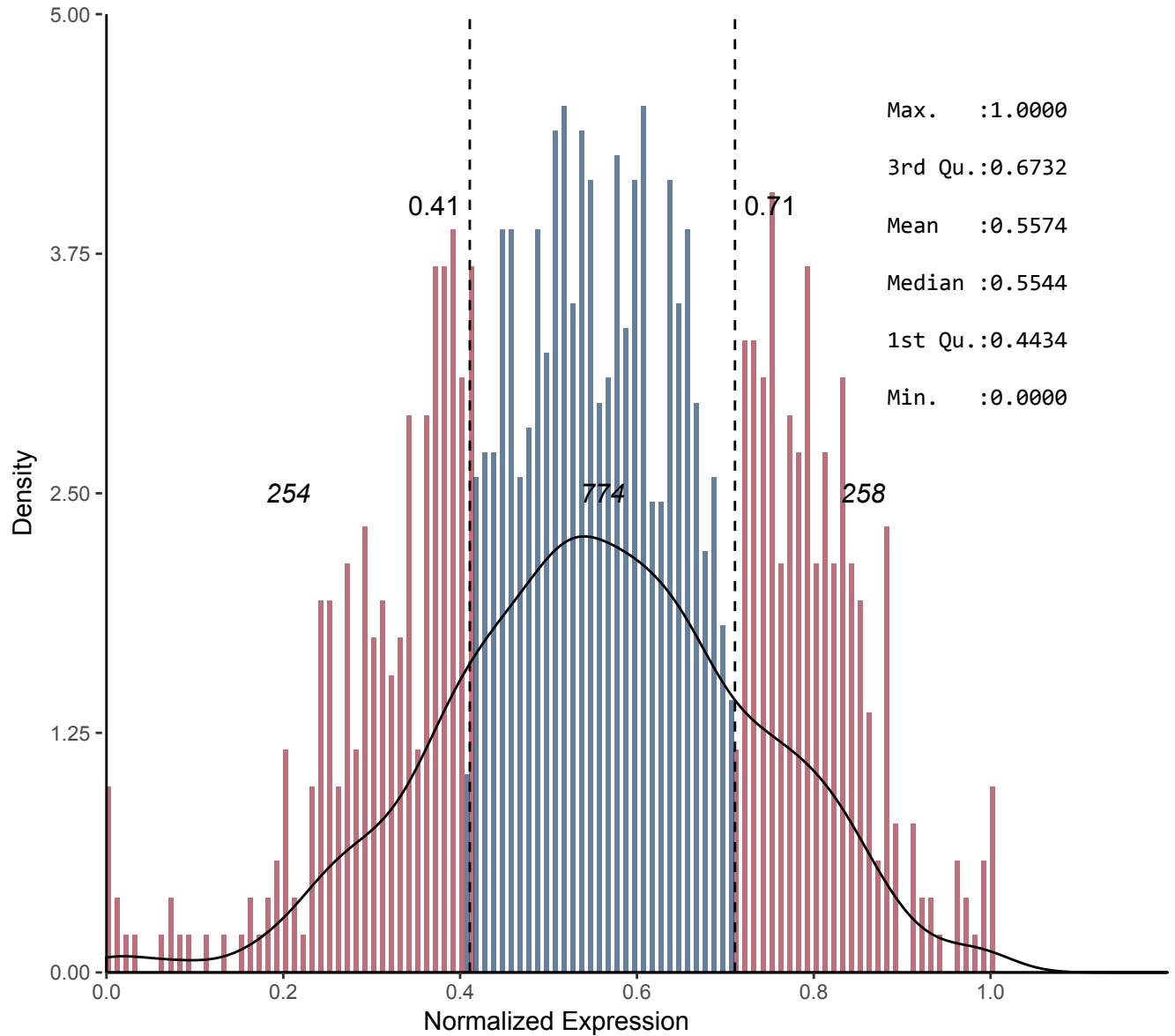


Figure 33 - CD27



Aberrant TRUE FALSE

Figure 34 - CD28

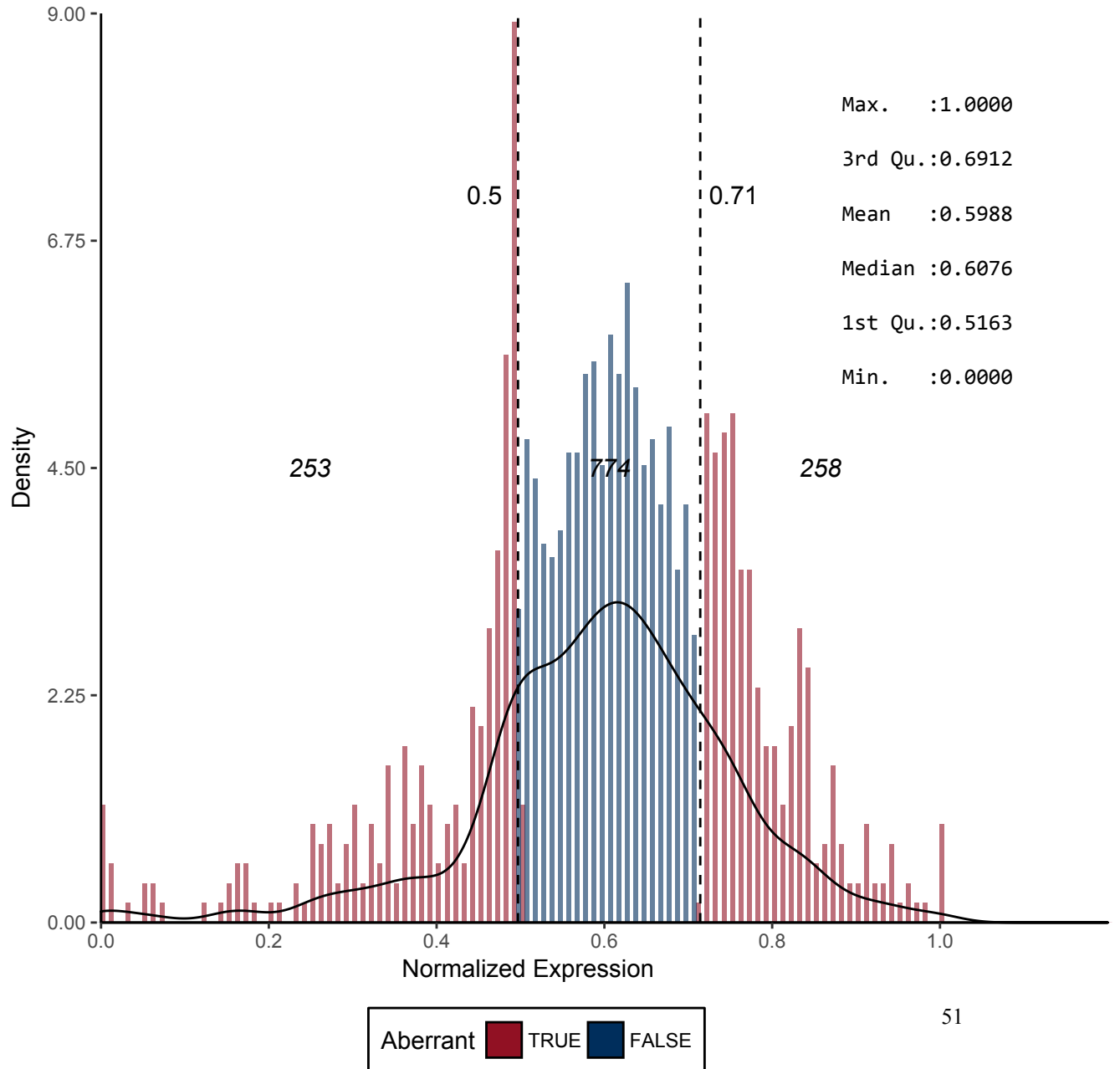


Figure 35 - CD30

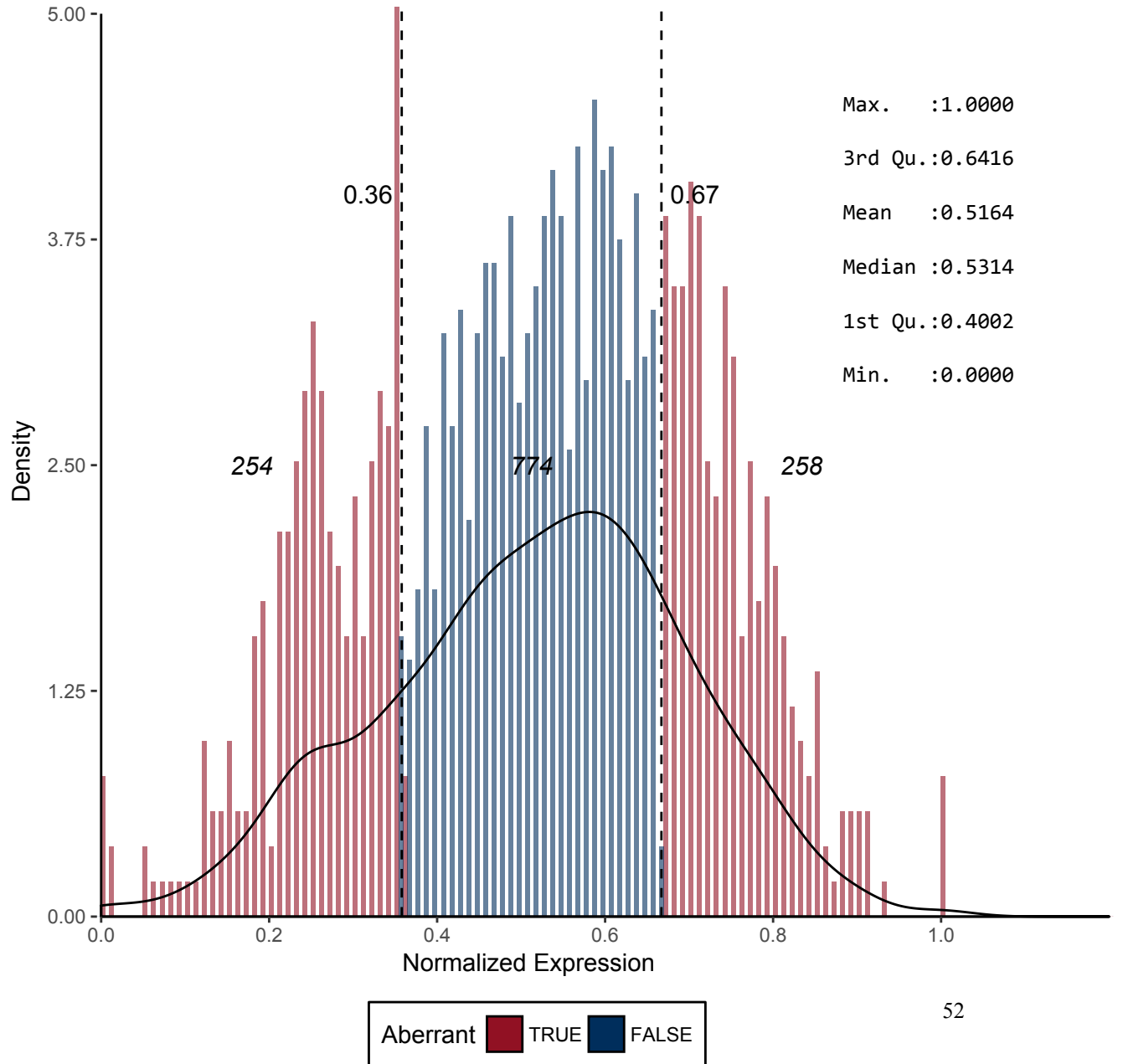


Figure 36 - CD31

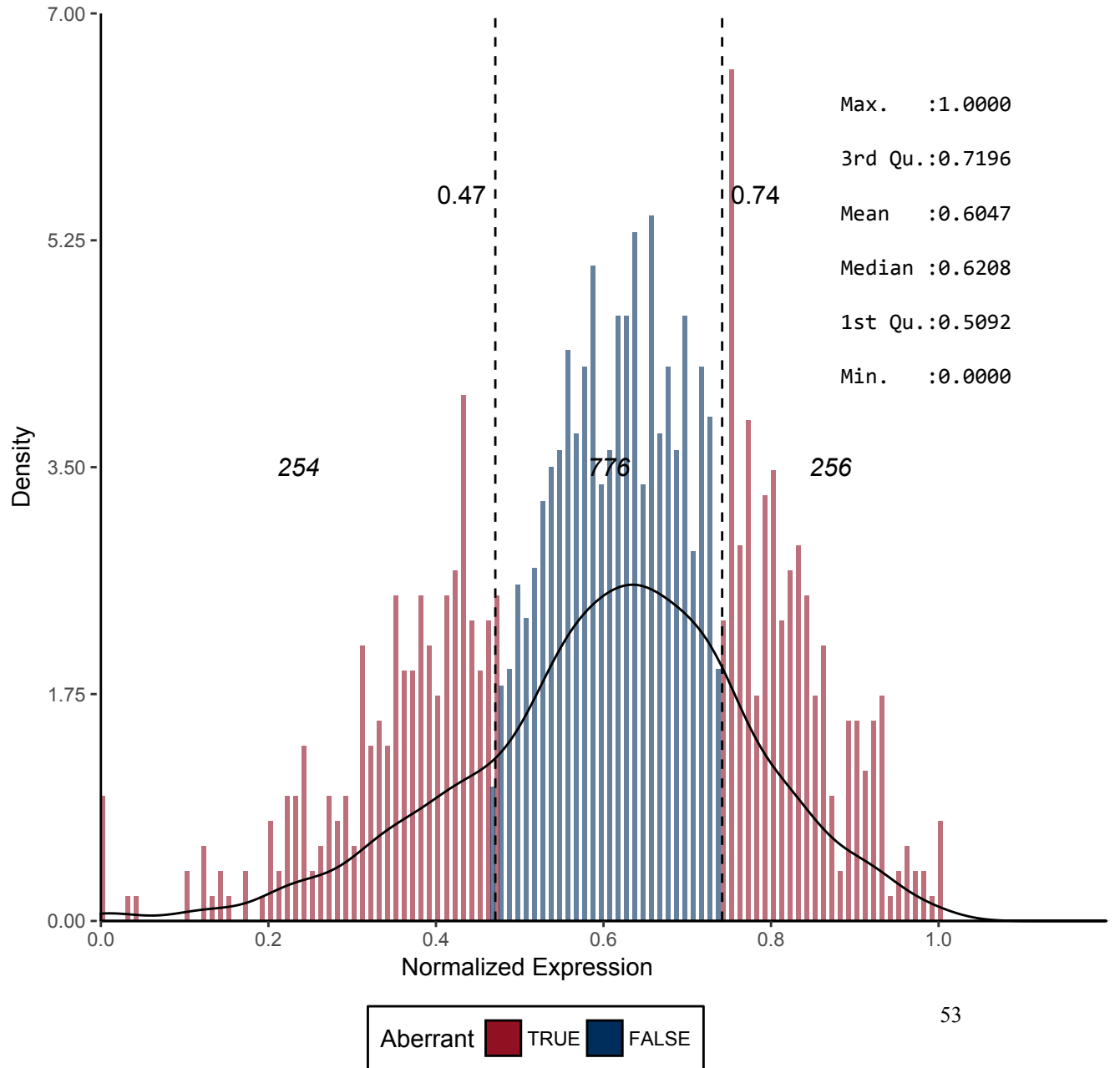


Figure 37 - CD33

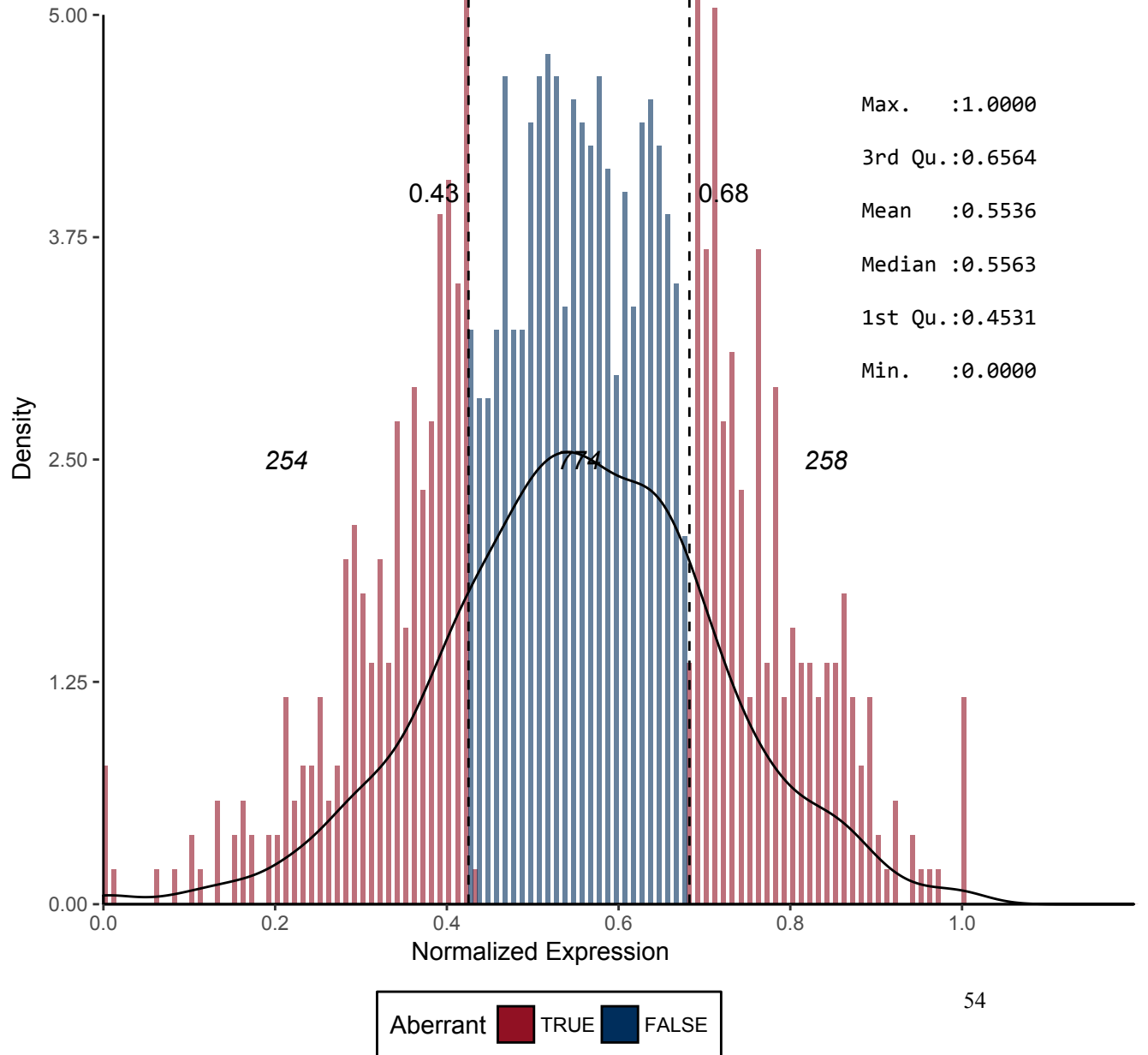


Figure 38 - CD34*

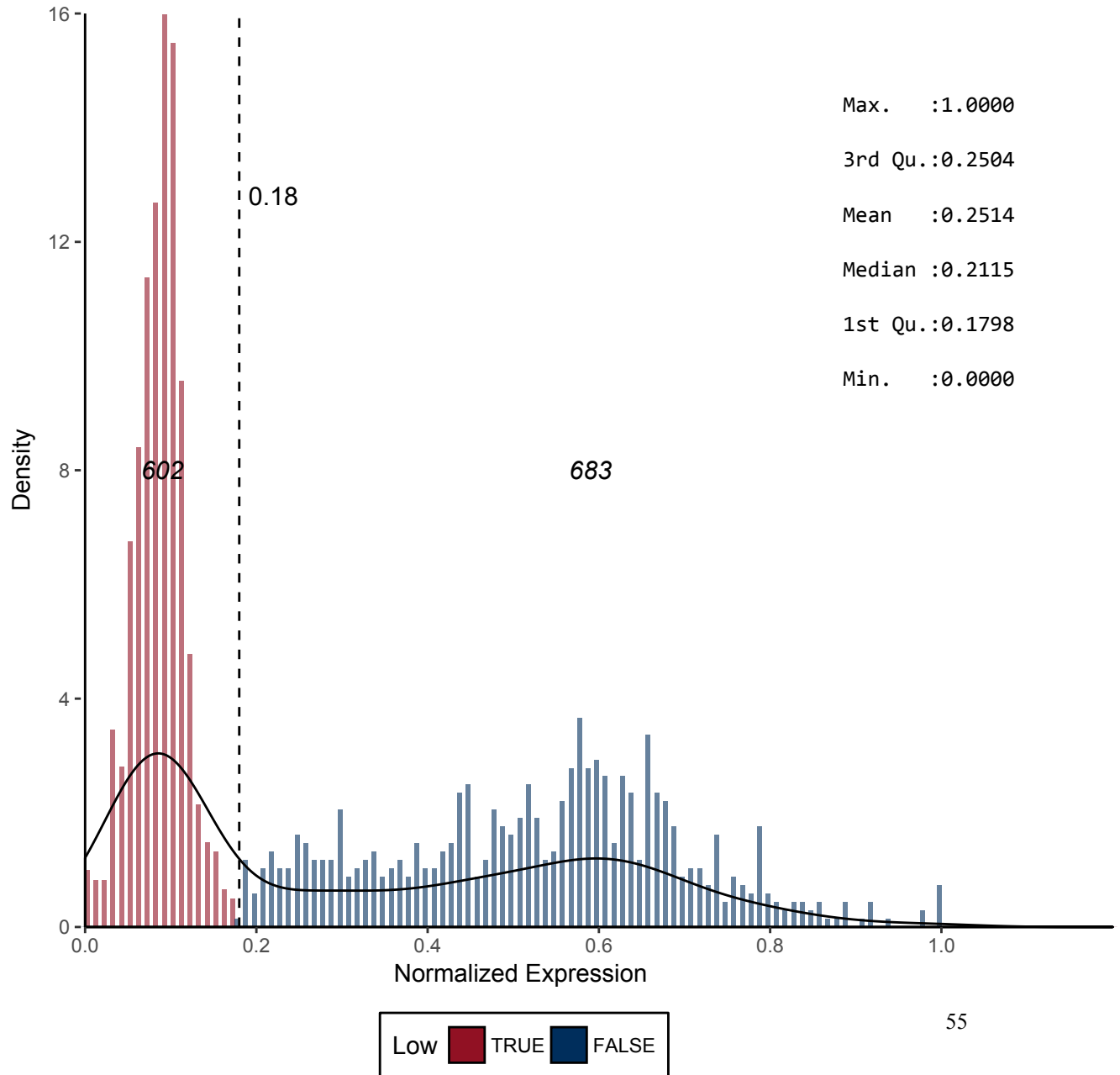
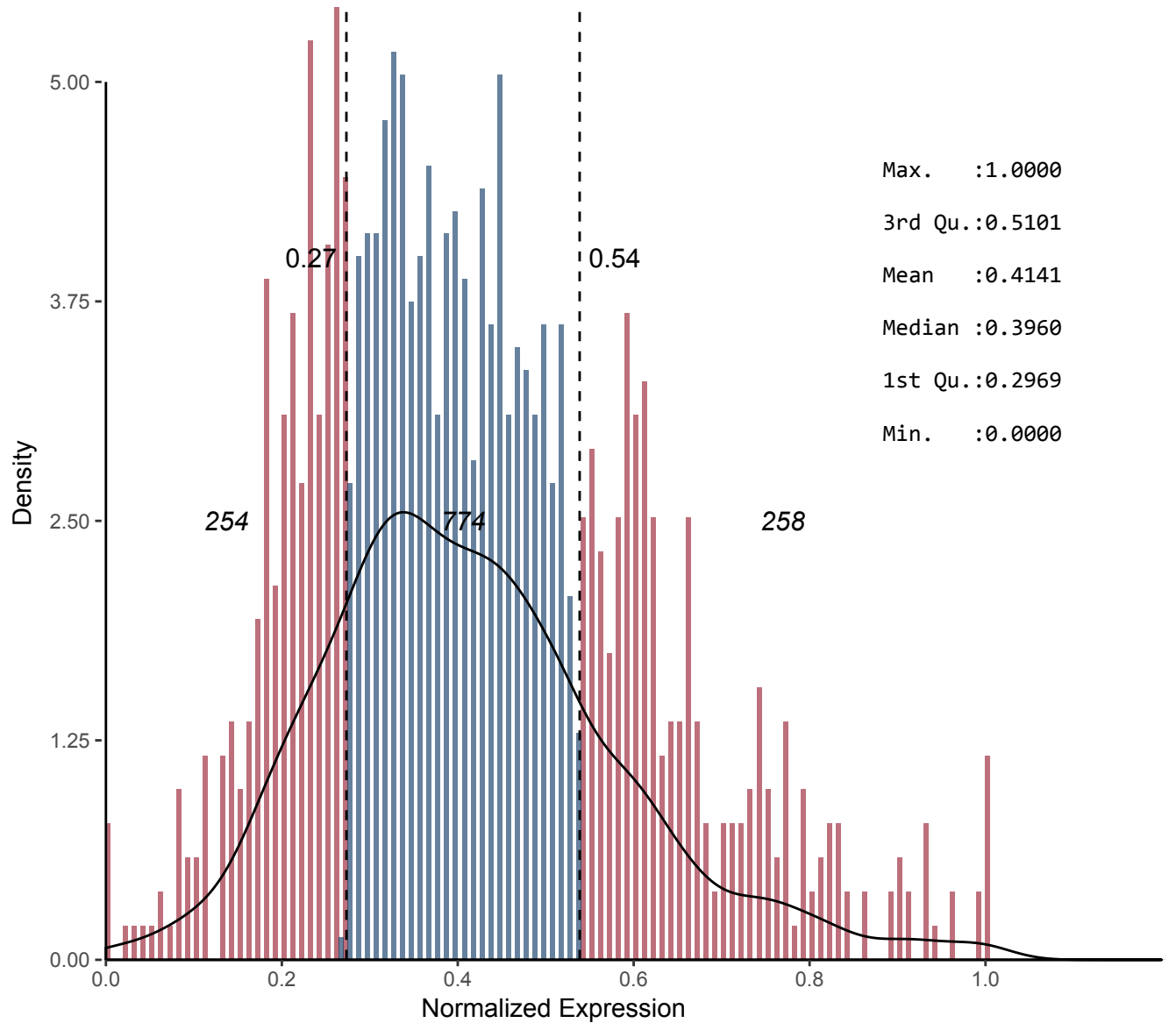


Figure 39 - CD35



Aberrant TRUE FALSE

Figure 40 - CD36

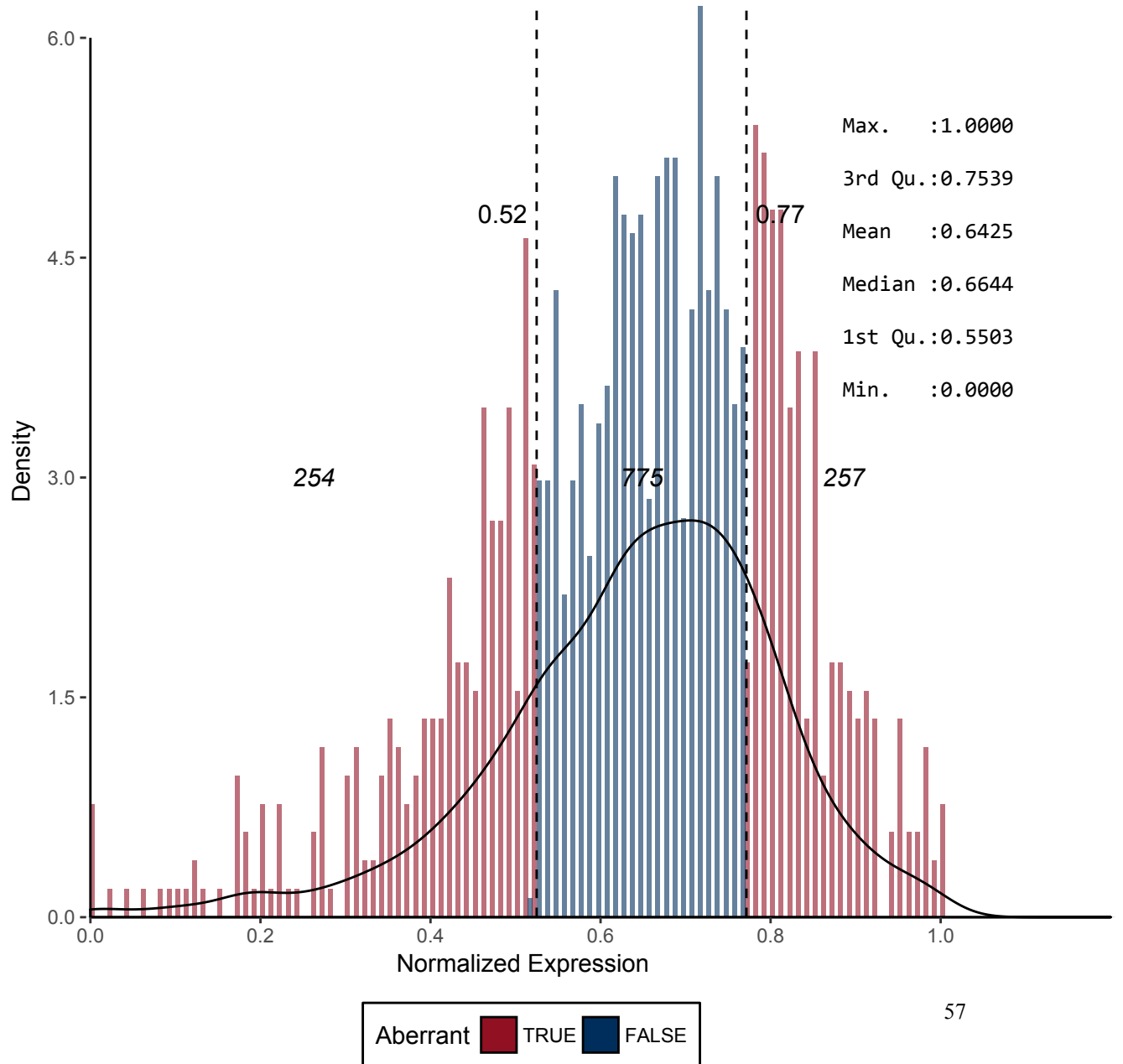


Figure 41 - CD37

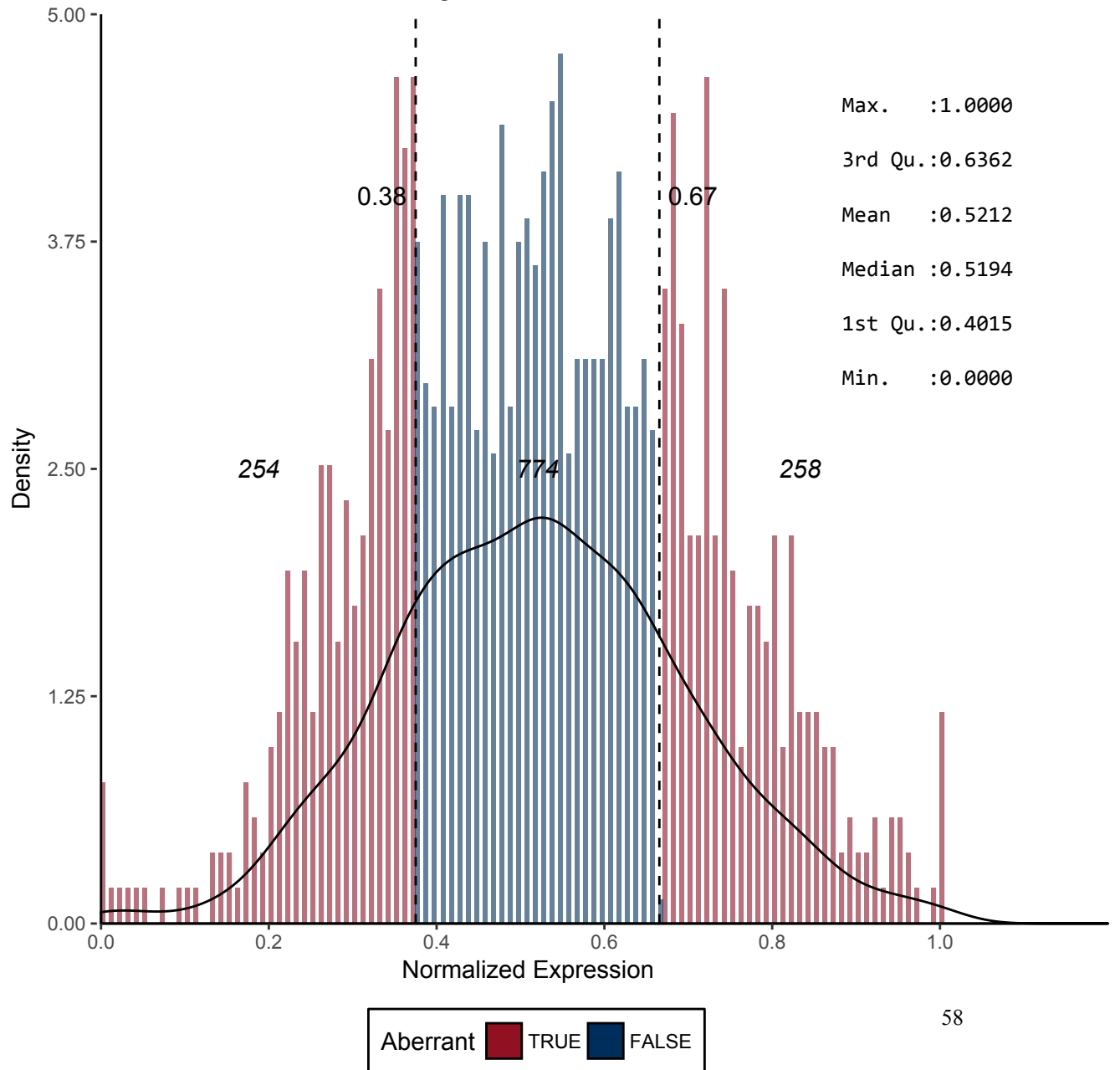
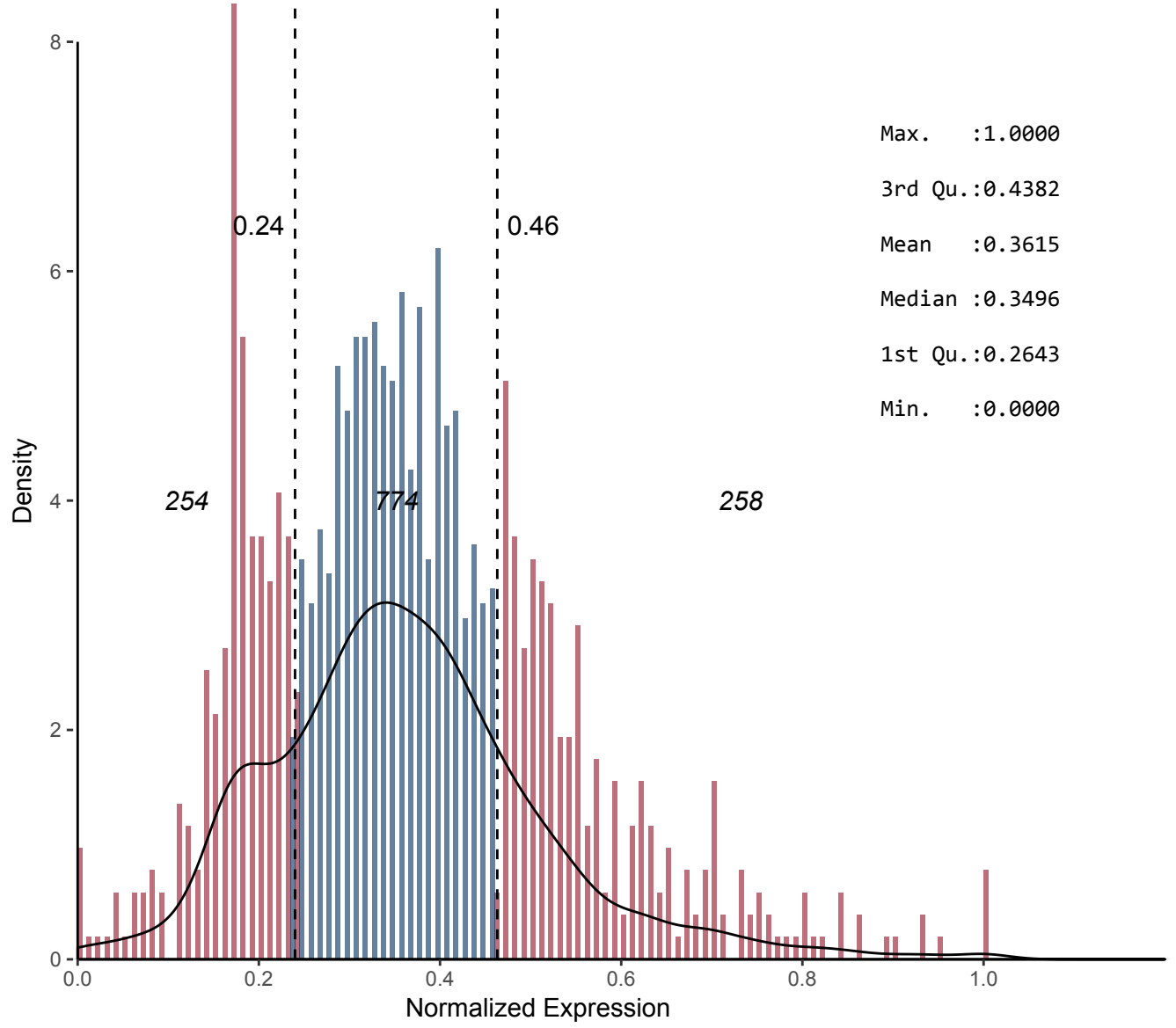


Figure 42 - CD38



Aberrant TRUE FALSE

Figure 43 - CD39

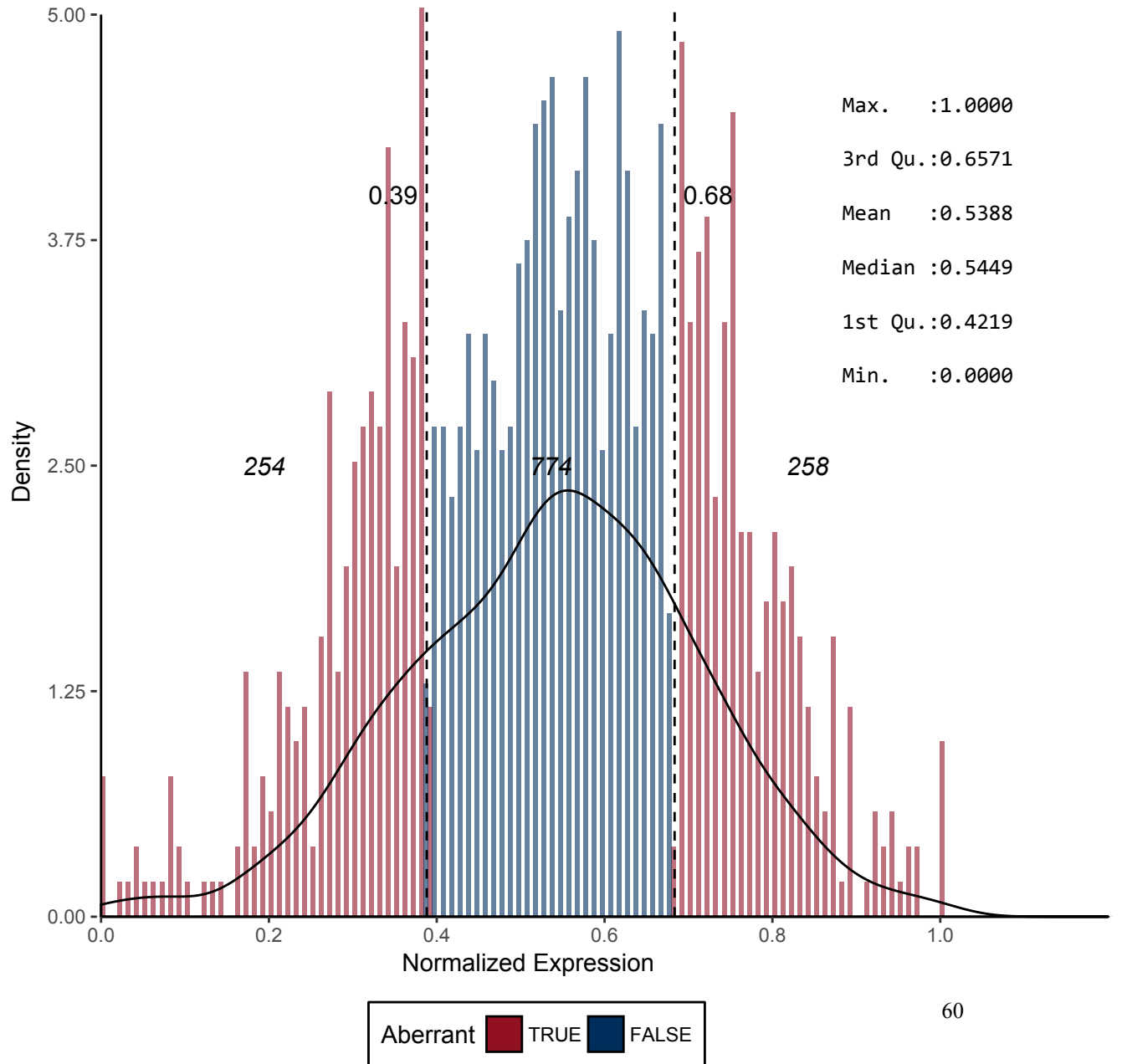


Figure 44 - CD40

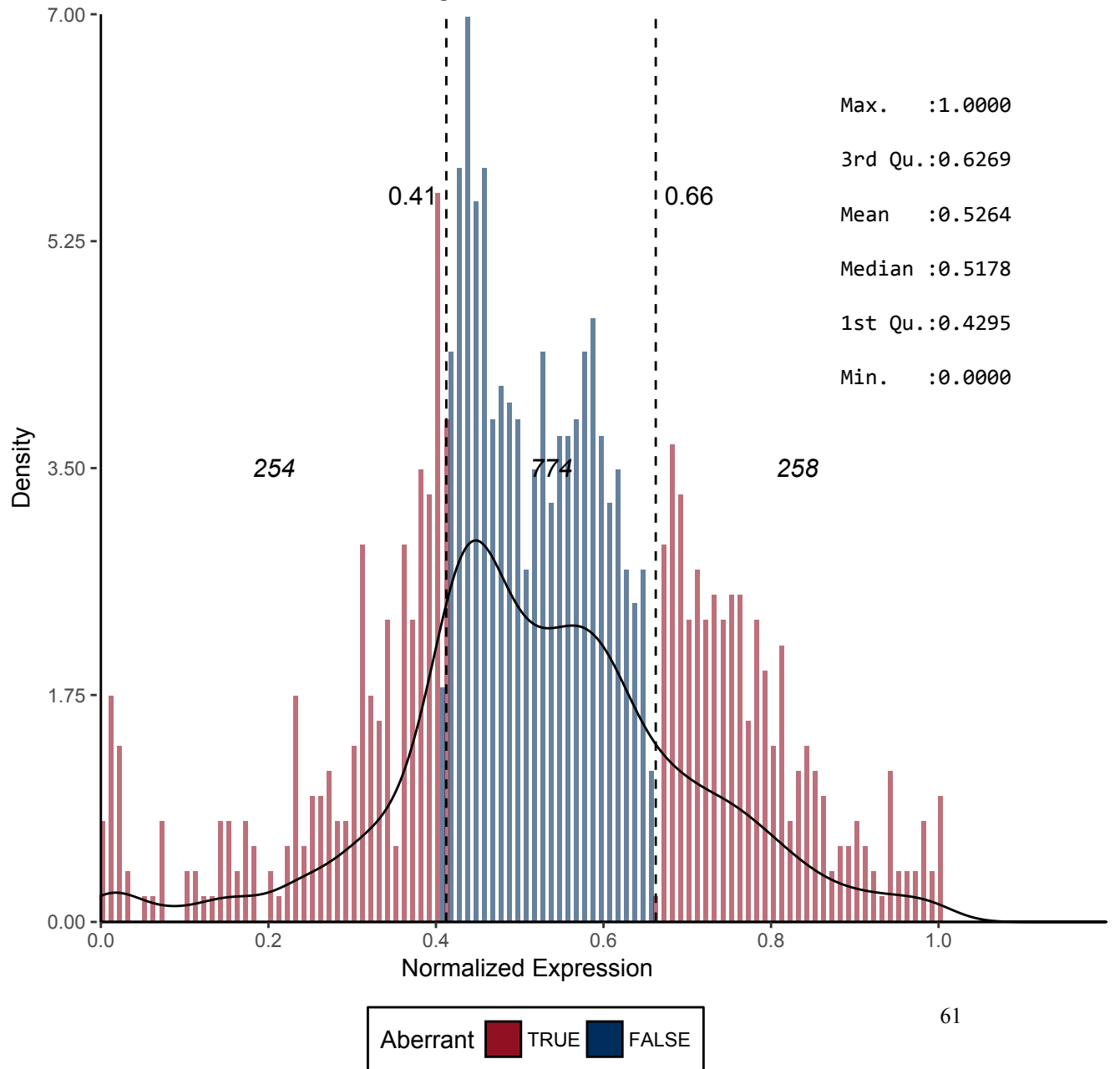


Figure 45 - CD41

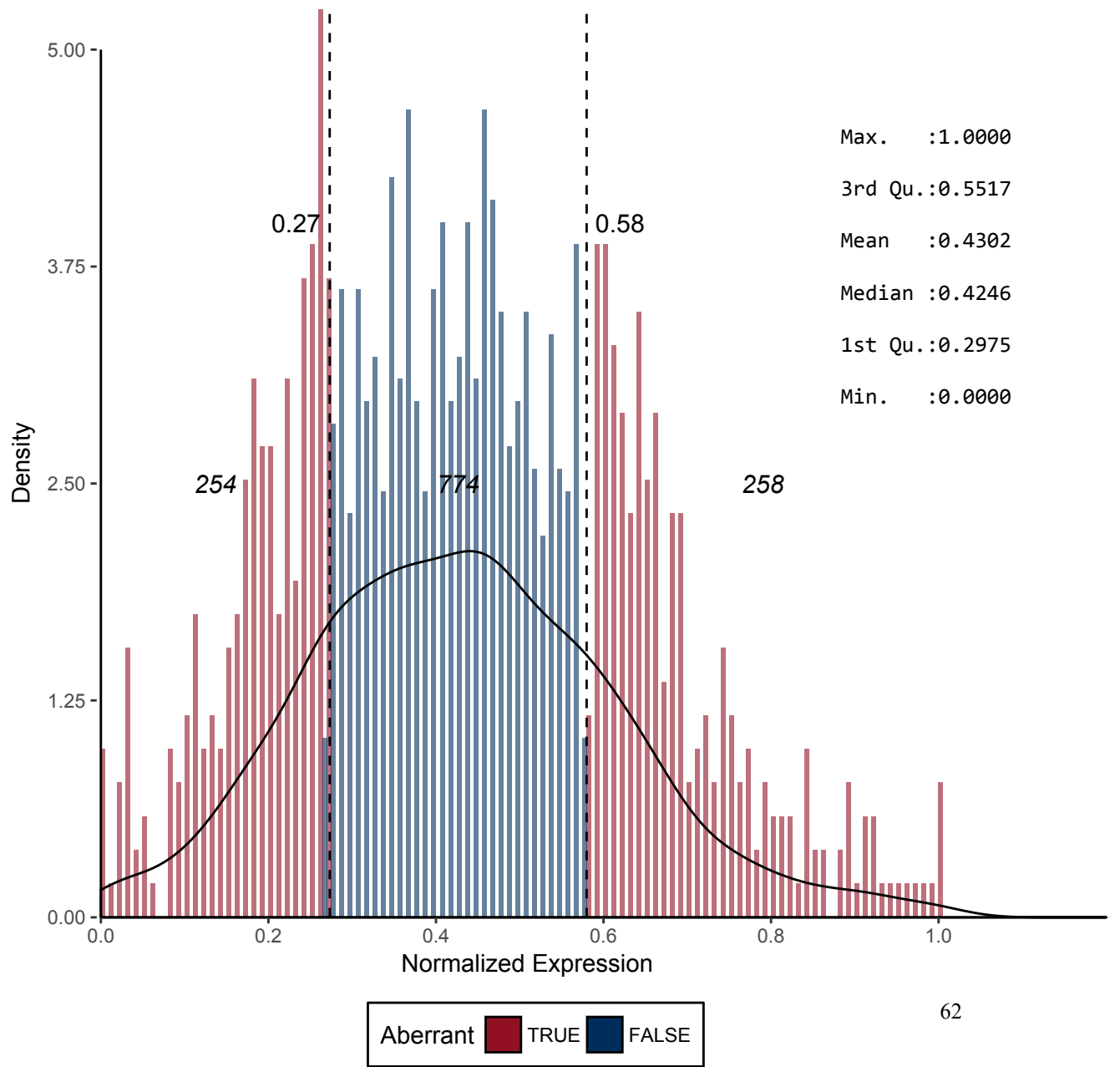


Figure 46 - CD42A

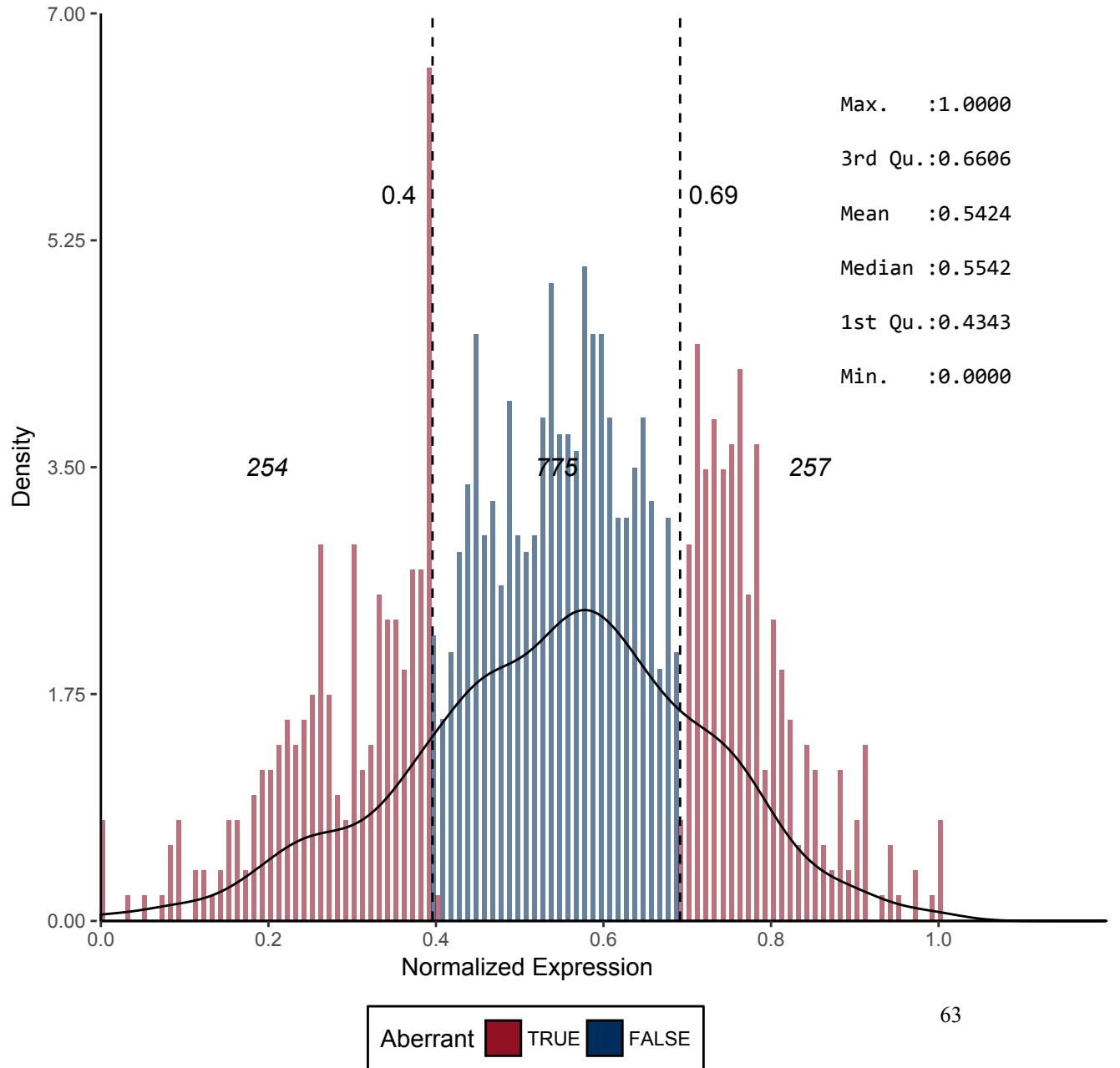


Figure 47 - CD42B

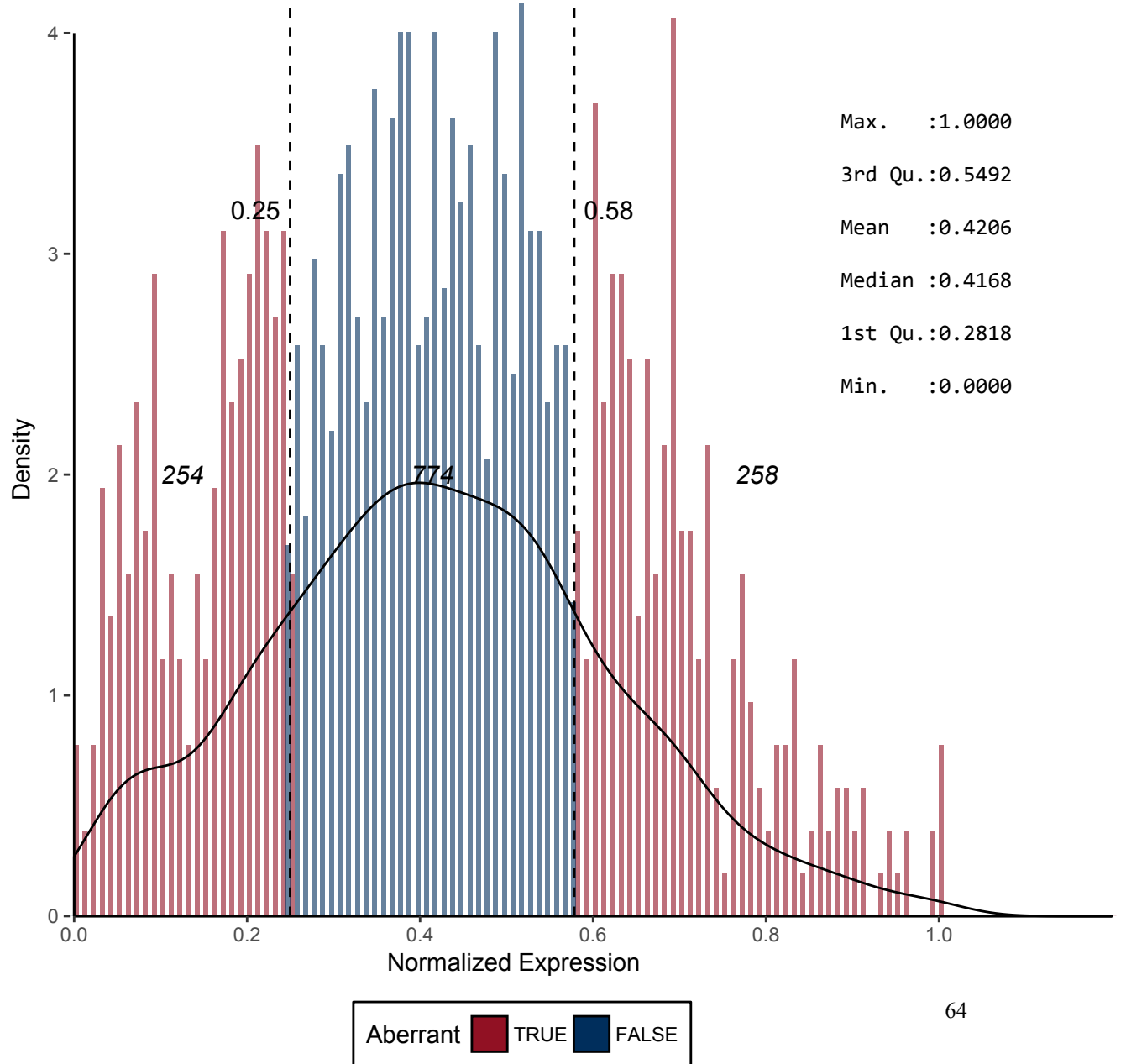
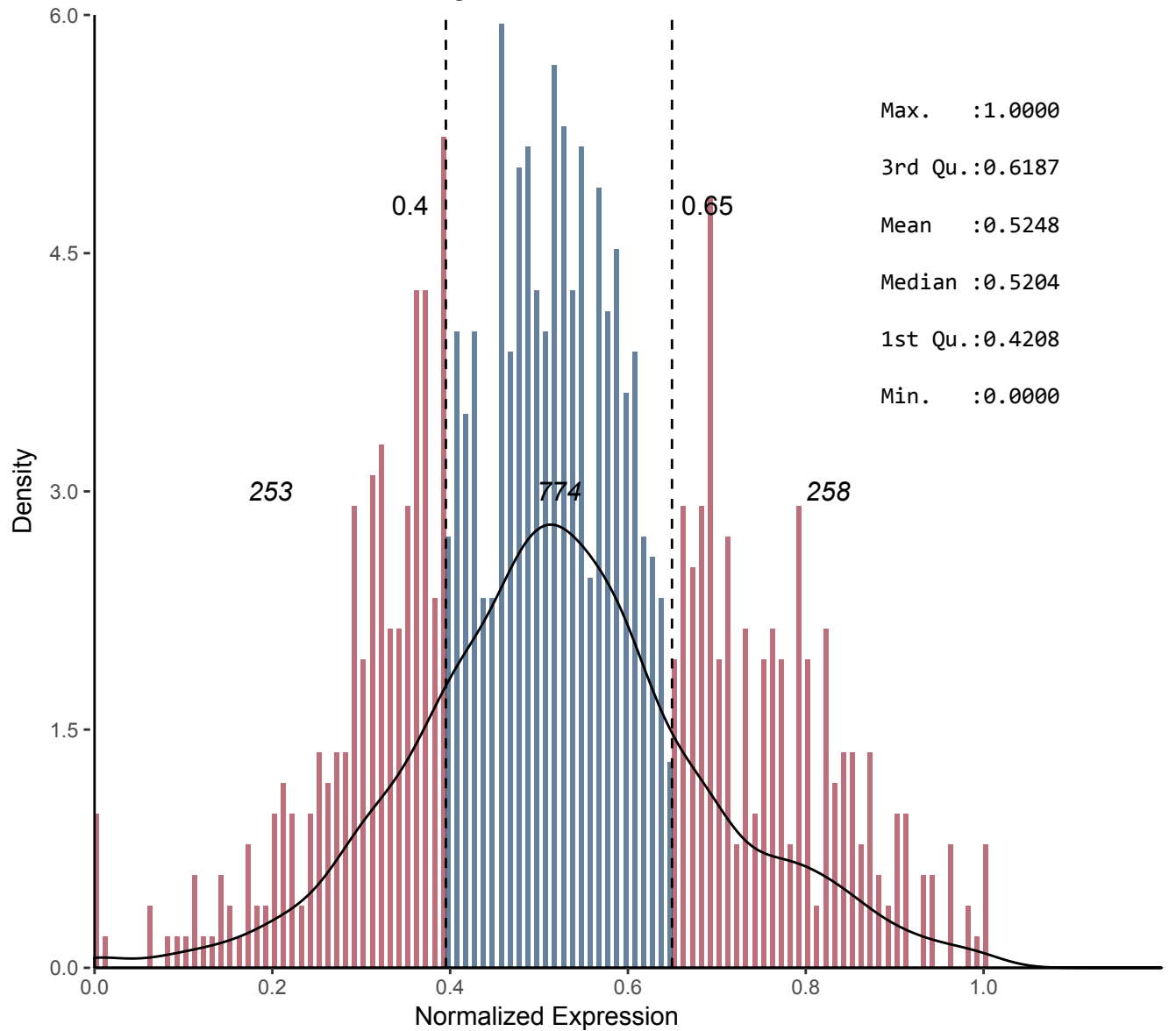
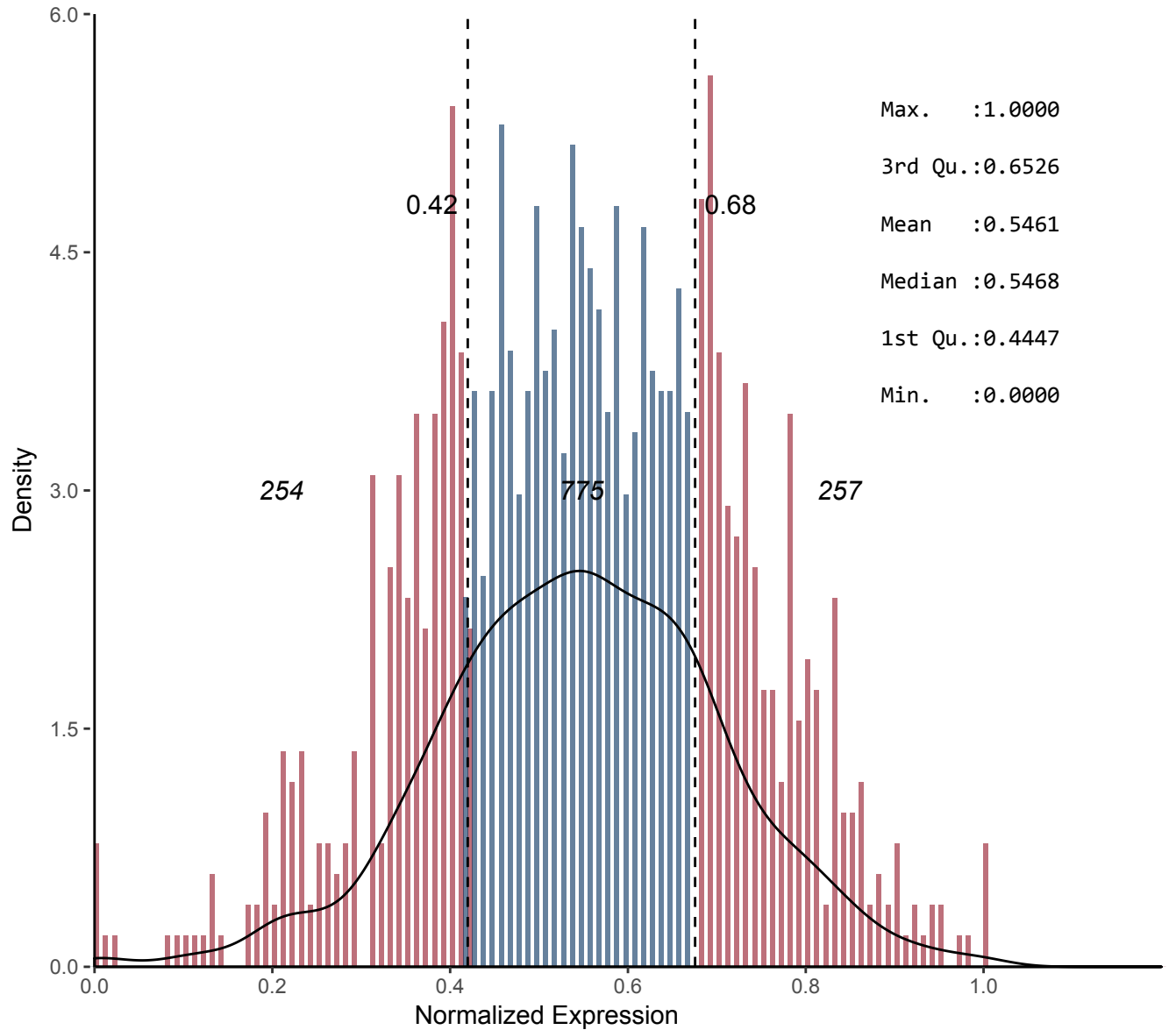


Figure 48 - CD43



Aberrant TRUE FALSE

Figure 49 - CD44



Aberrant TRUE FALSE

Figure 50 - CD45

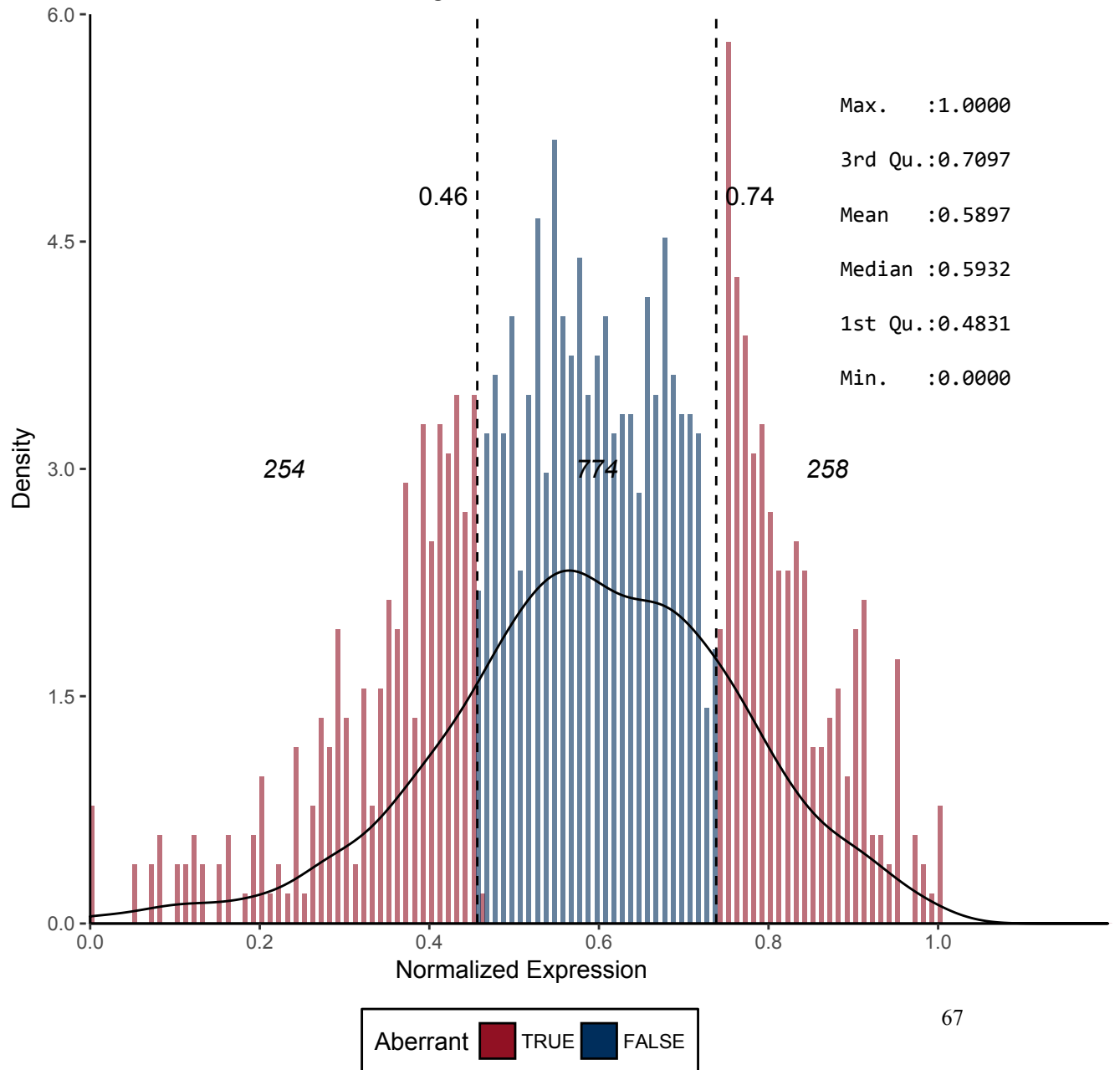


Figure 51 - CD46

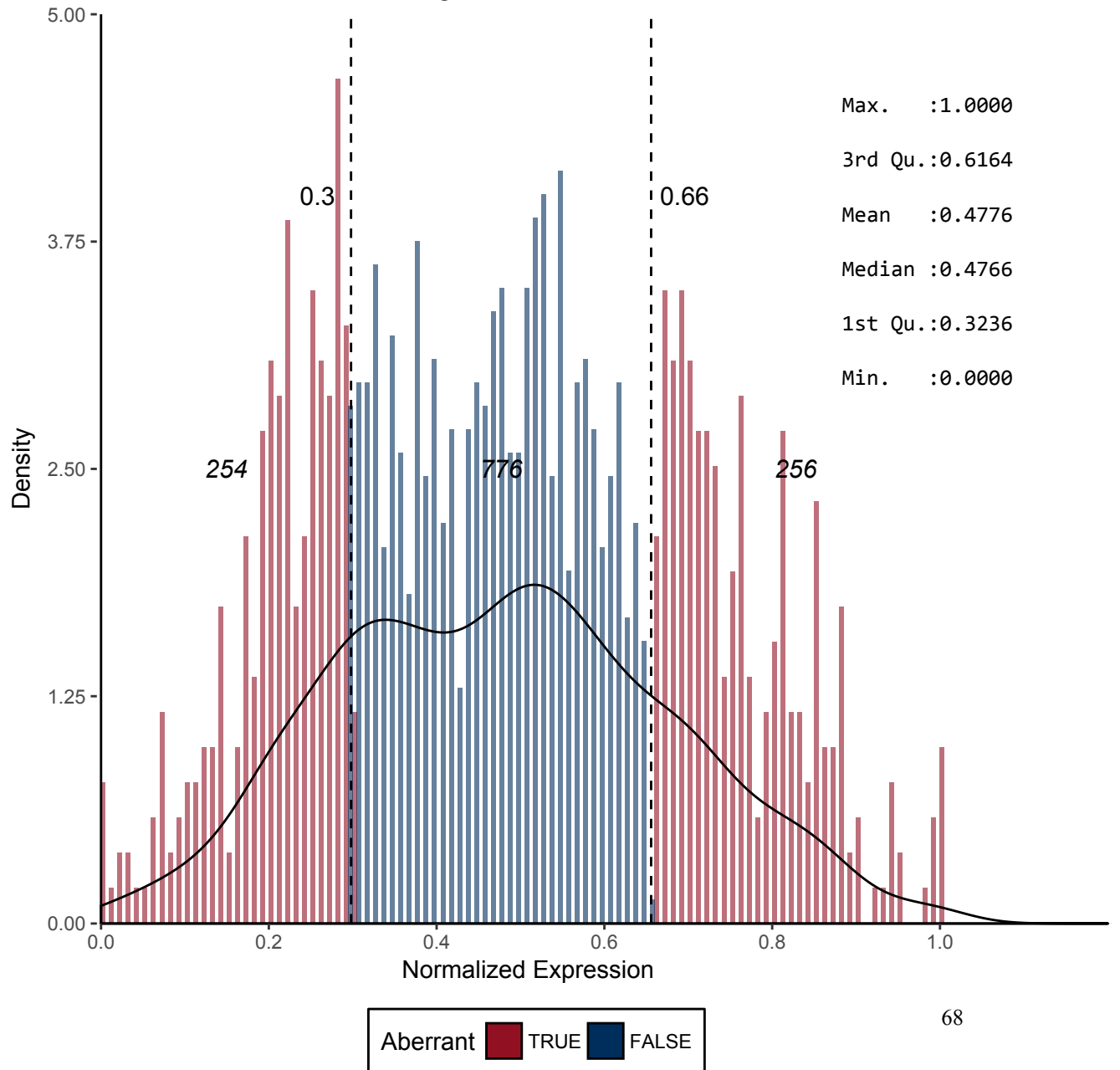


Figure 52 - CD47

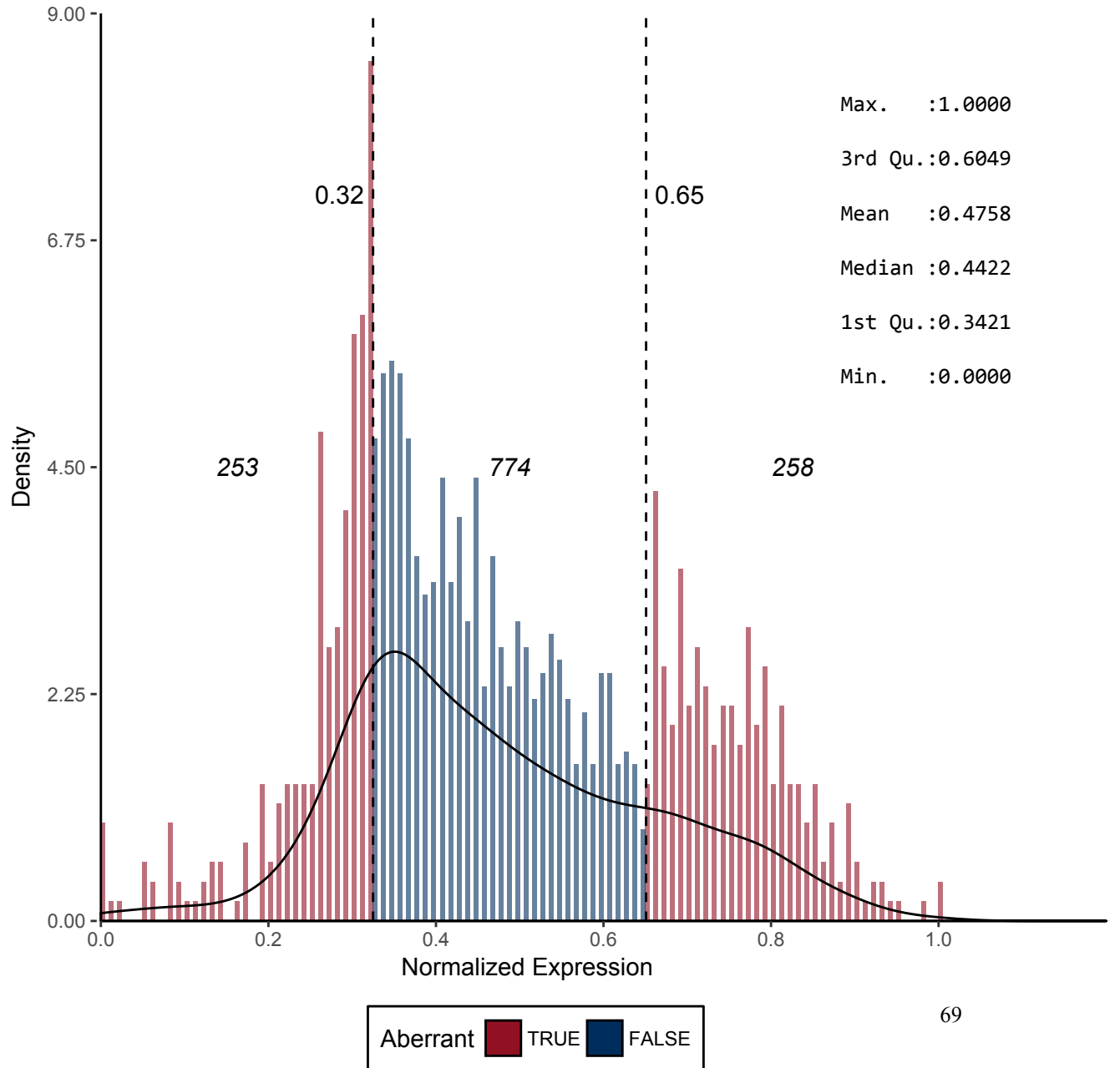


Figure 53 - CD48

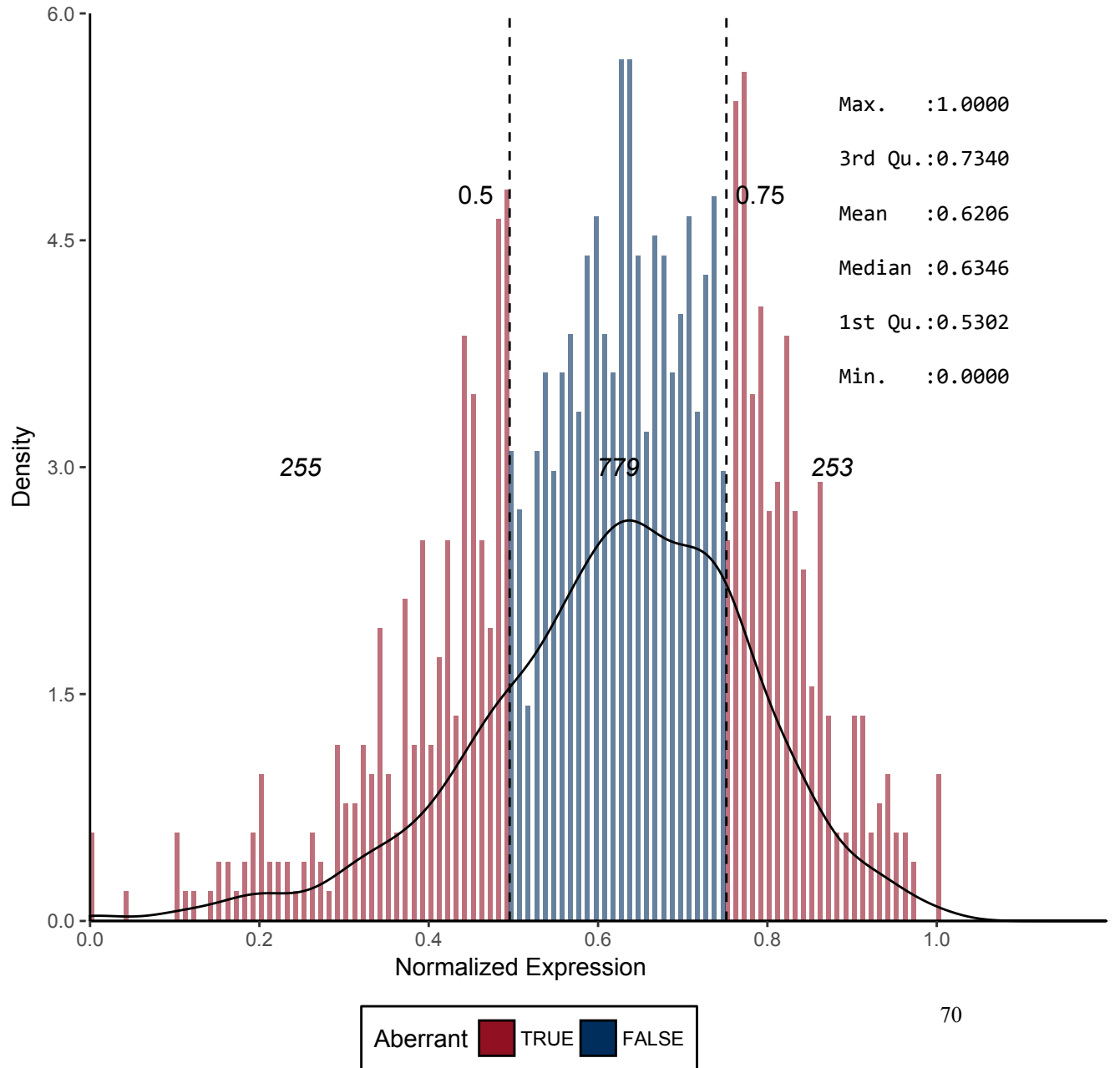


Figure 54 - CD49B*

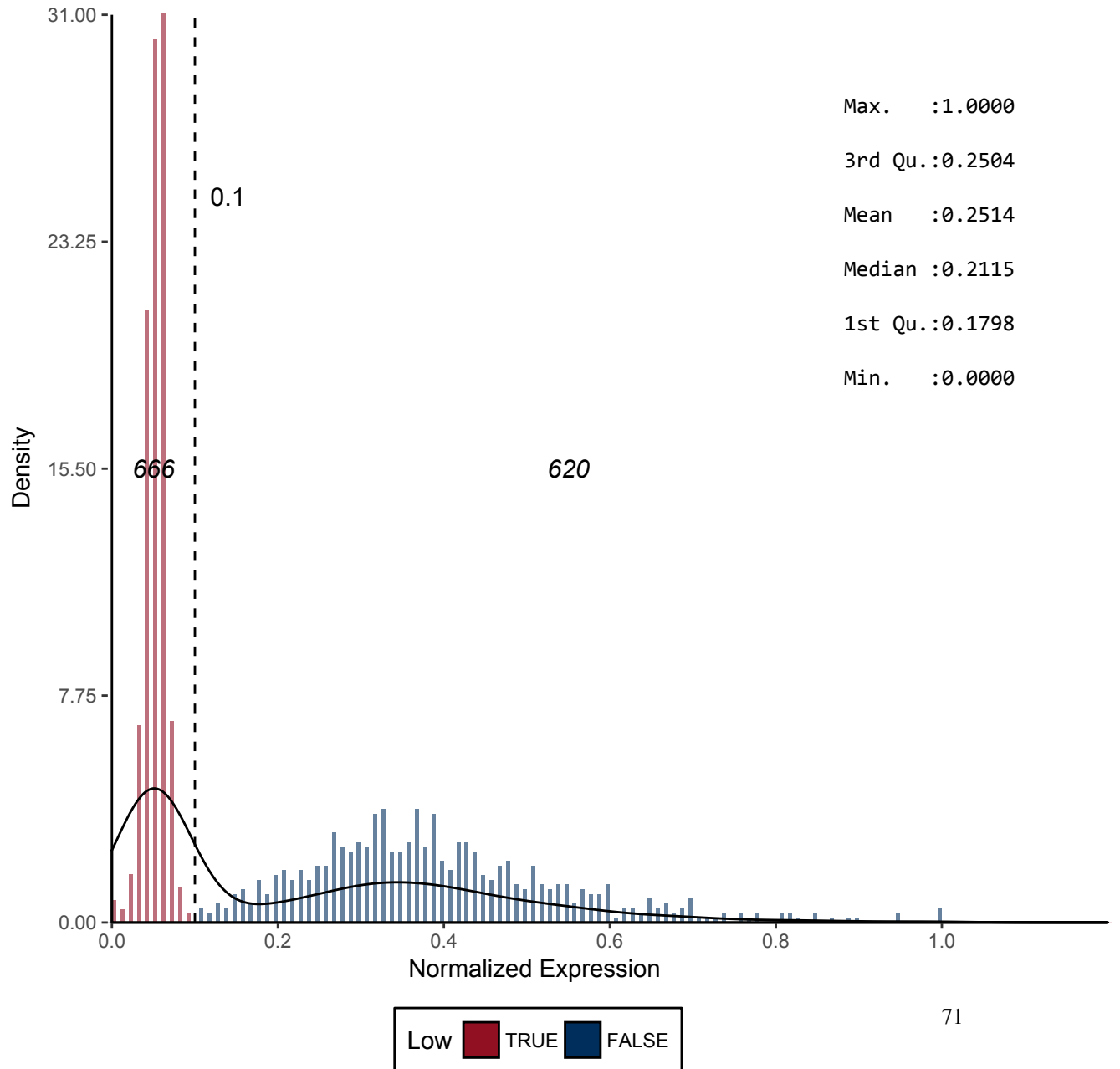


Figure 55 - CD49C*

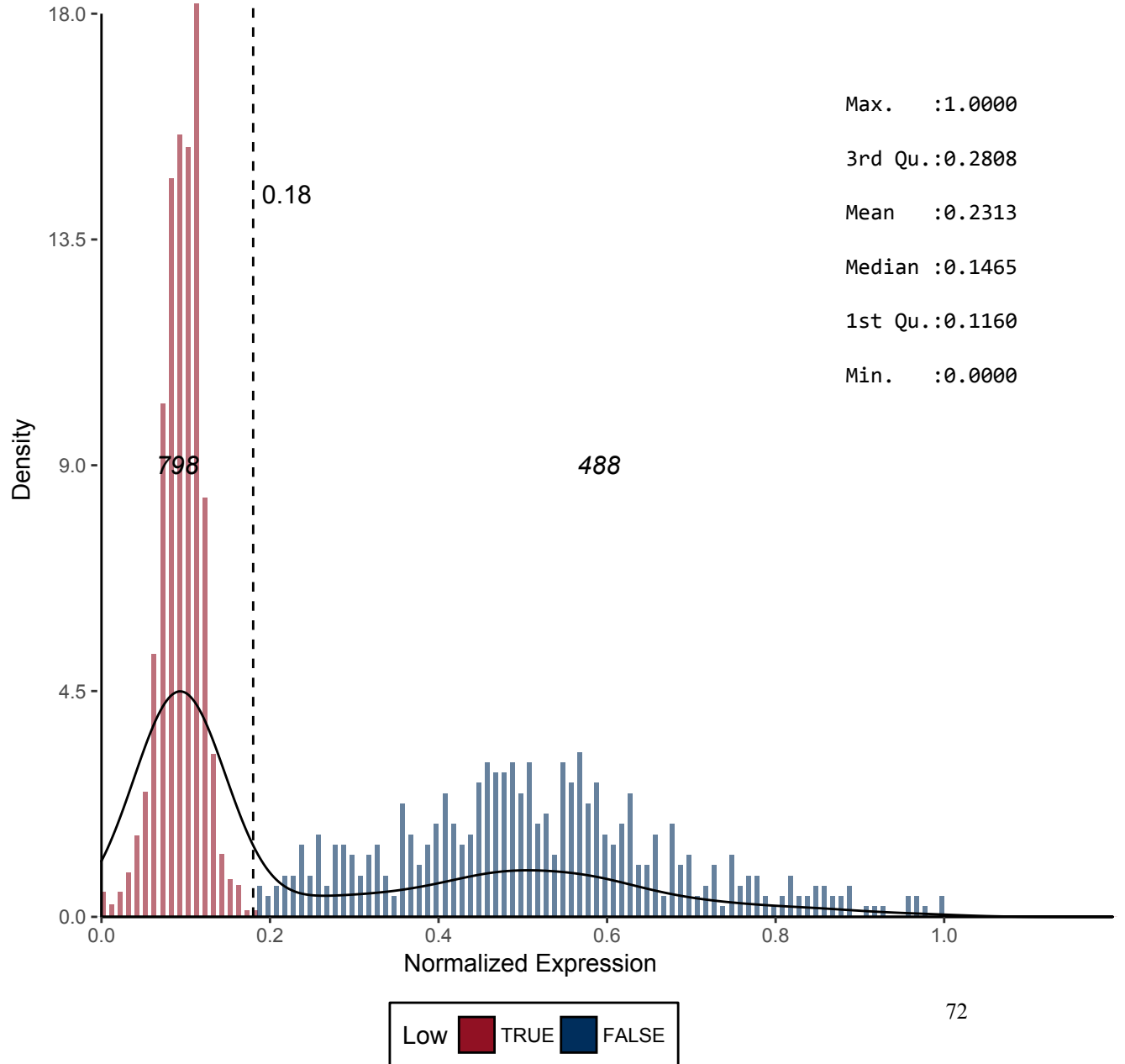


Figure 56 - CD49D

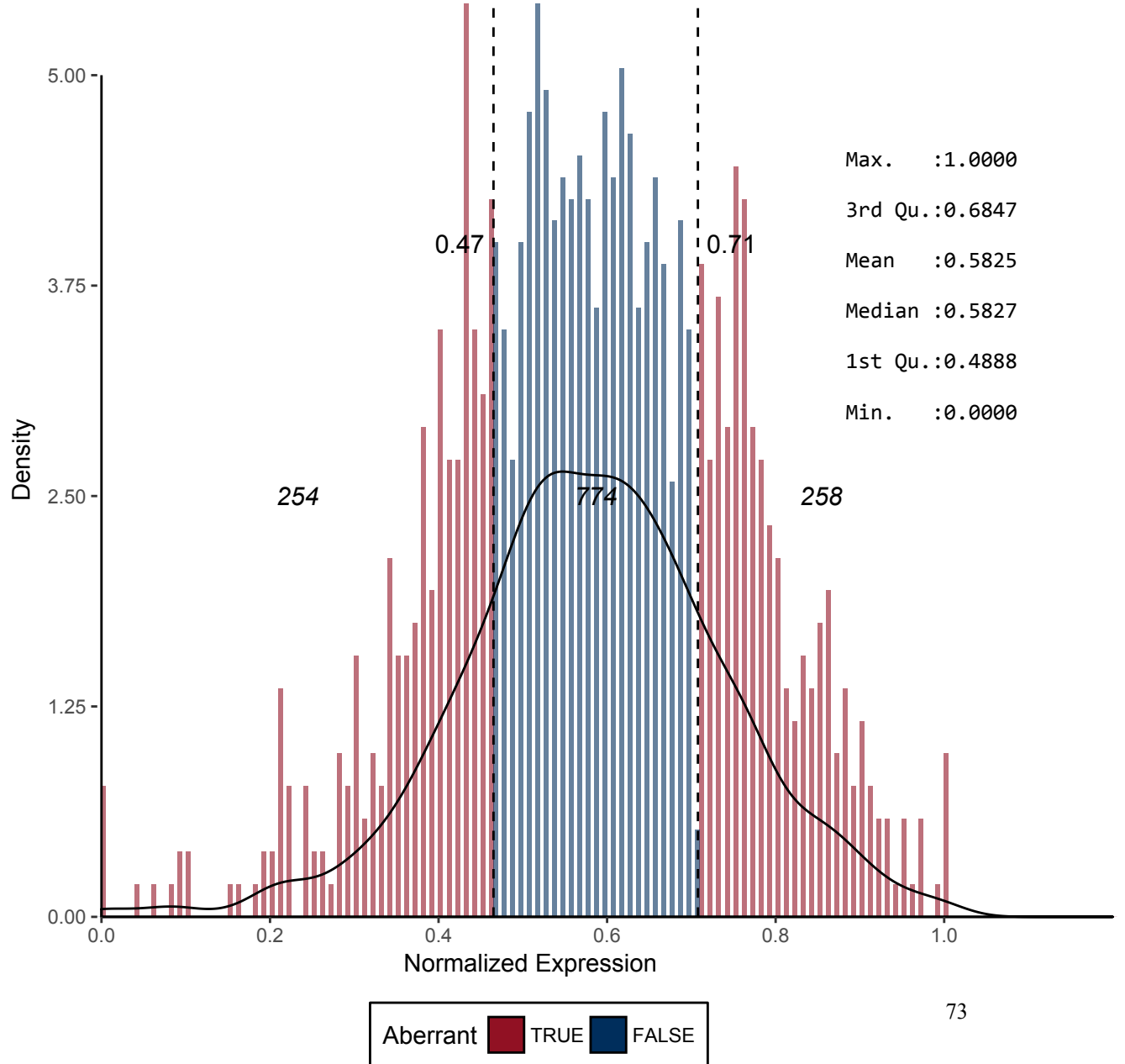
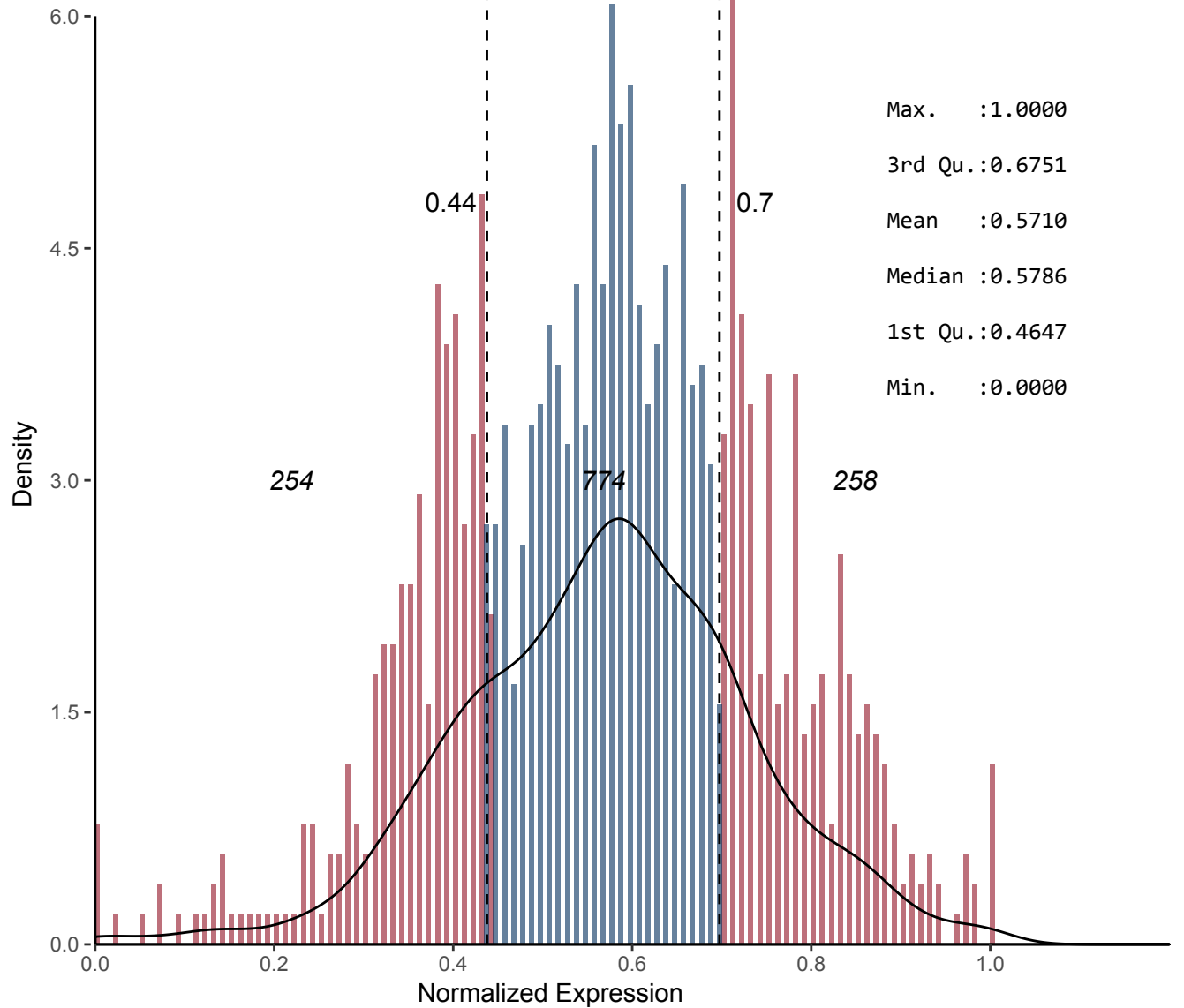


Figure 57 - CD49E



Aberrant TRUE FALSE

Figure 58 - CD49F

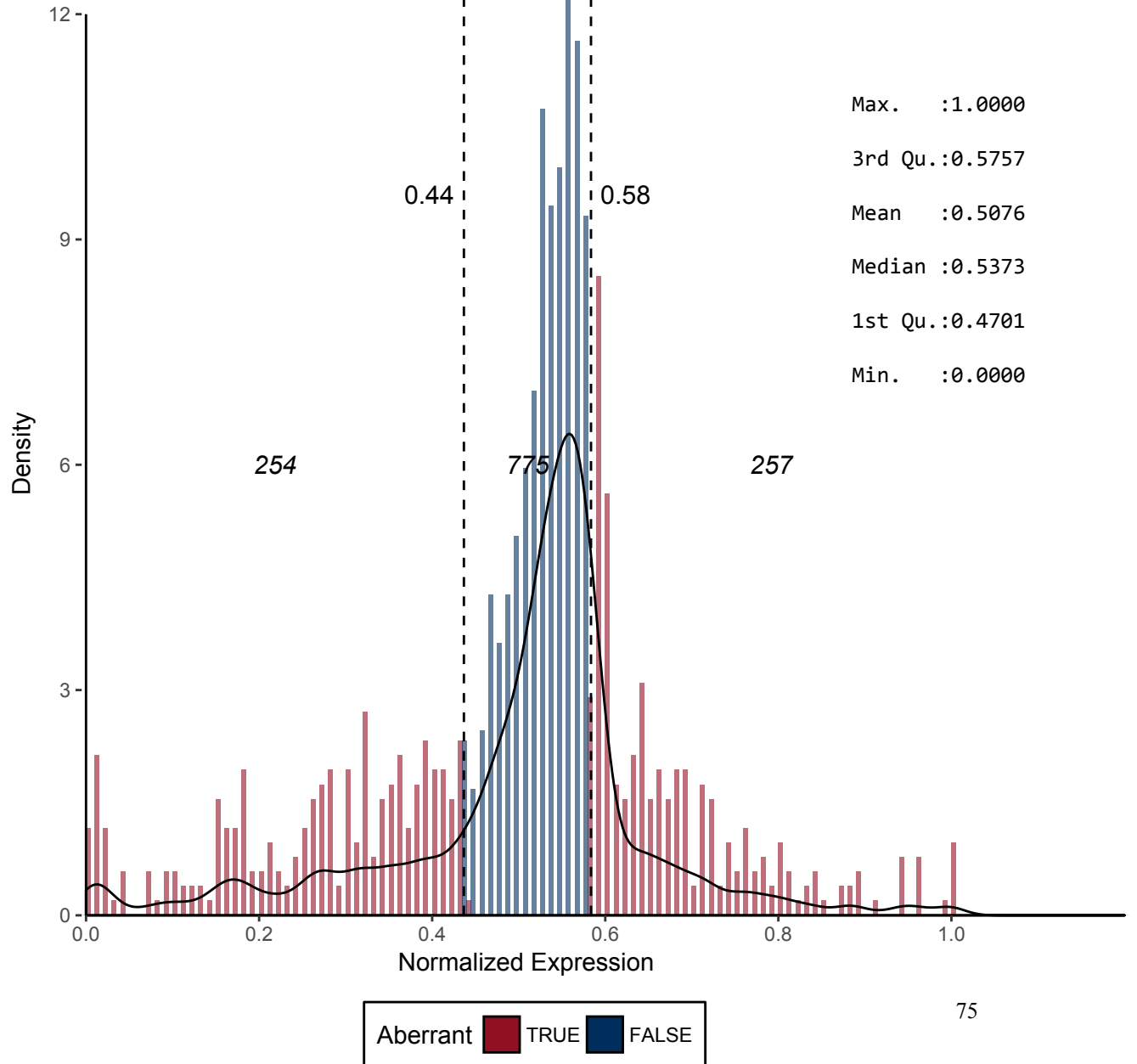
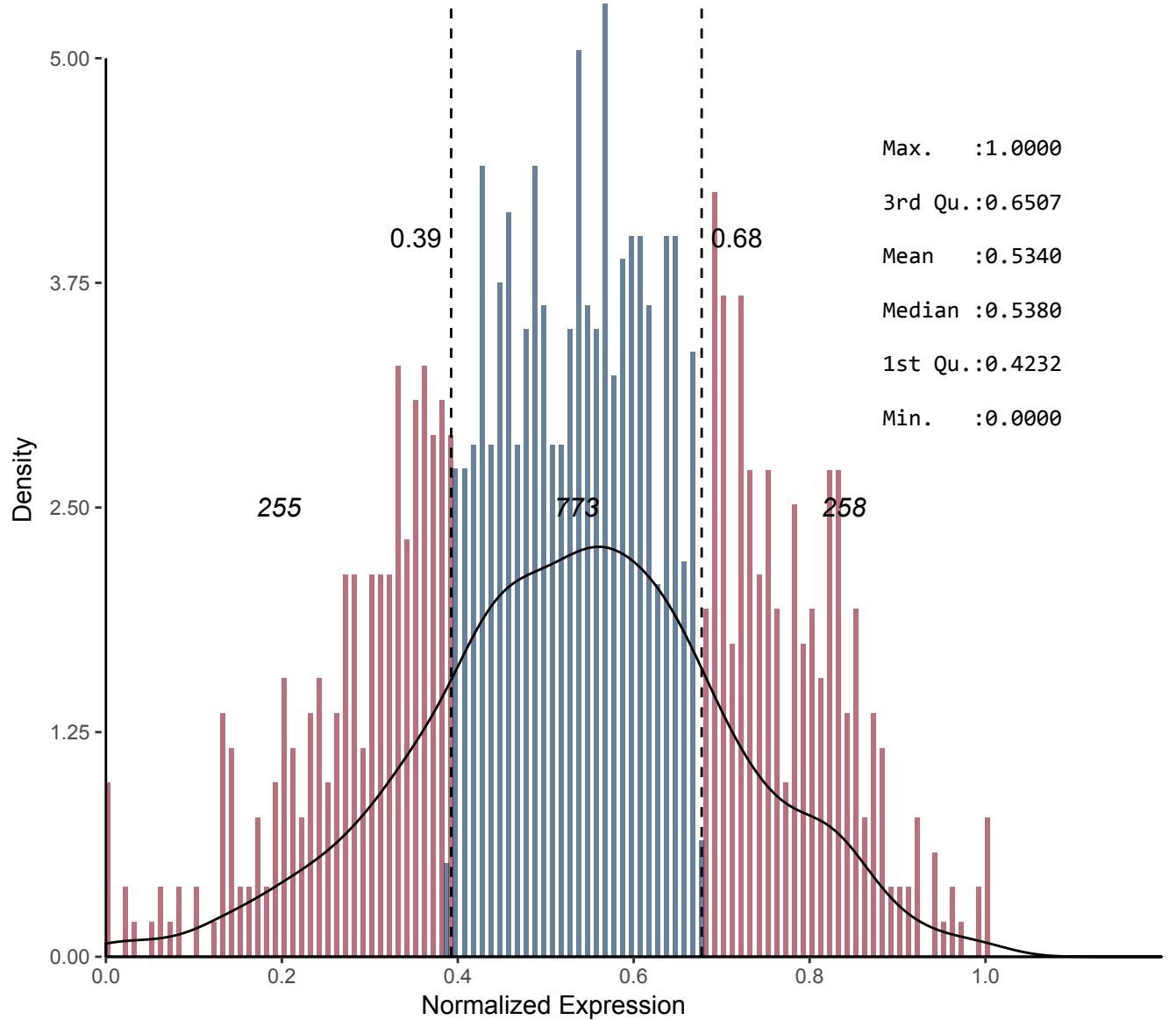


Figure 59 - CD50



Aberrant TRUE FALSE

Figure 60 - CD51

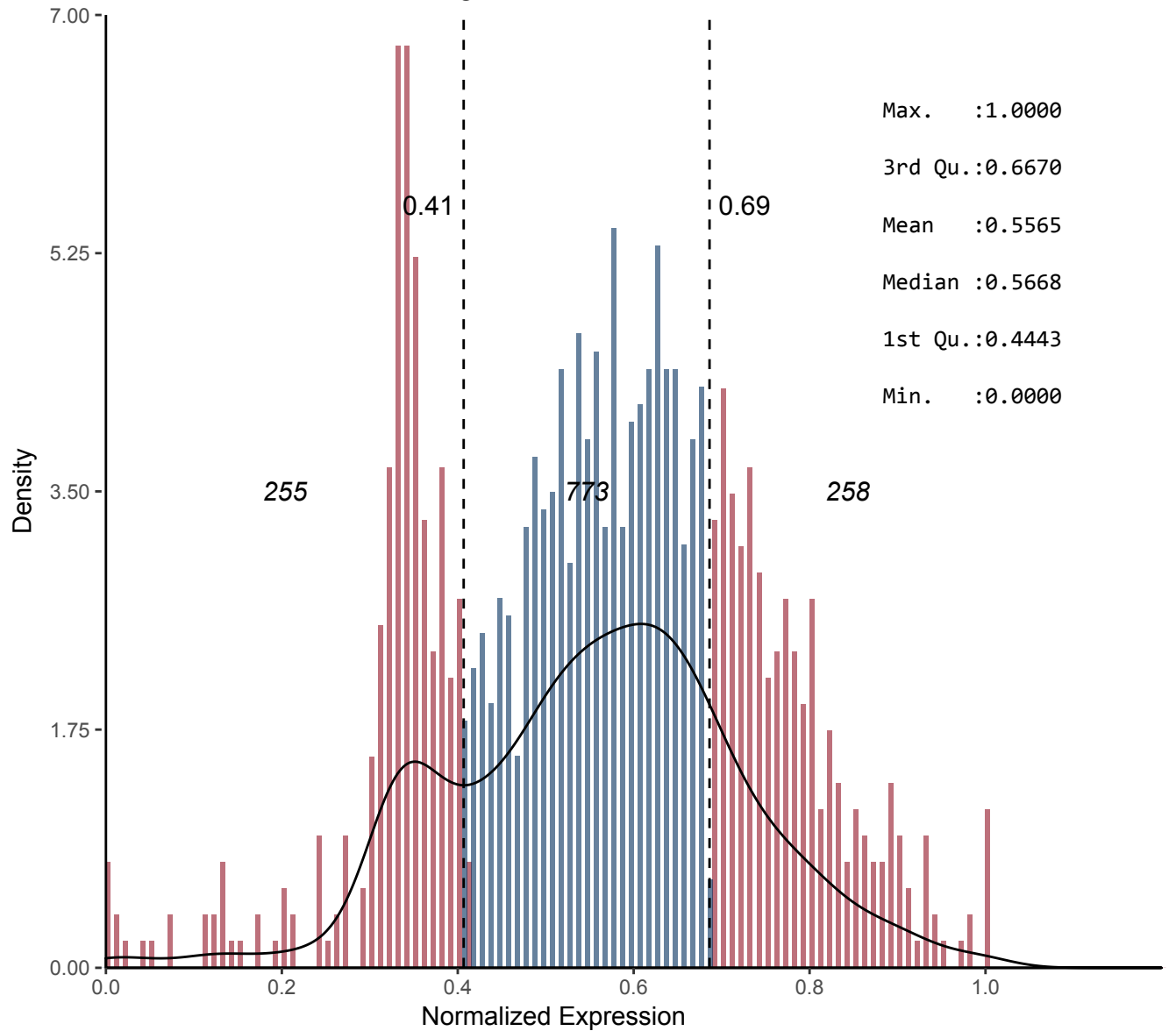


Figure 61 - CD52

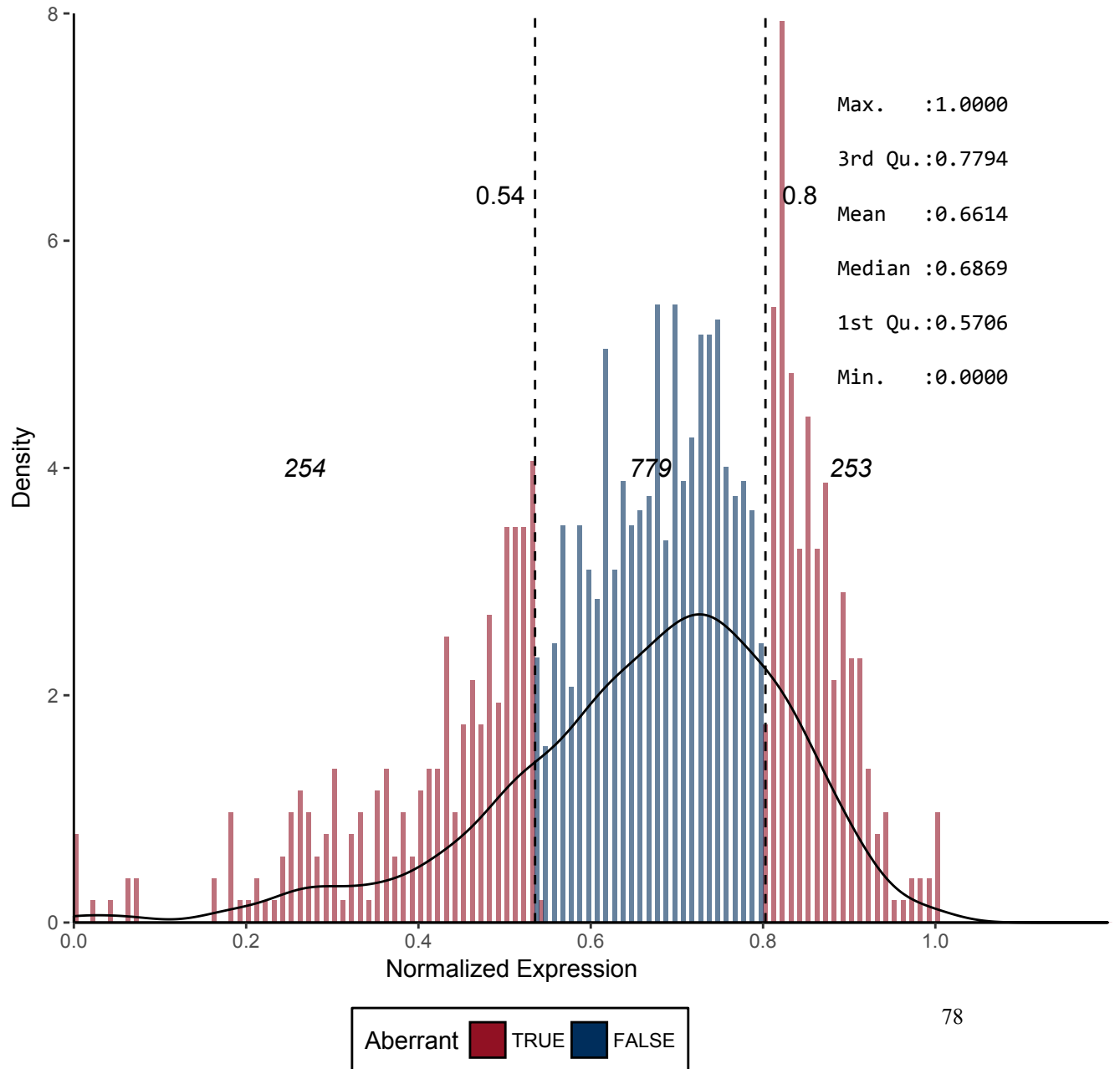
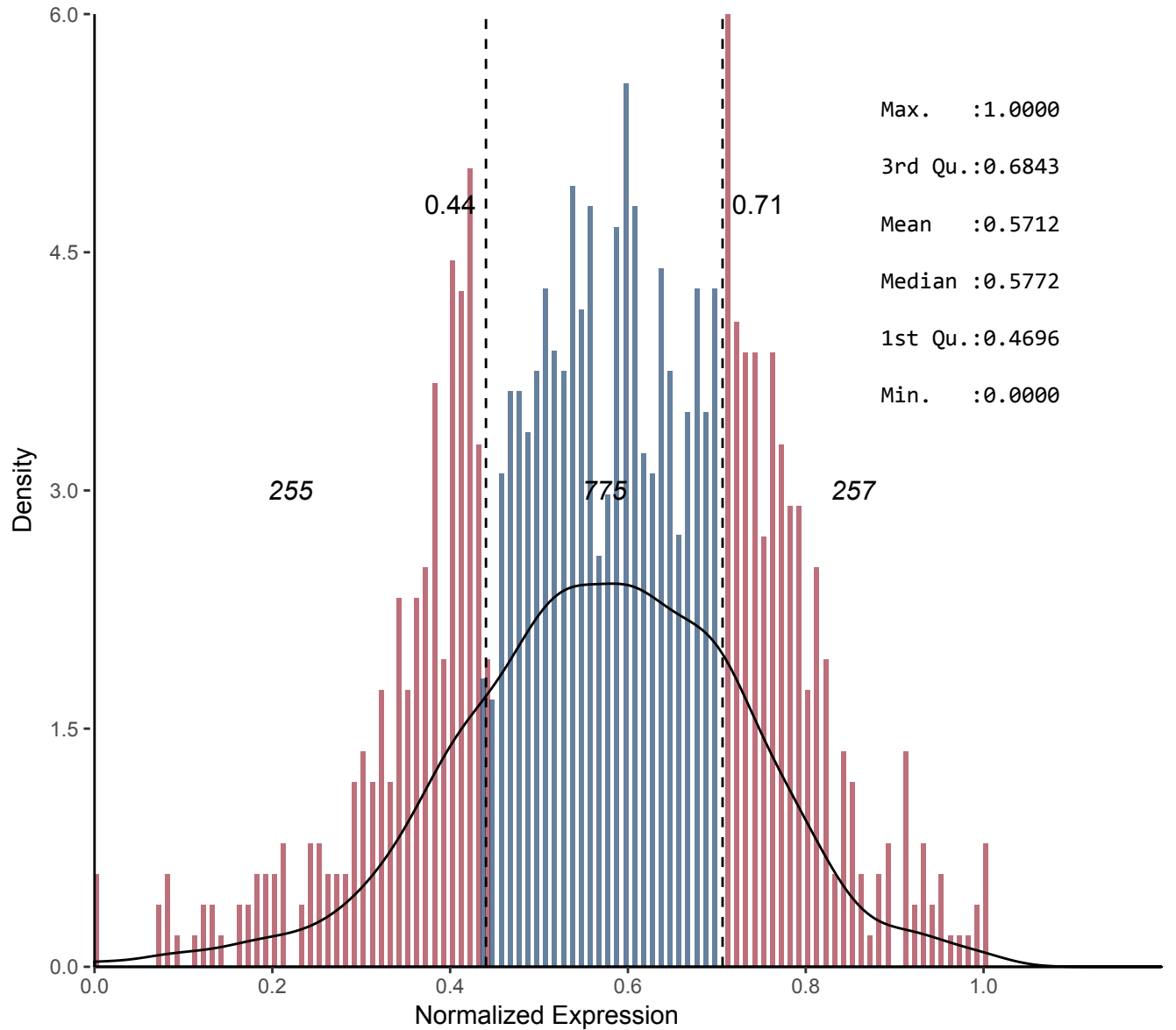
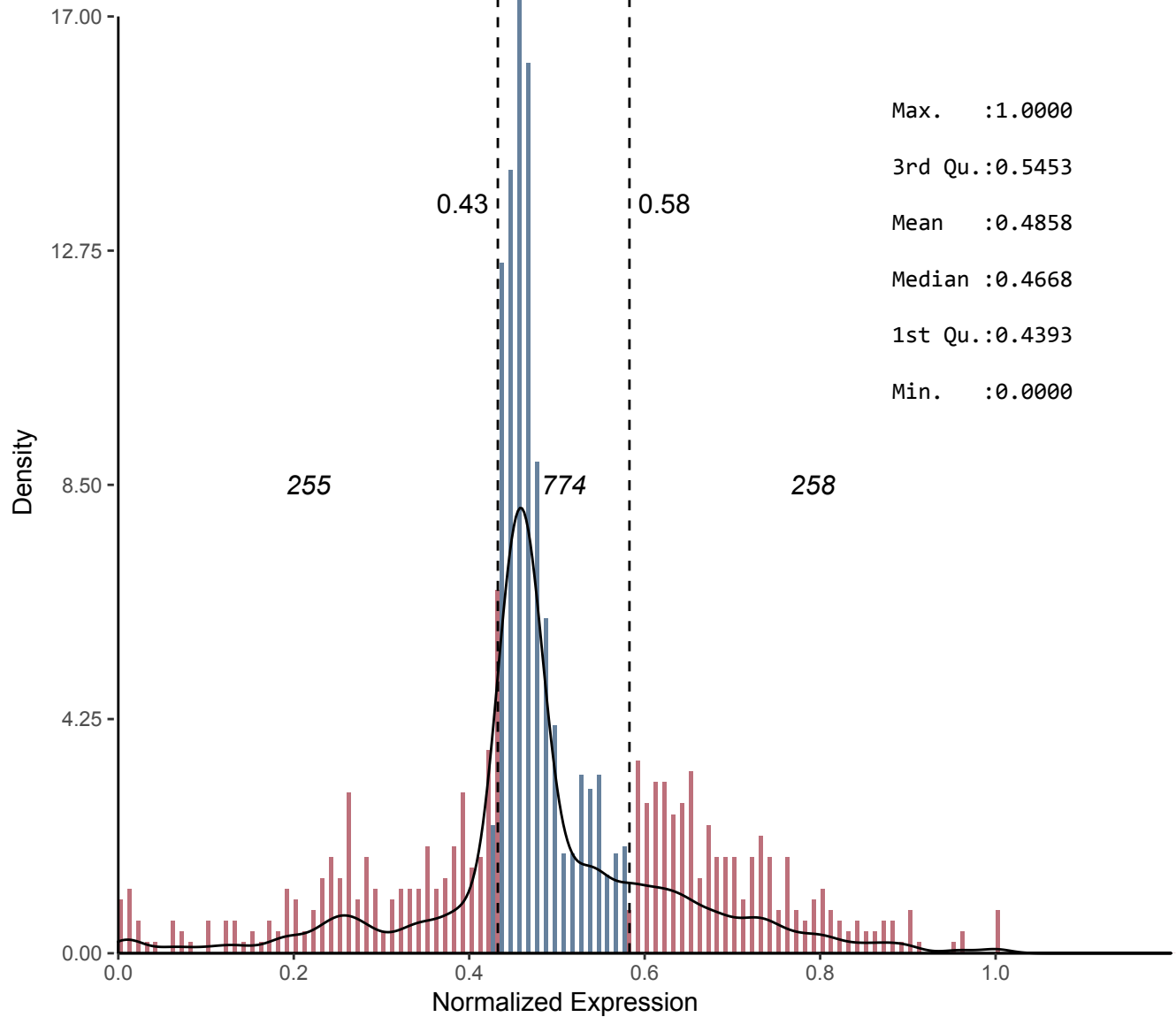


Figure 62 - CD53



Aberrant TRUE FALSE

Figure 63 - CD54



Aberrant ■ TRUE ■ FALSE

Figure 64 - CD55

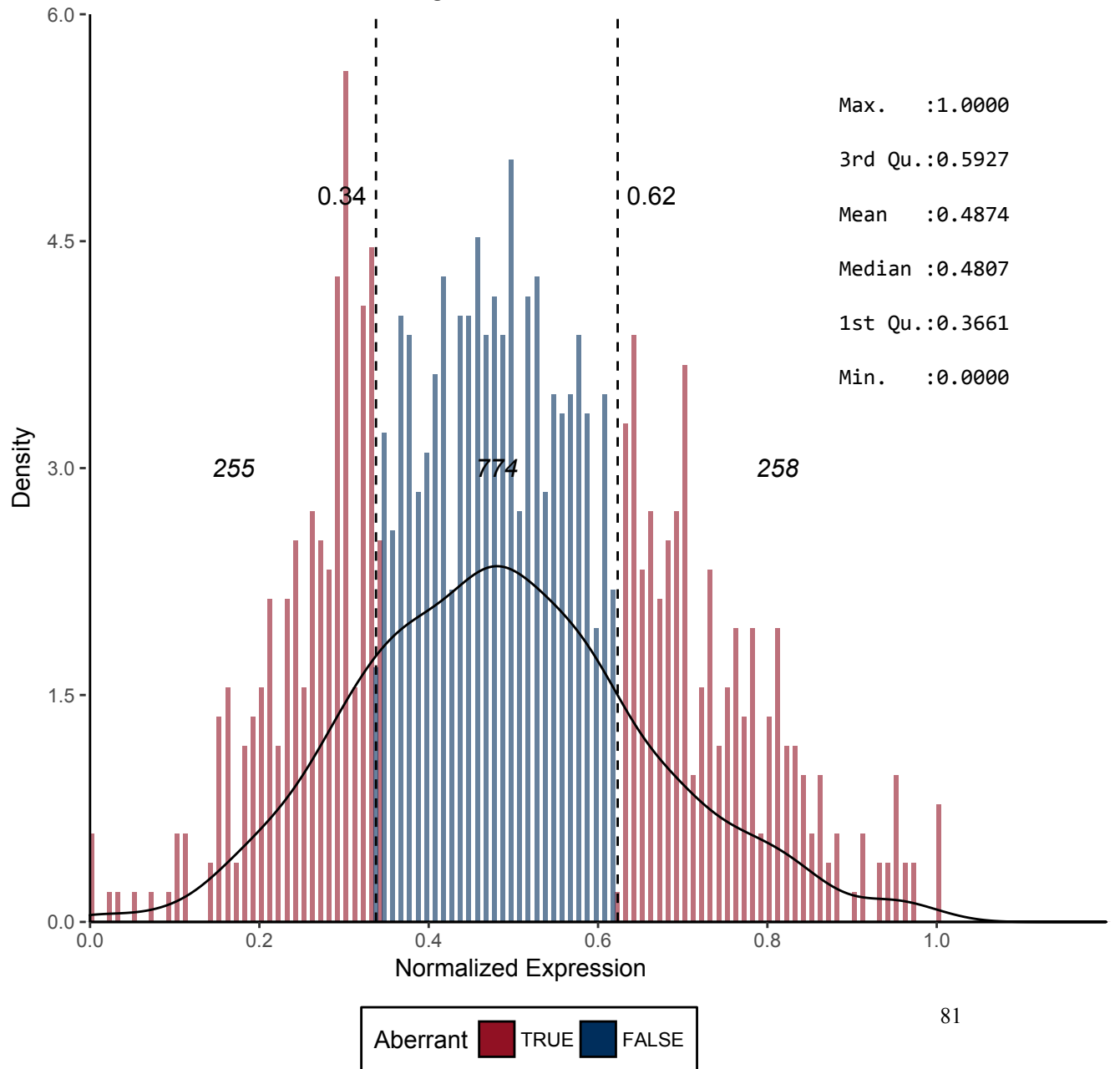
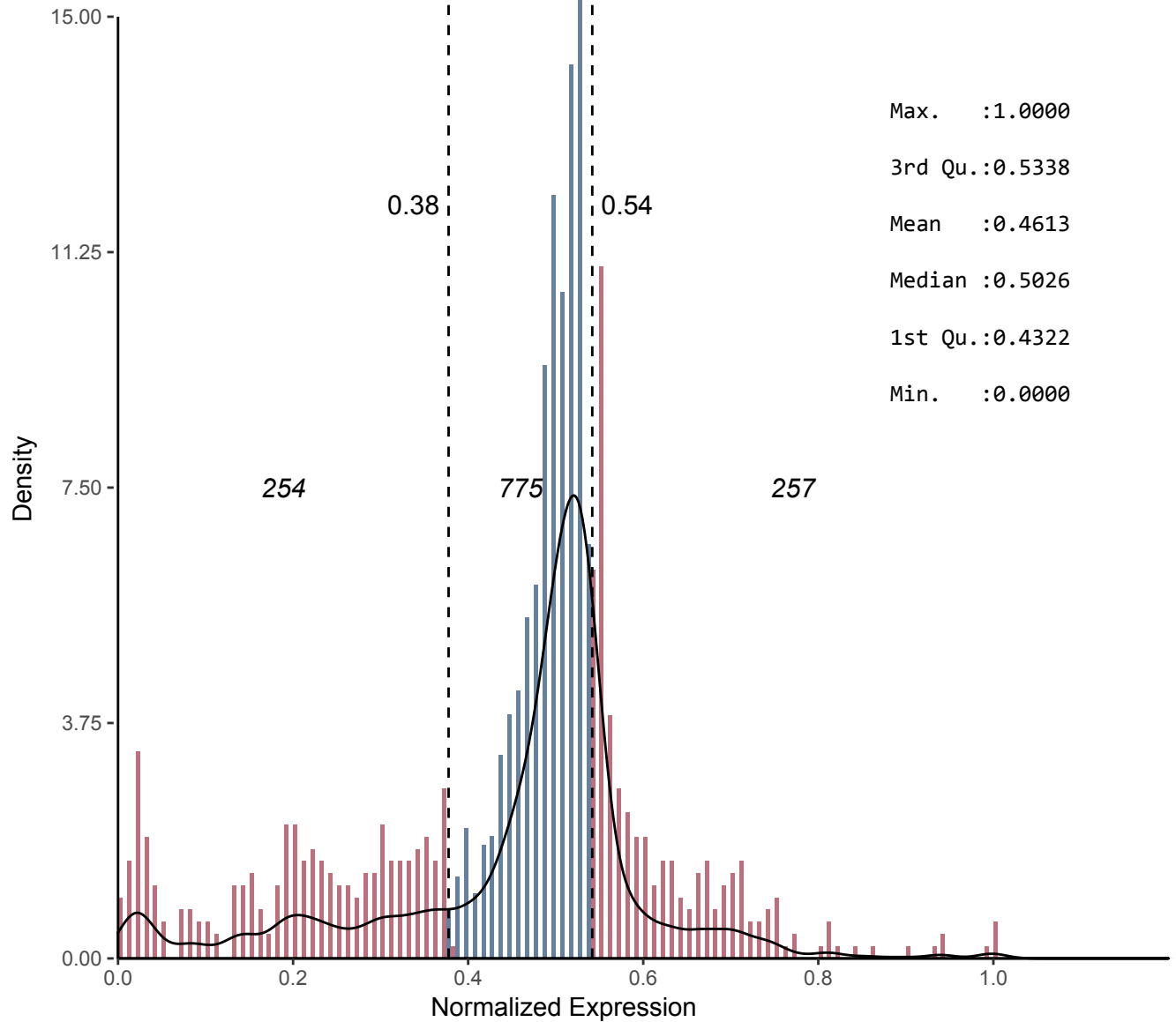


Figure 65 - CD56



Aberrant TRUE FALSE

Figure 66 - CD57*

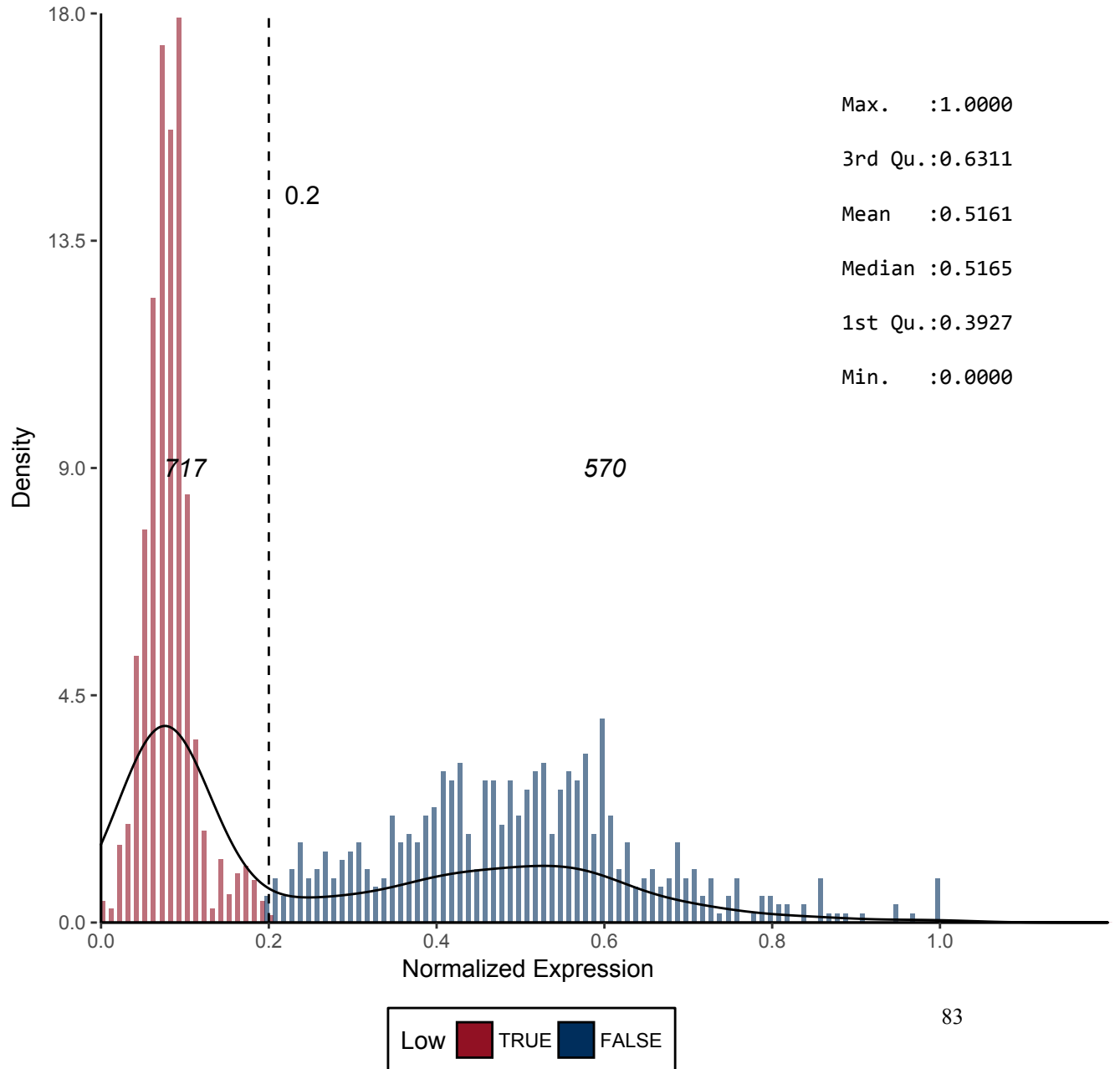


Figure 67 - CD58

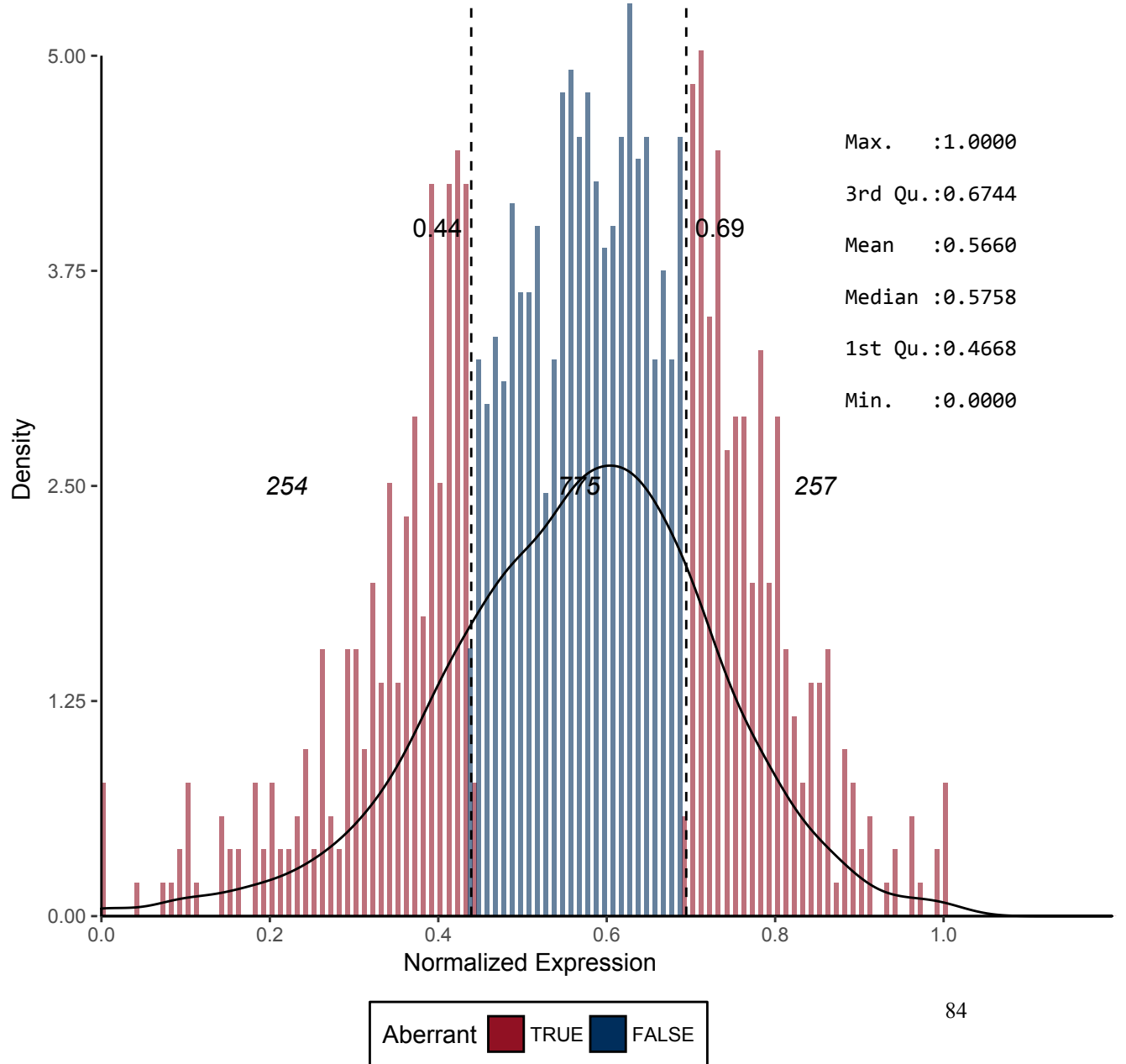
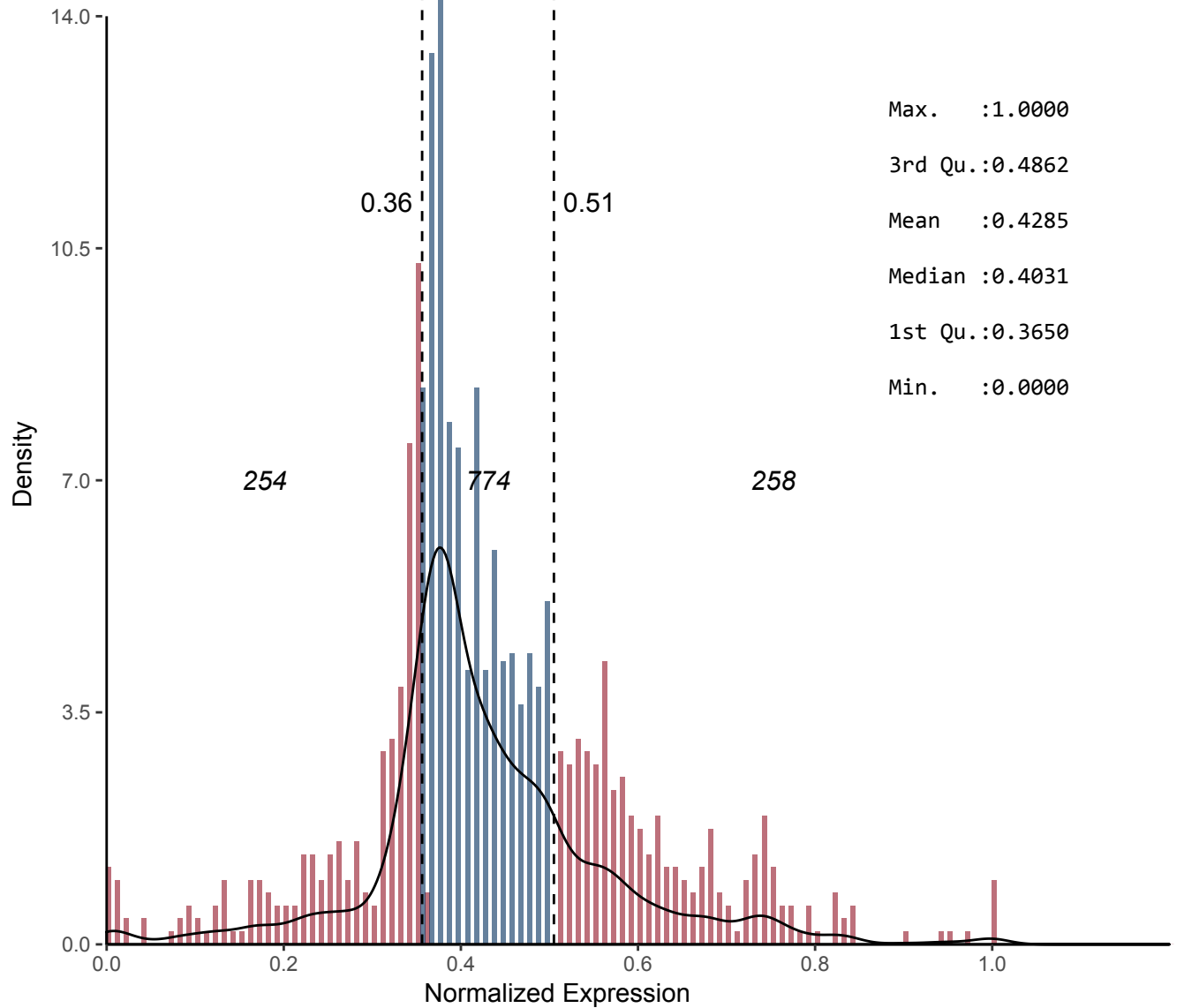


Figure 68 - CD59



Aberrant TRUE FALSE

Figure 69 - CD61

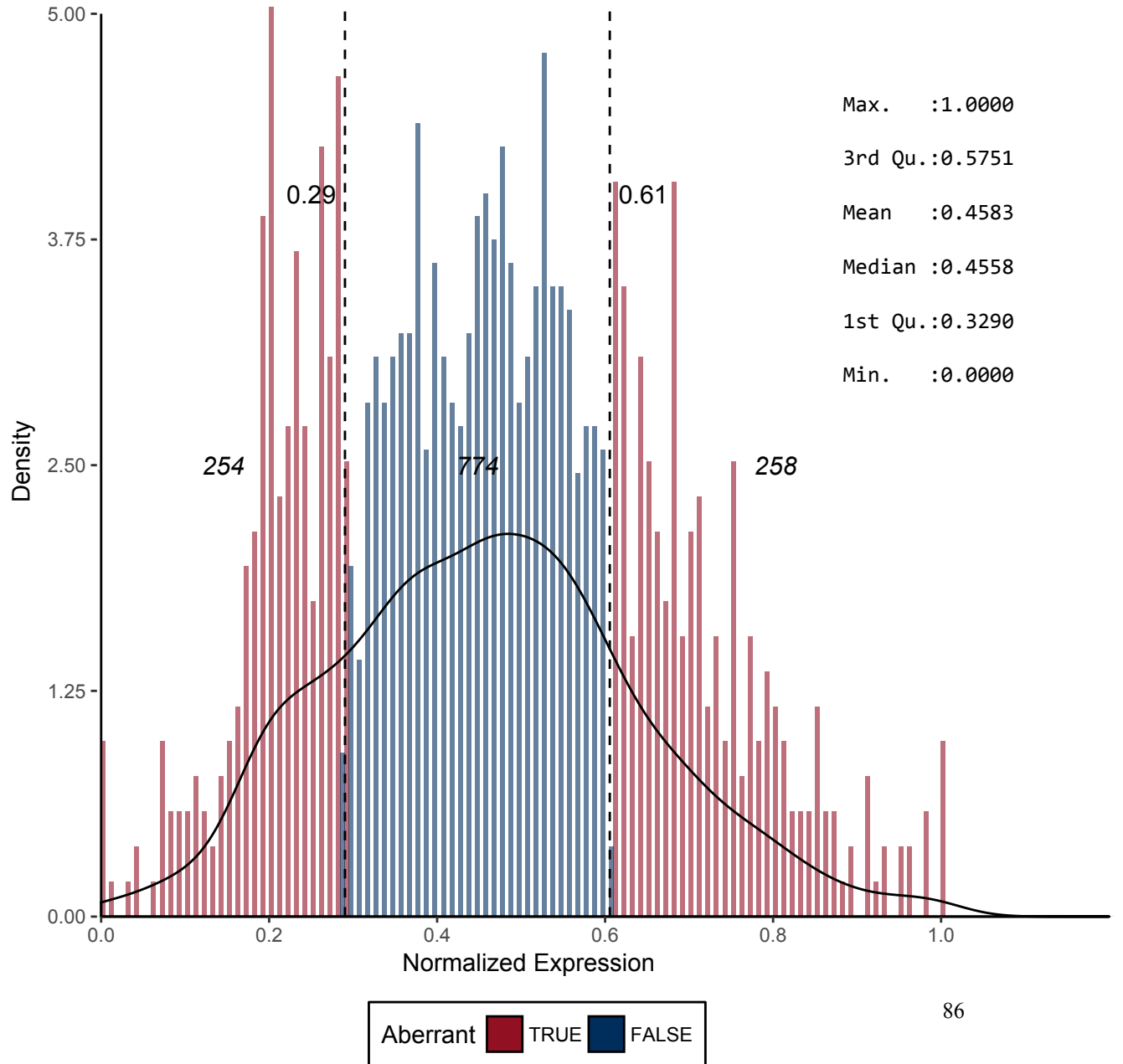


Figure 70 - CD62E*

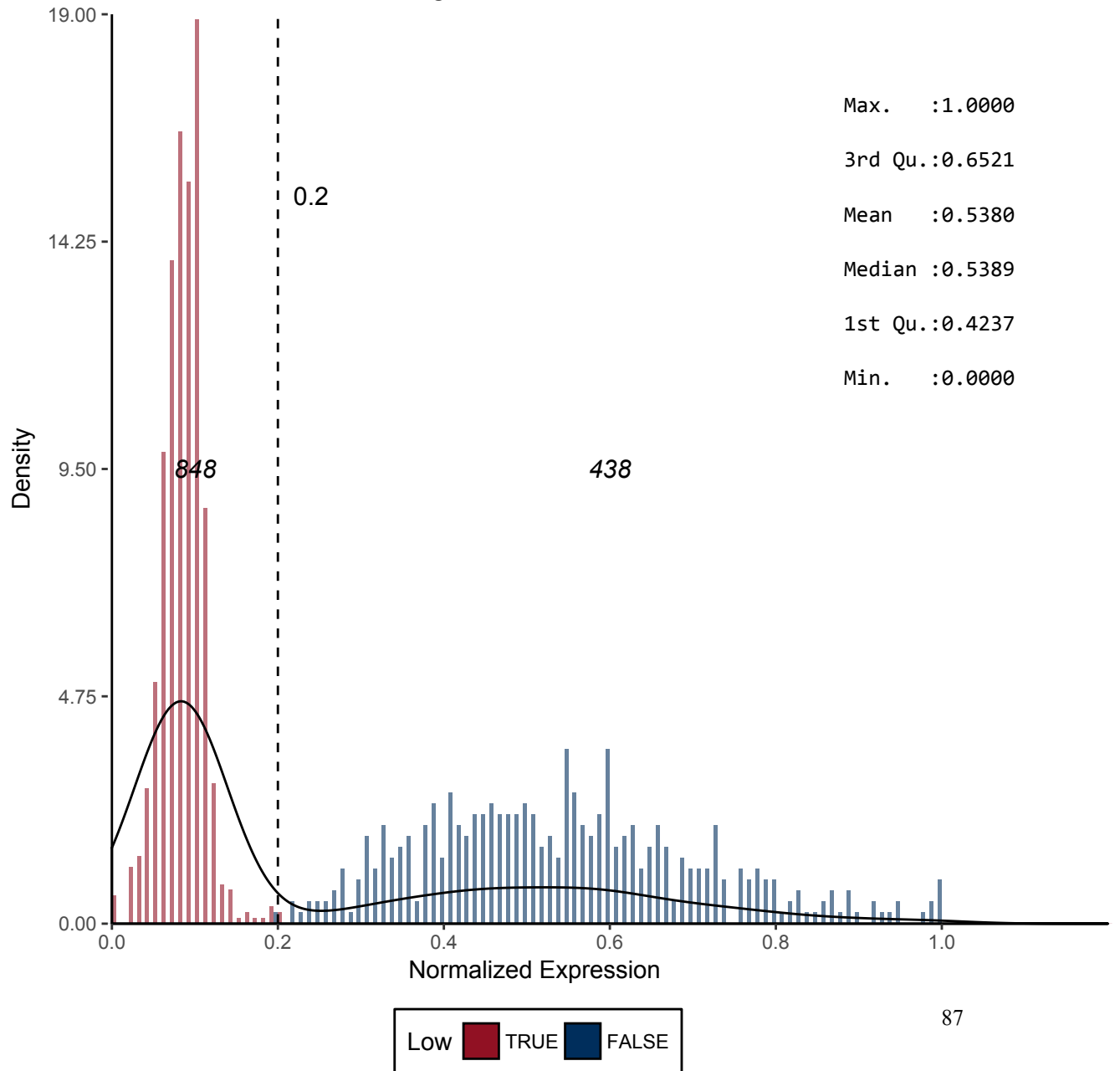


Figure 71 - CD62L*

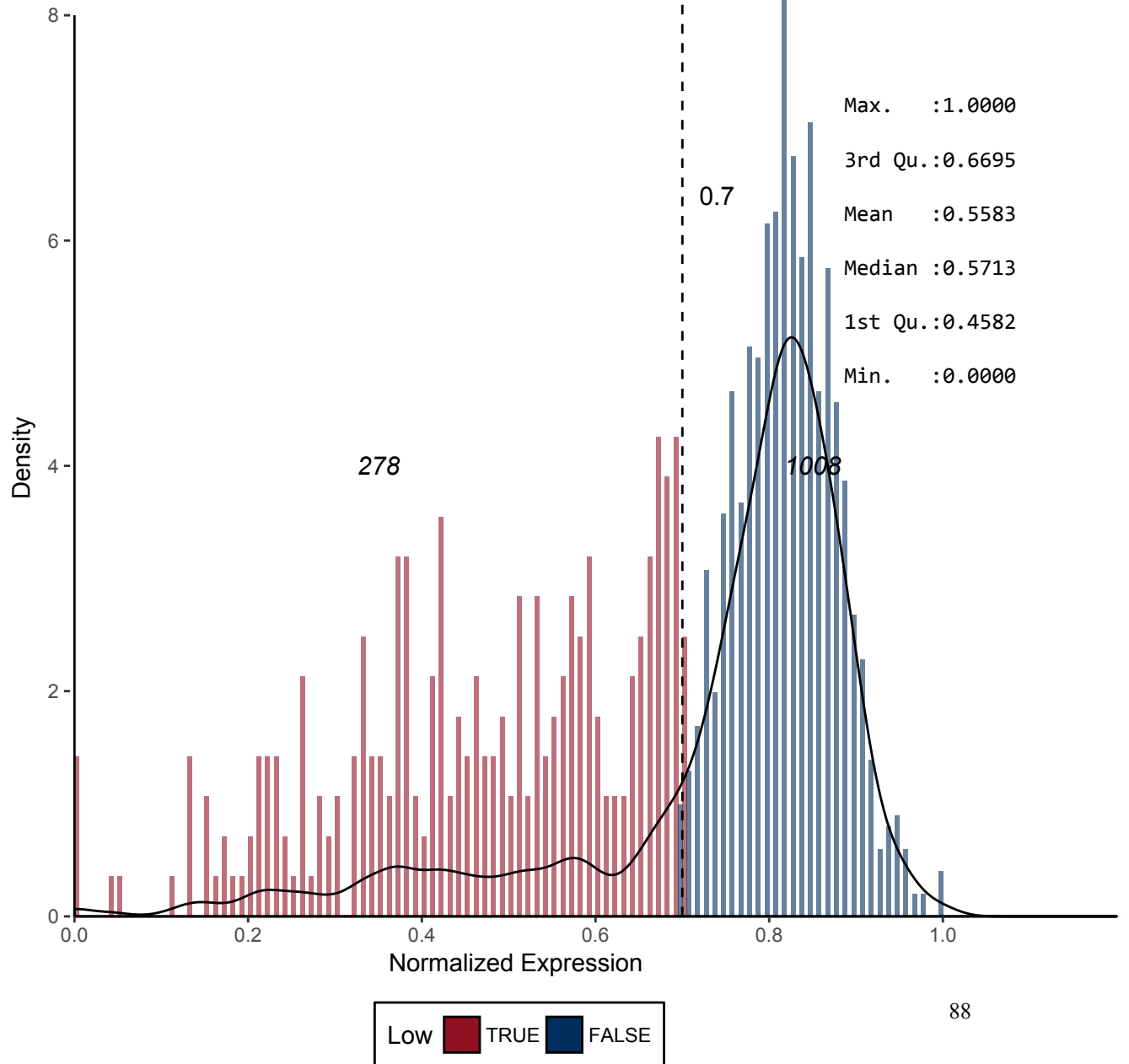


Figure 72 - CD62P

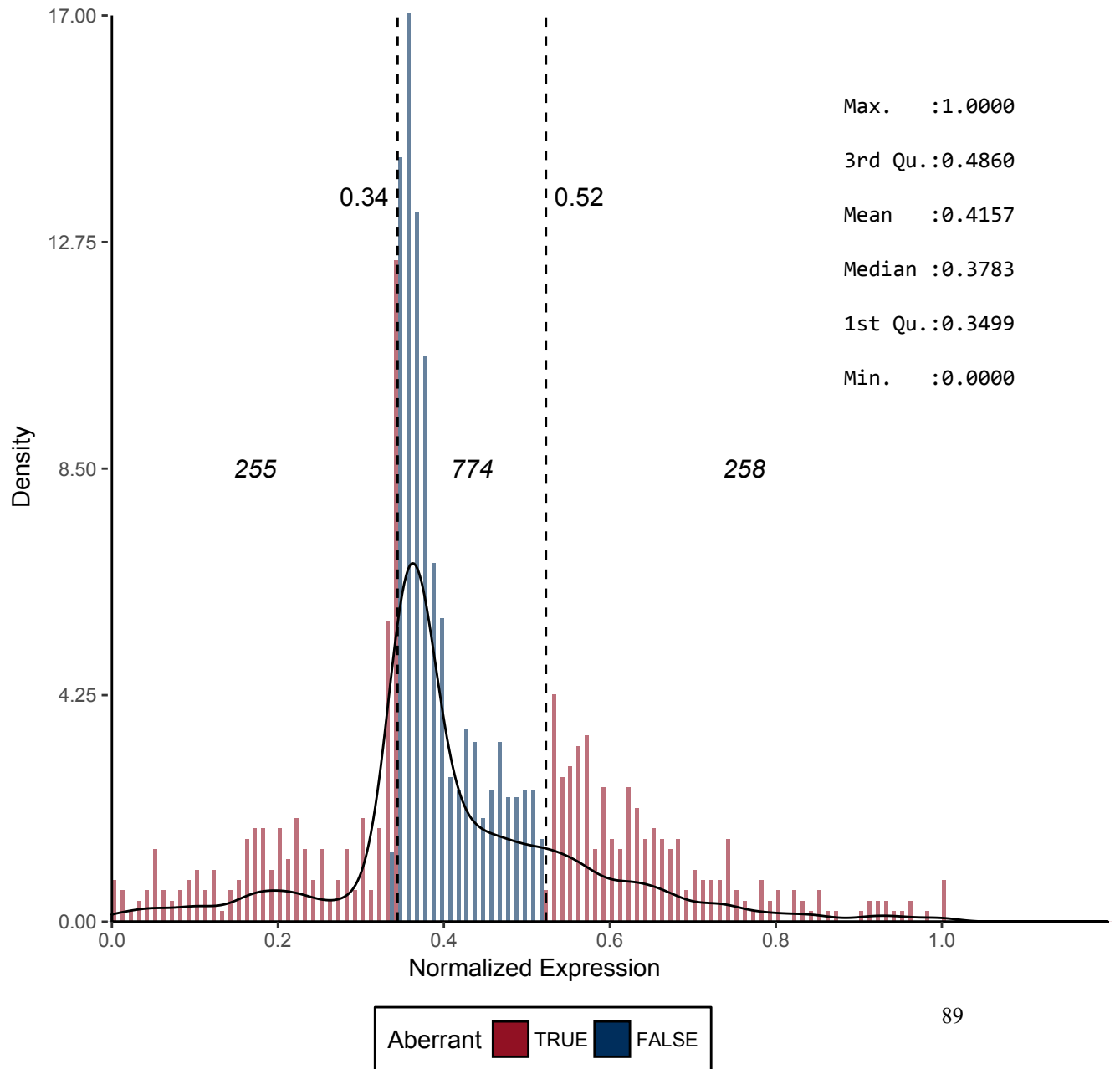
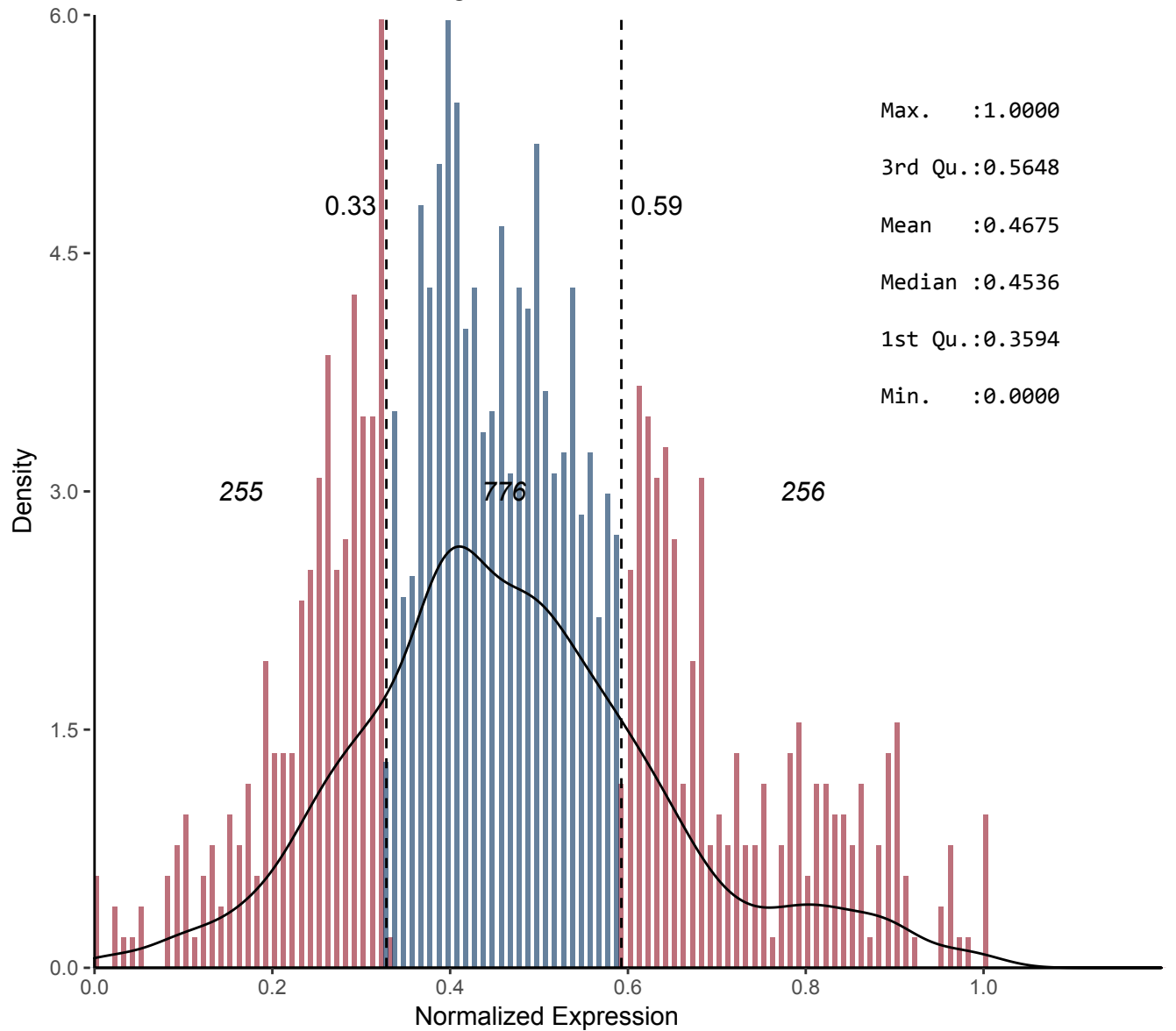


Figure 73 - CD63



Aberrant TRUE FALSE

Figure 74 - CD66A

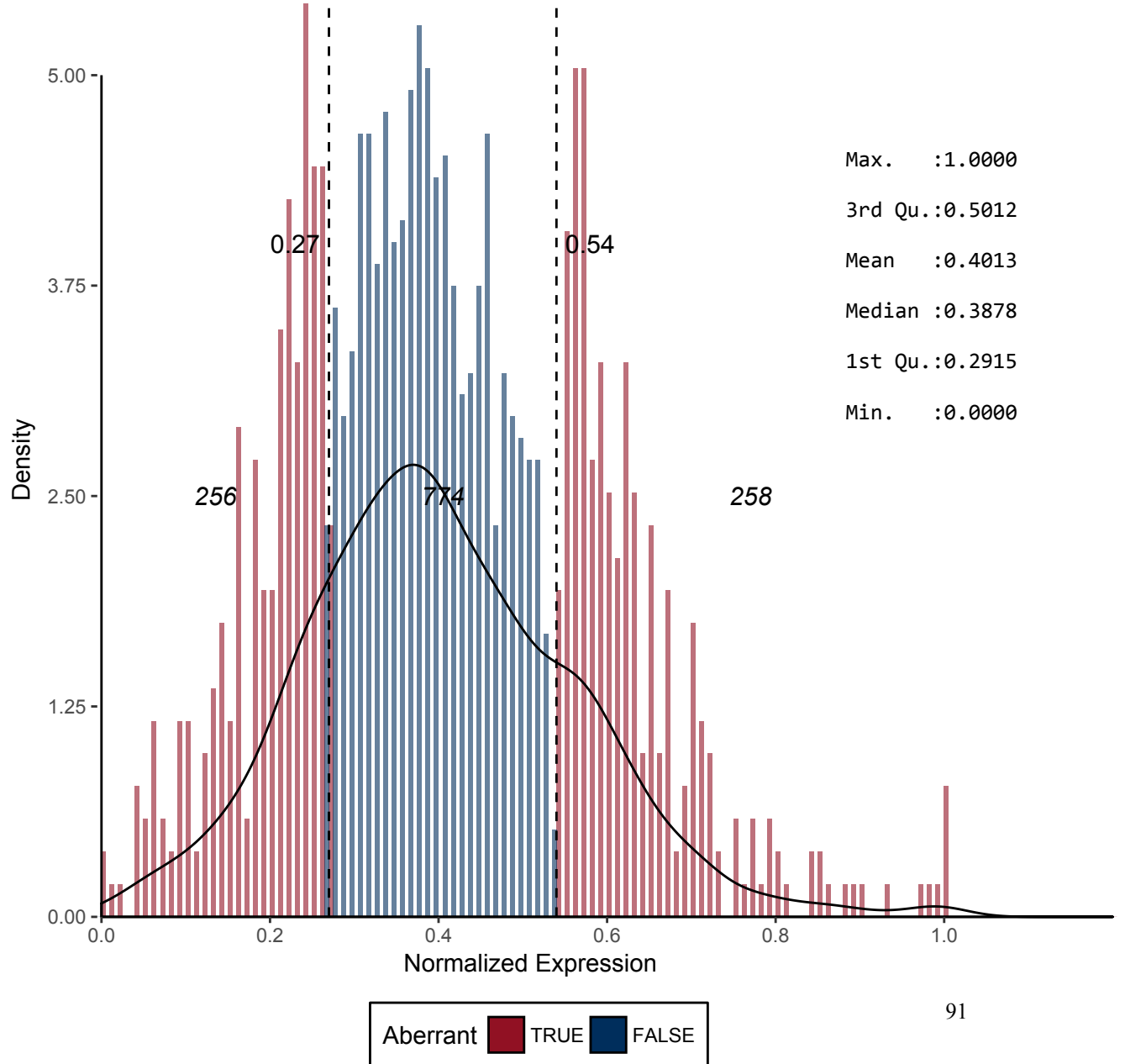


Figure 75 - CD66B

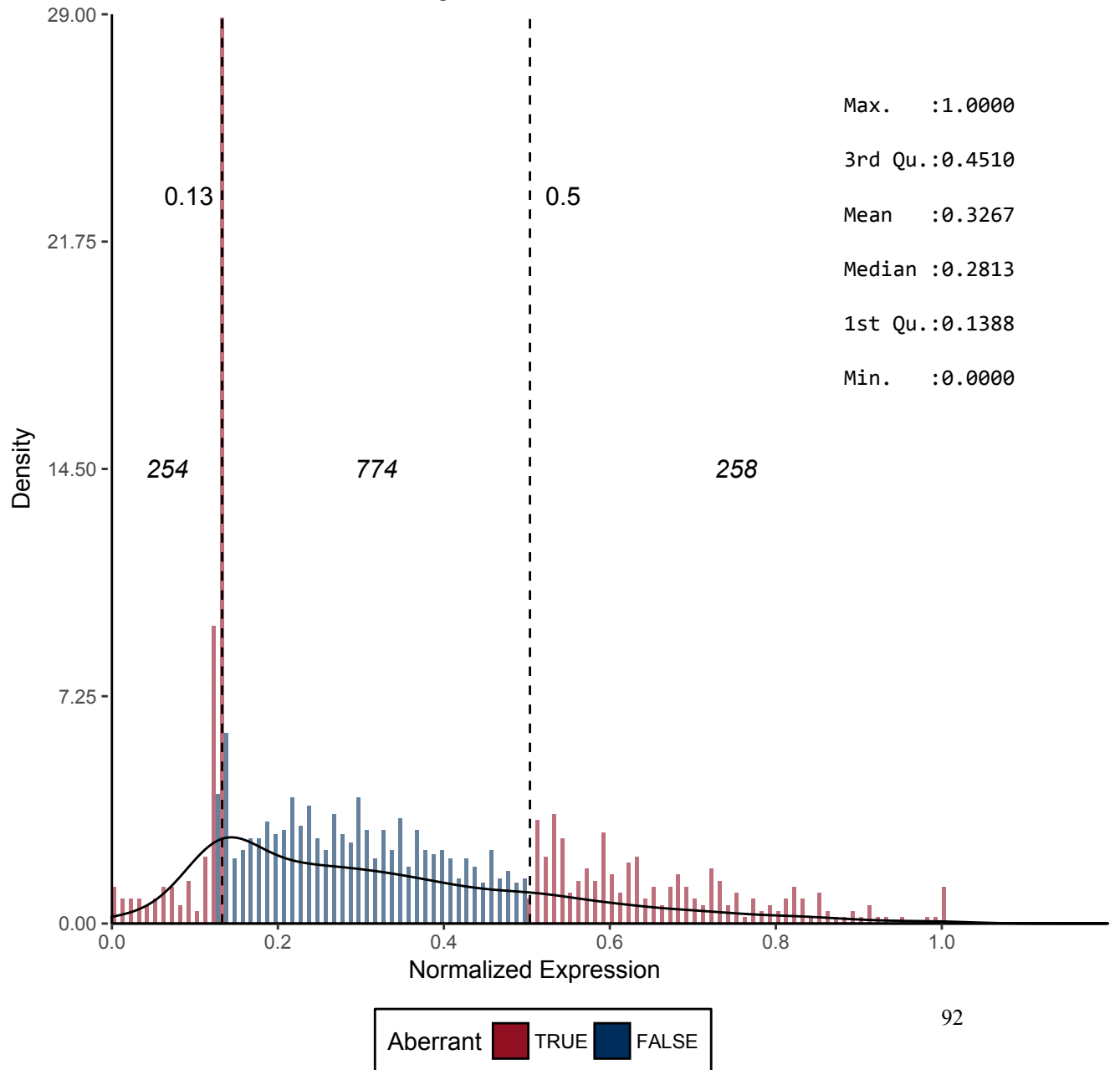


Figure 76 - CD66C

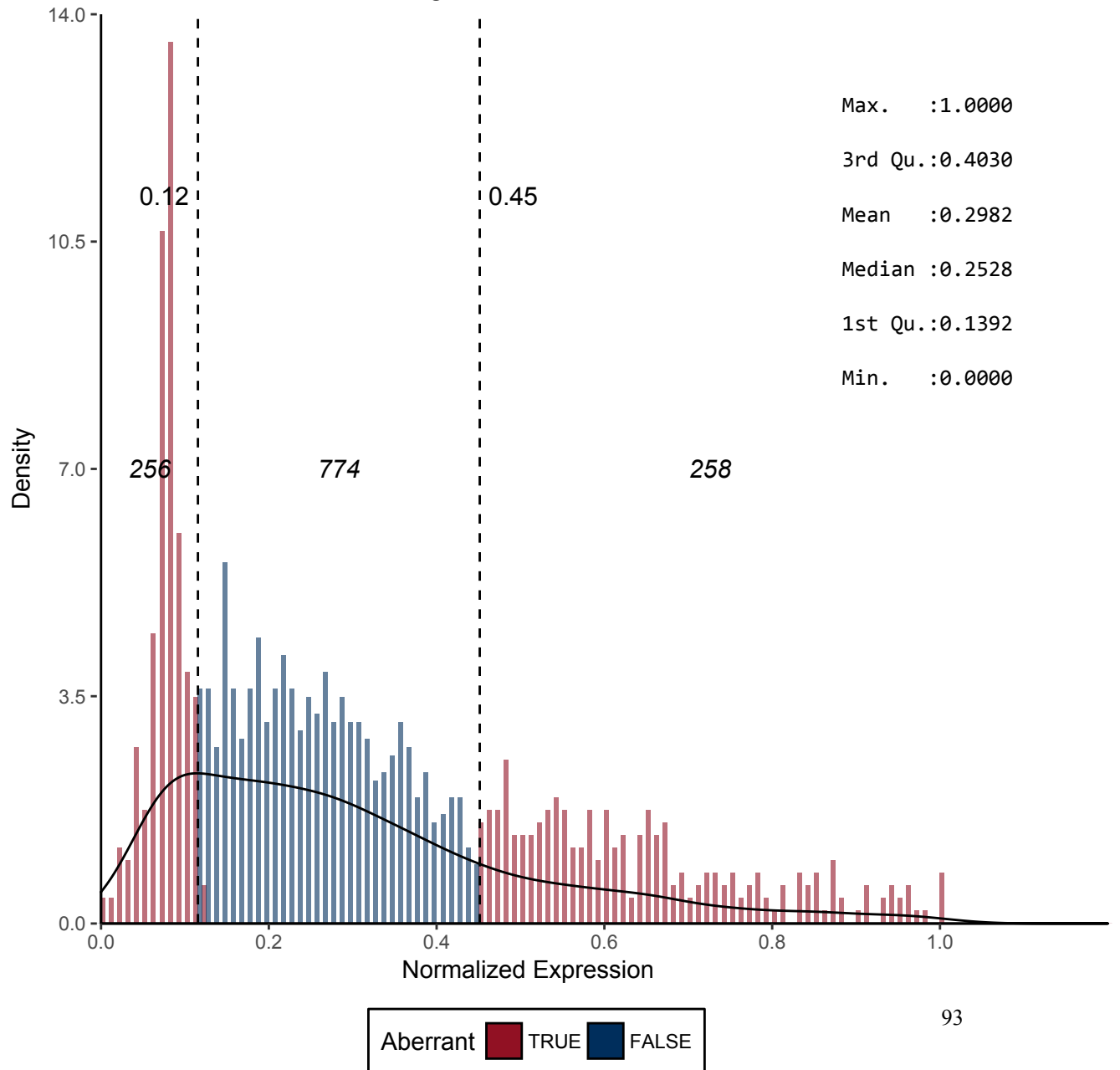


Figure 77 - CD66D

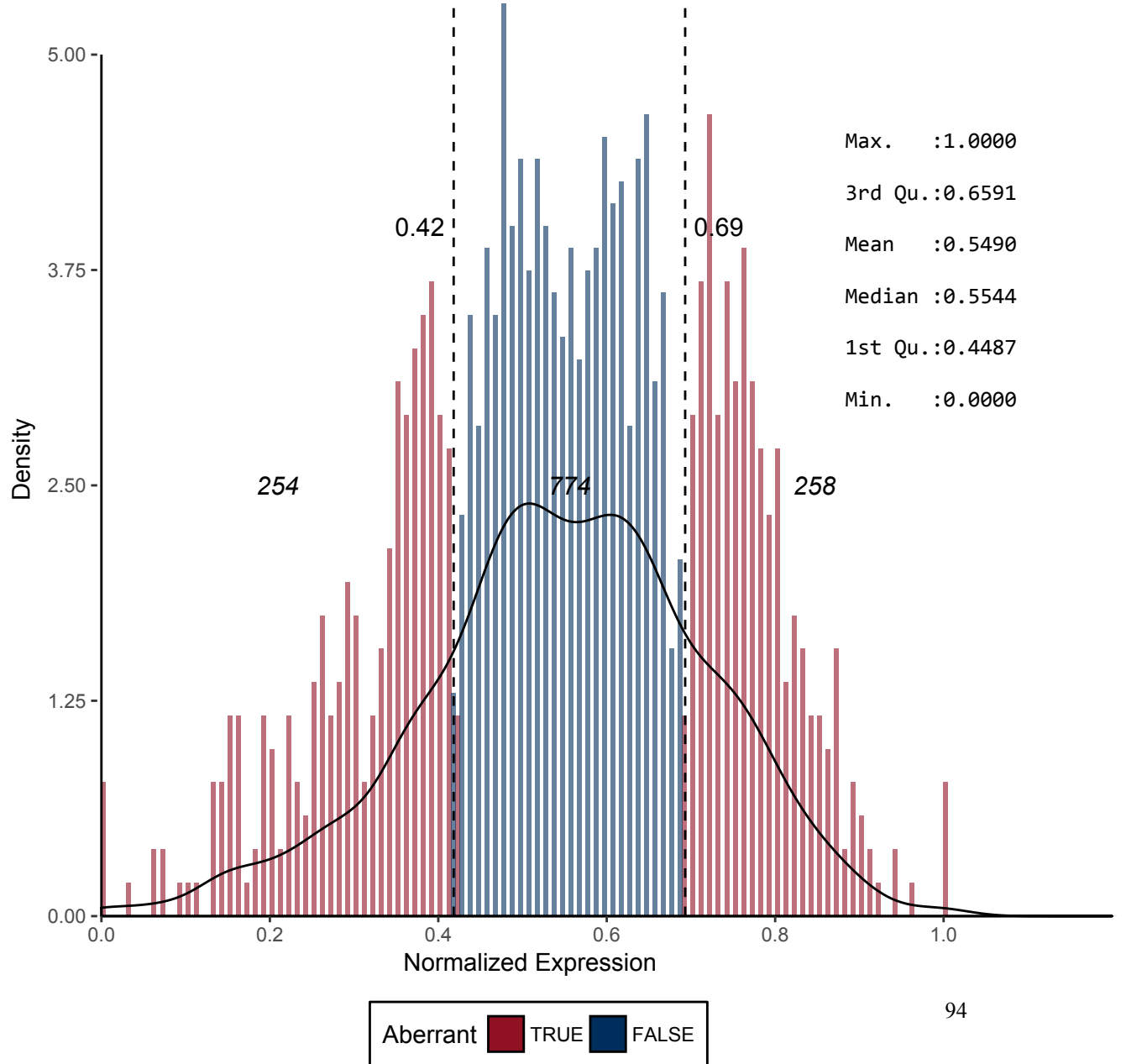


Figure 78 - CD66E*

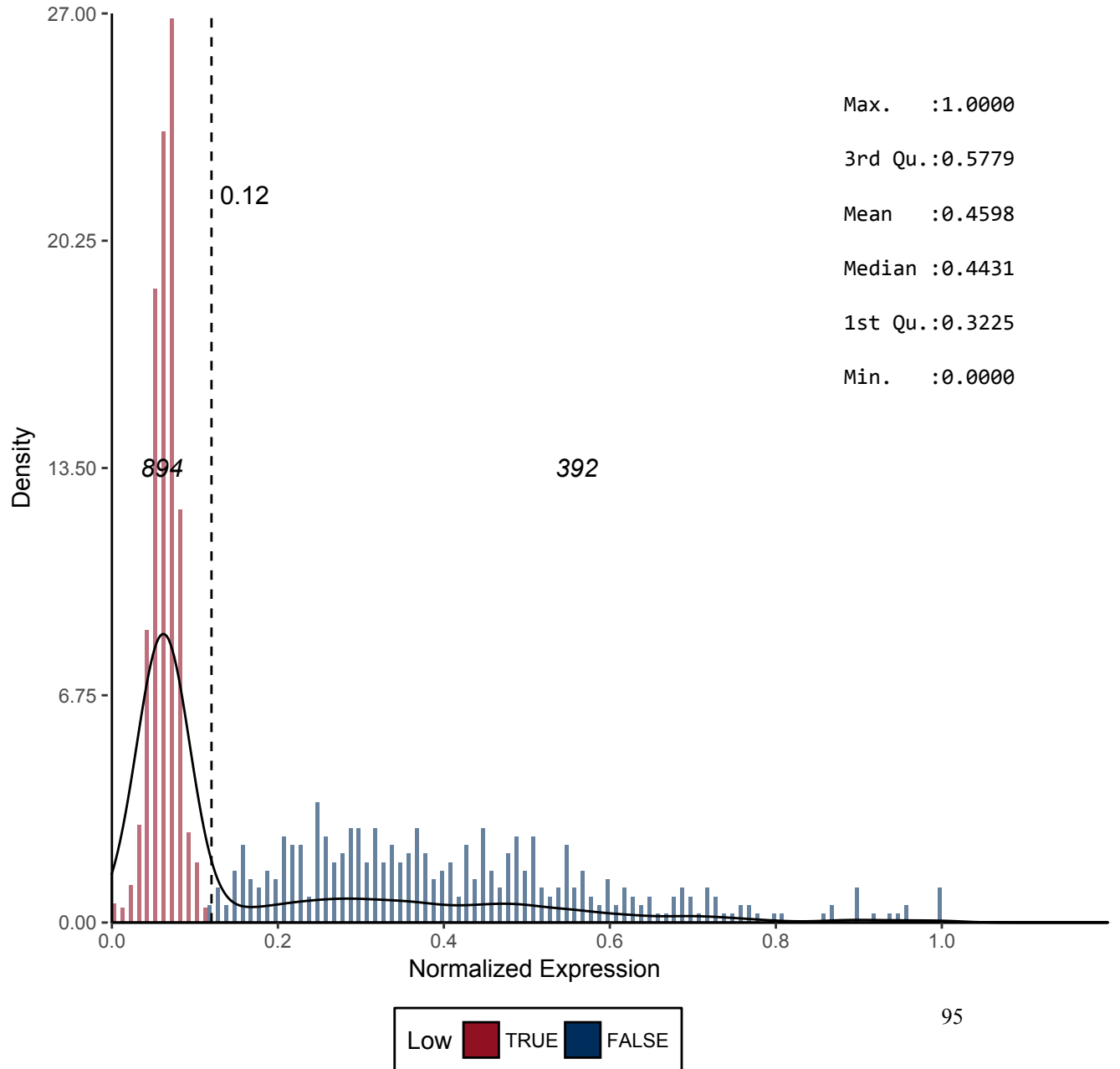


Figure 79 - CD66F*

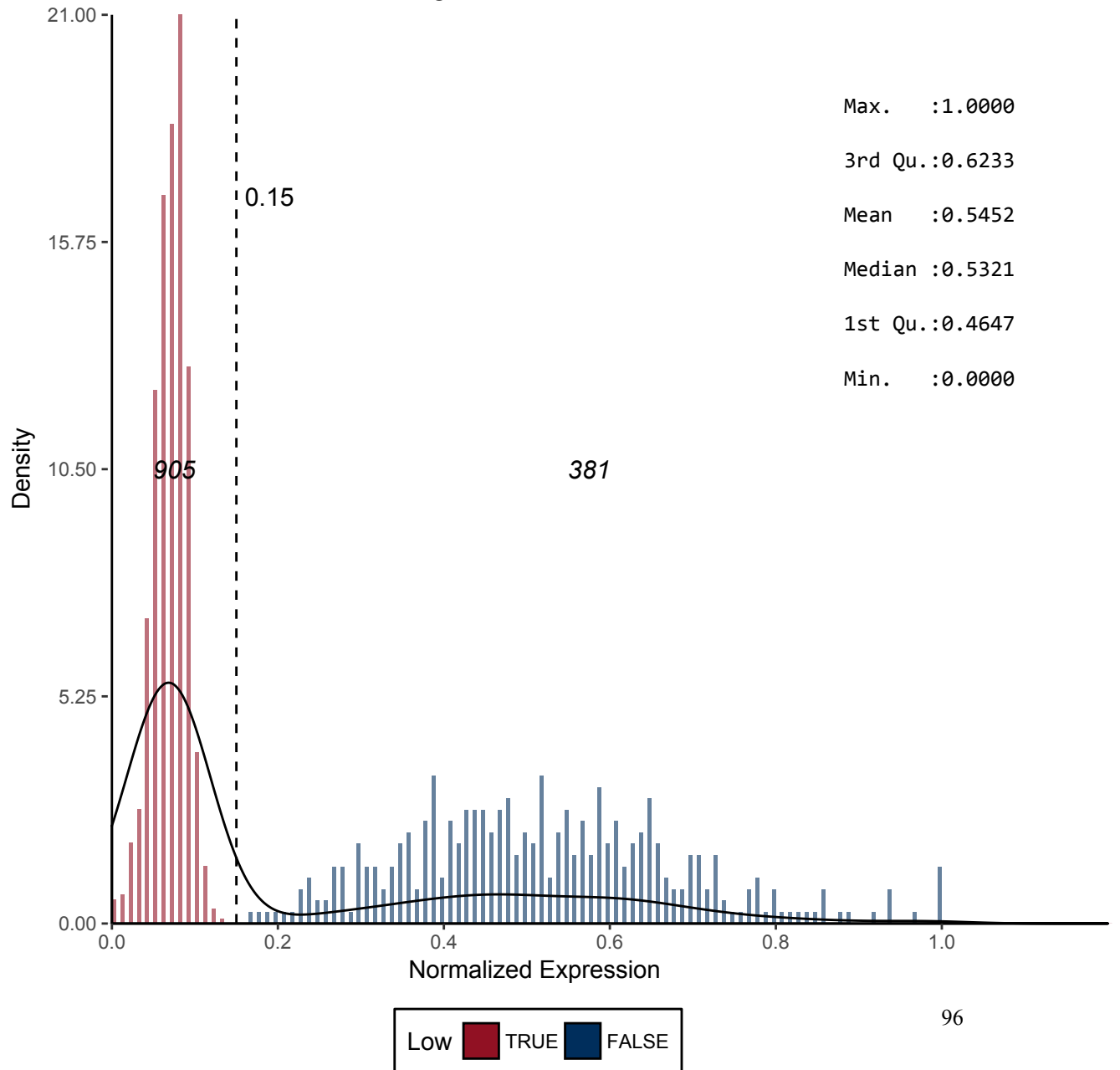


Figure 80 - CD68

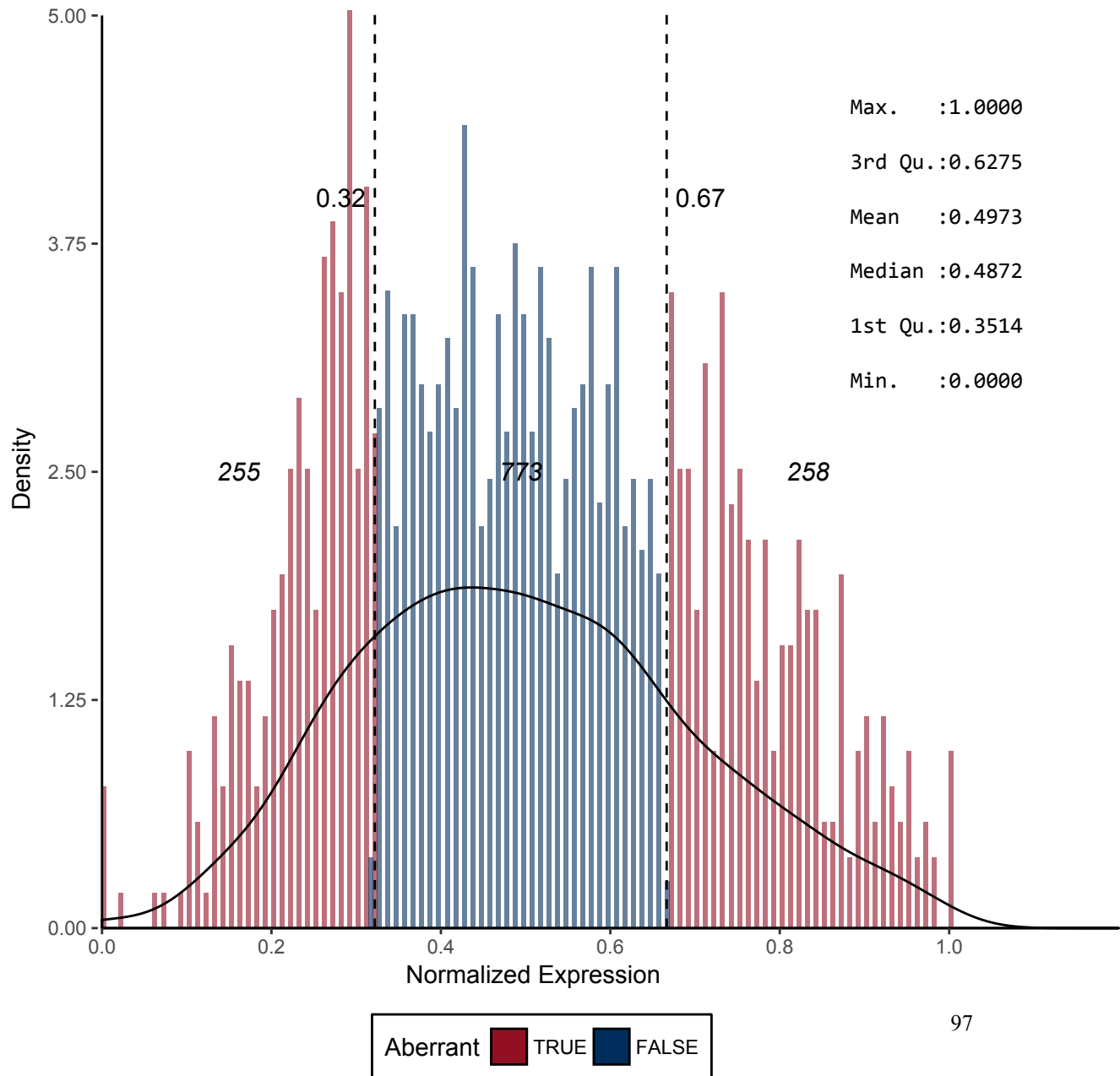


Figure 81 - CD69

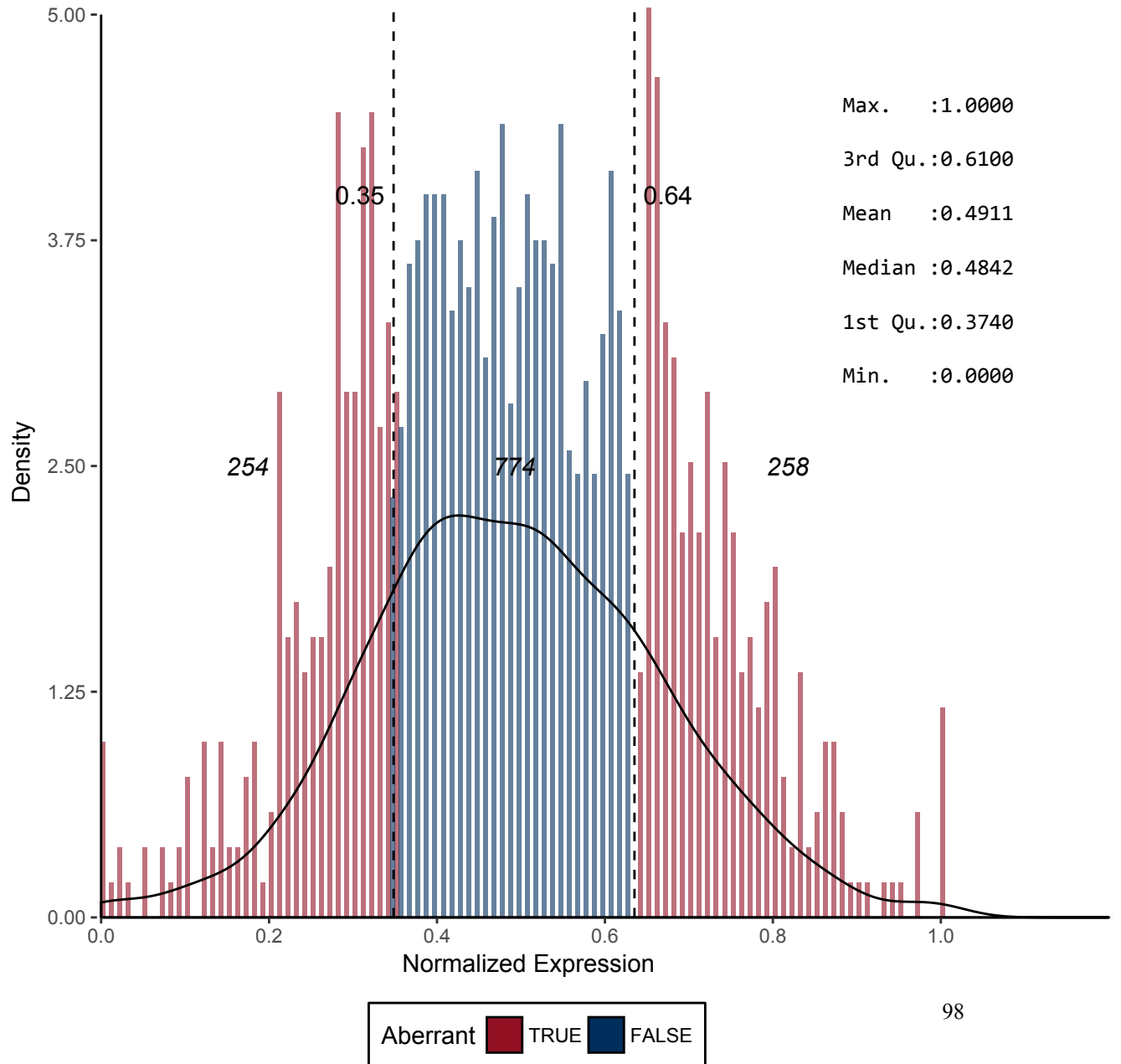


Figure 82 - CD70

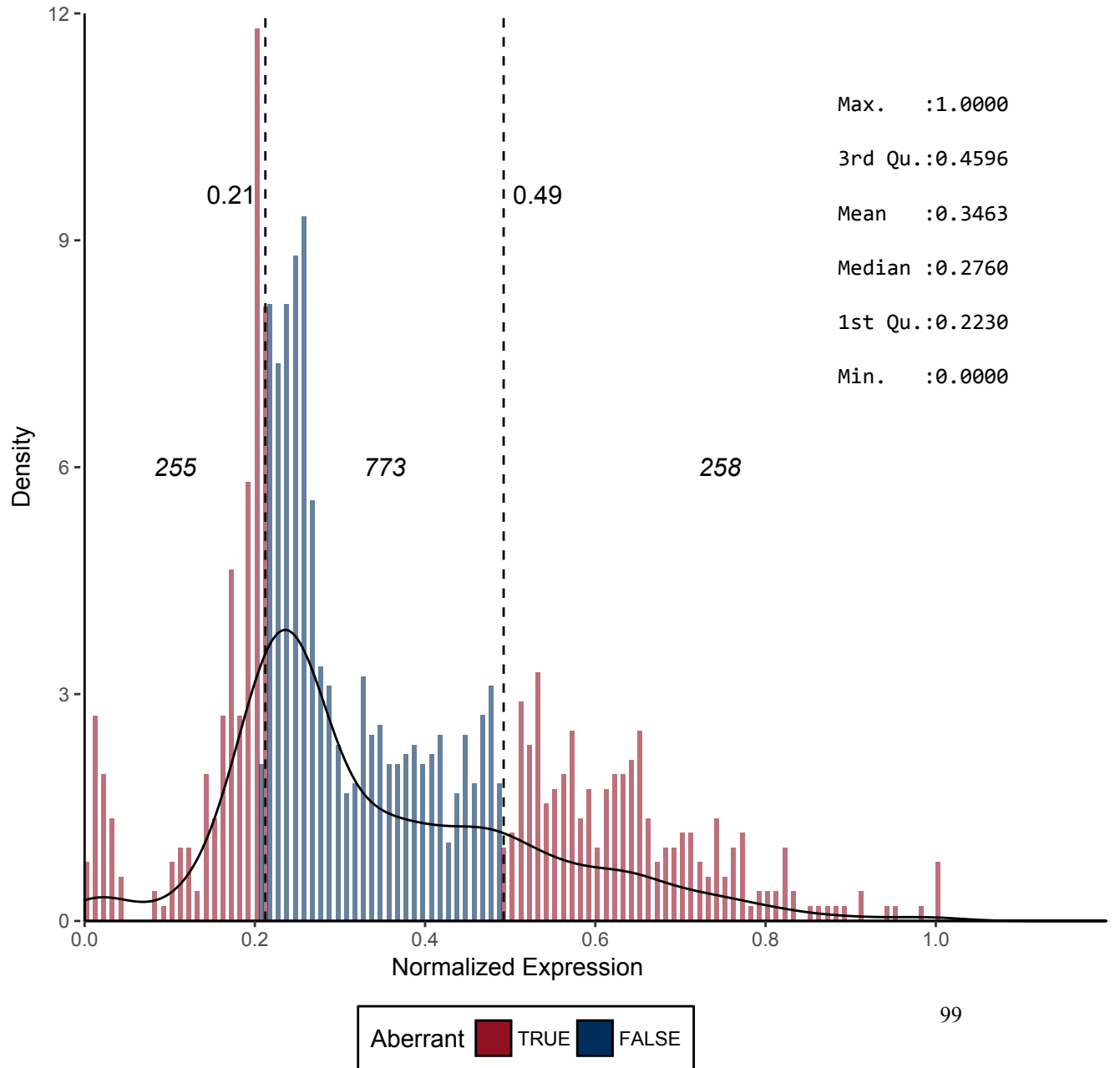
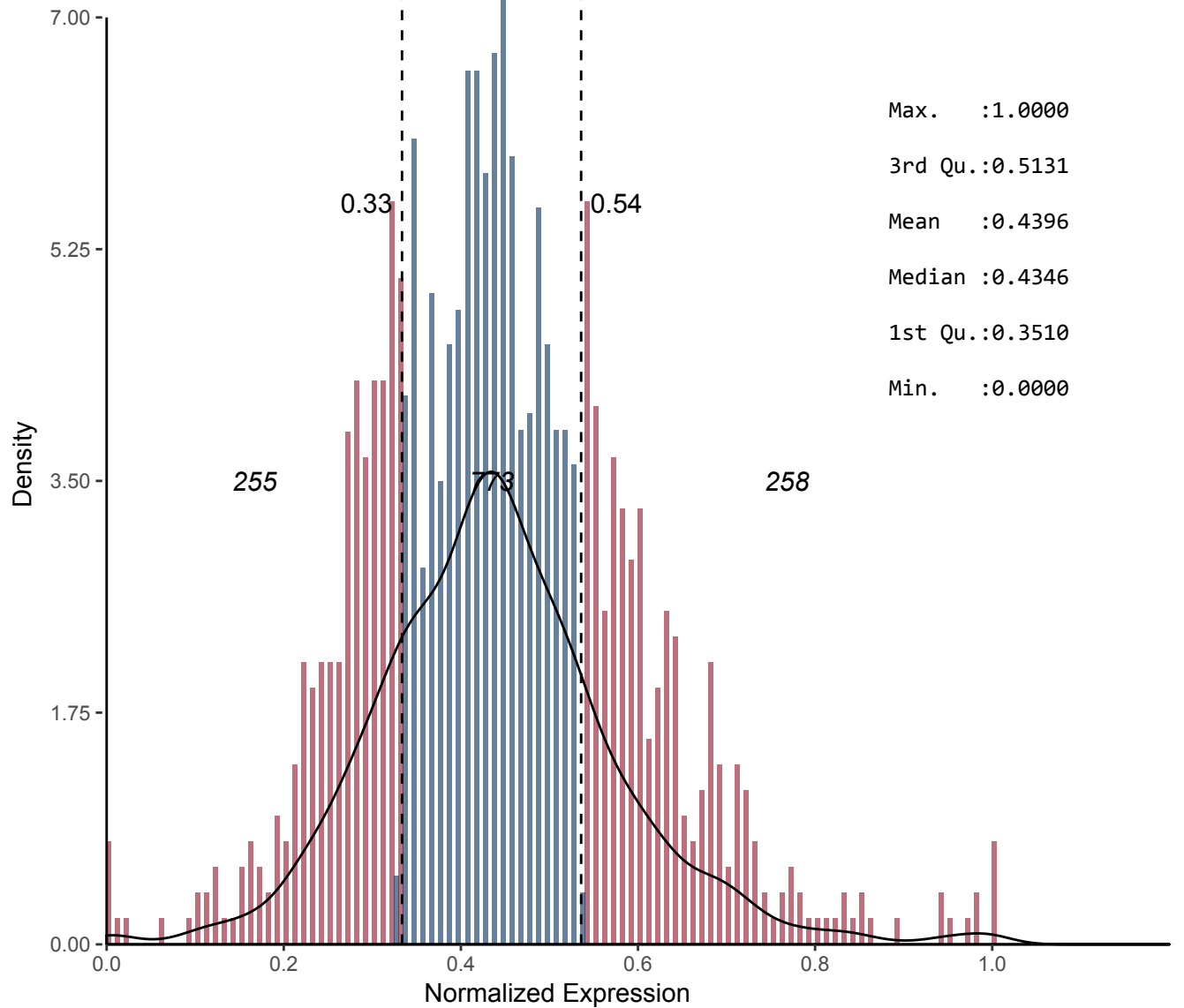


Figure 83 - CD71



Aberrant TRUE FALSE

Figure 84 - CD72*

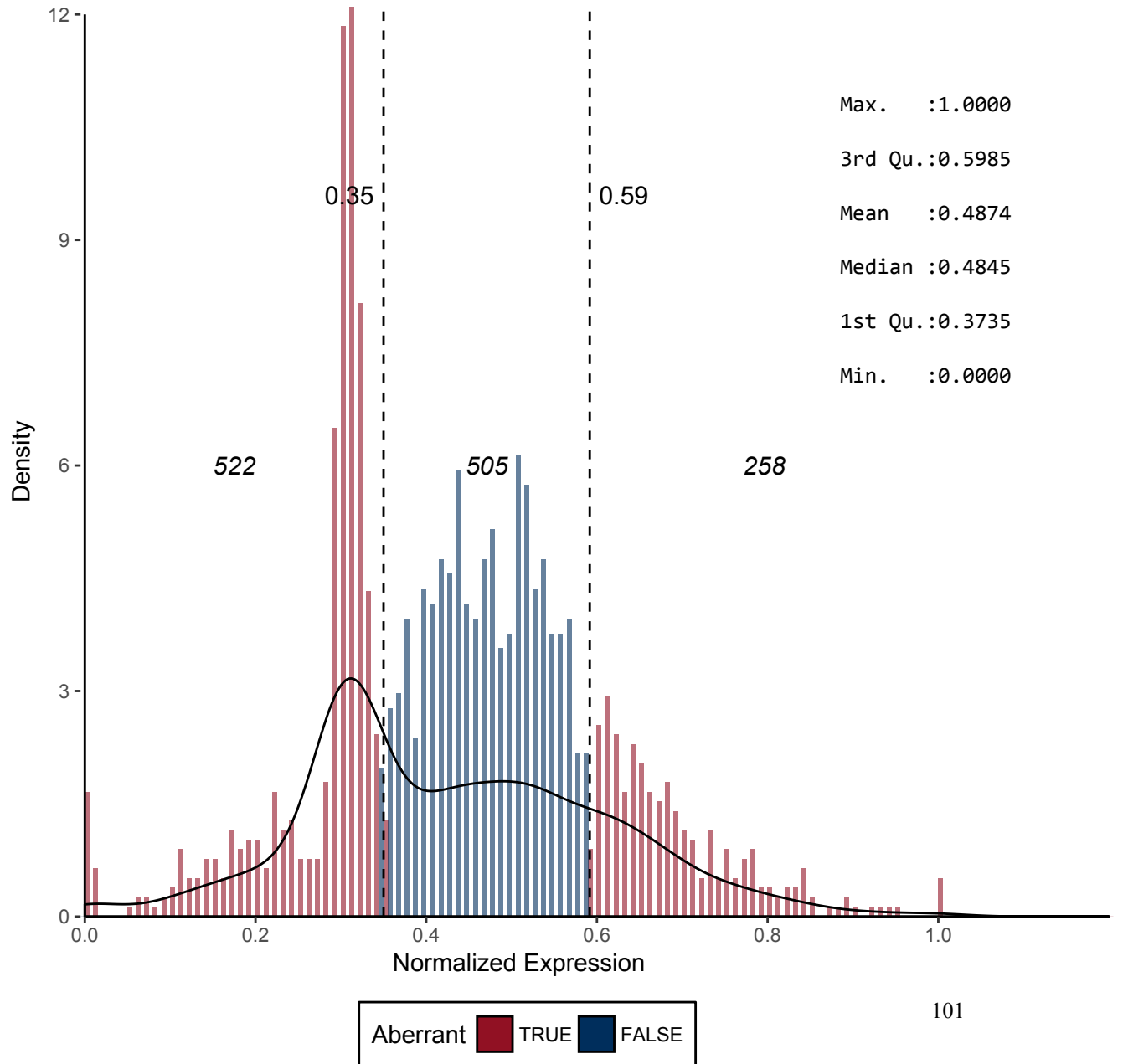


Figure 85 - CD73

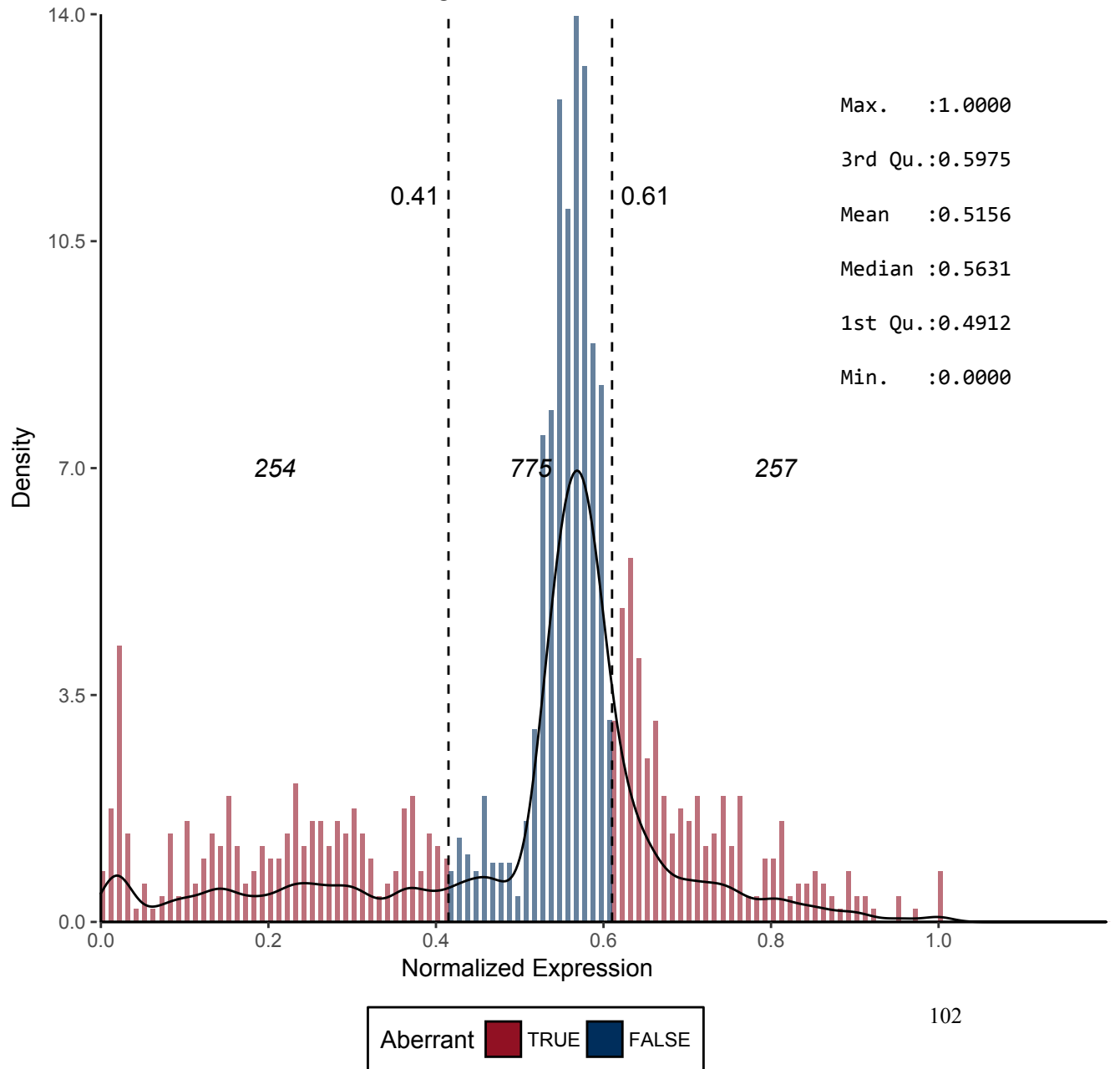
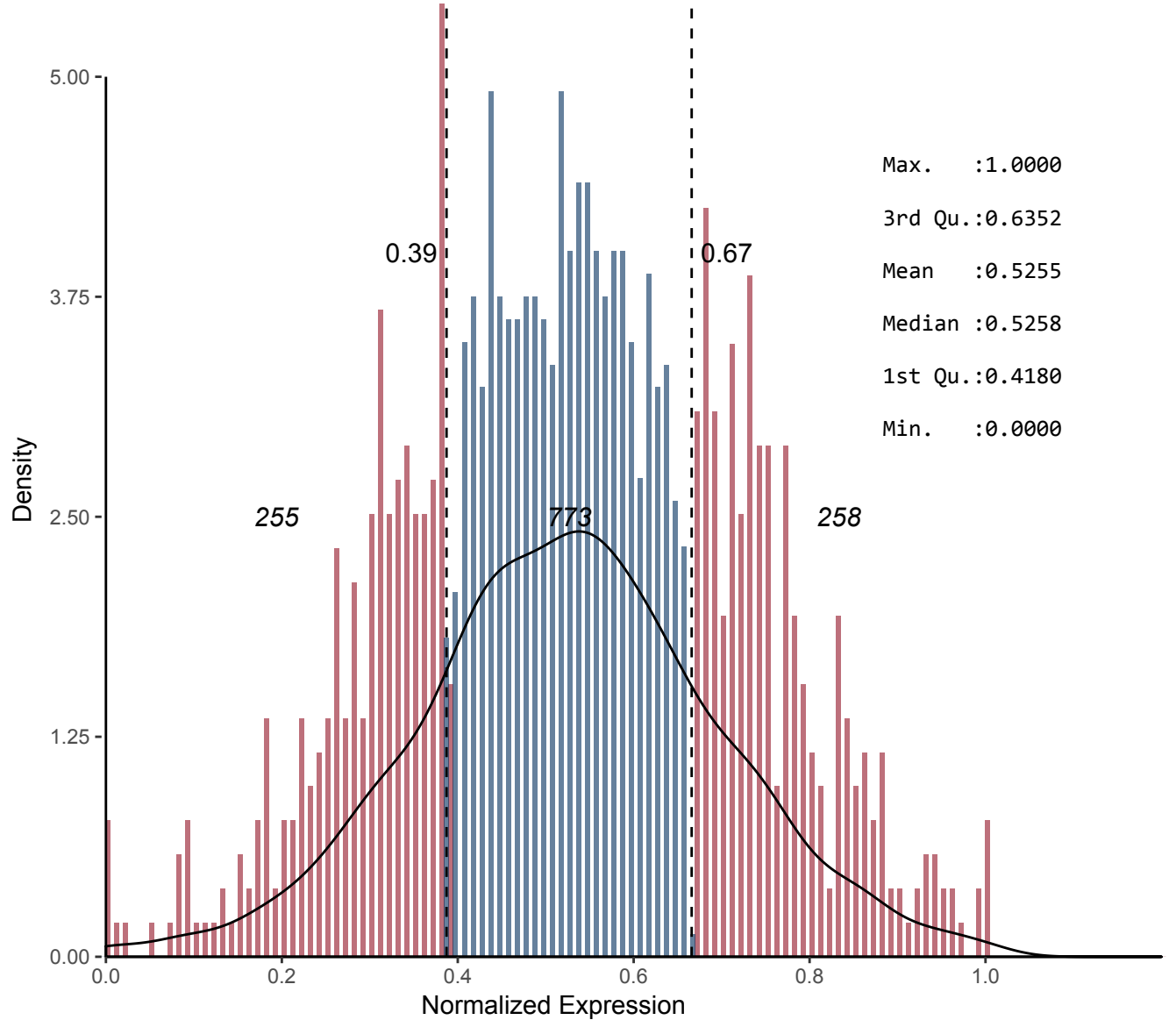


Figure 86 - CD74



Aberrant TRUE FALSE

Figure 87 - CD79A

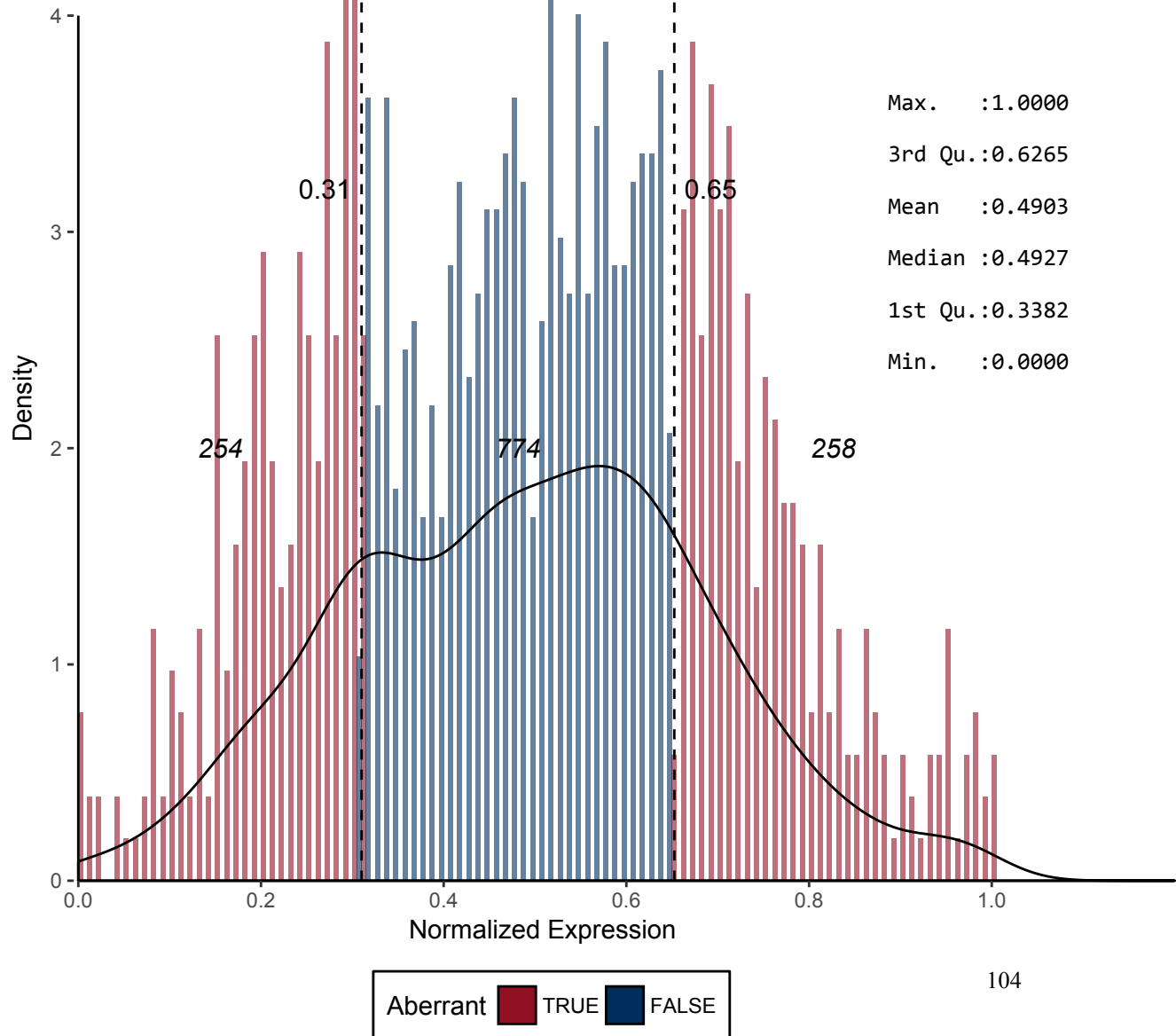


Figure 88 - CD79B

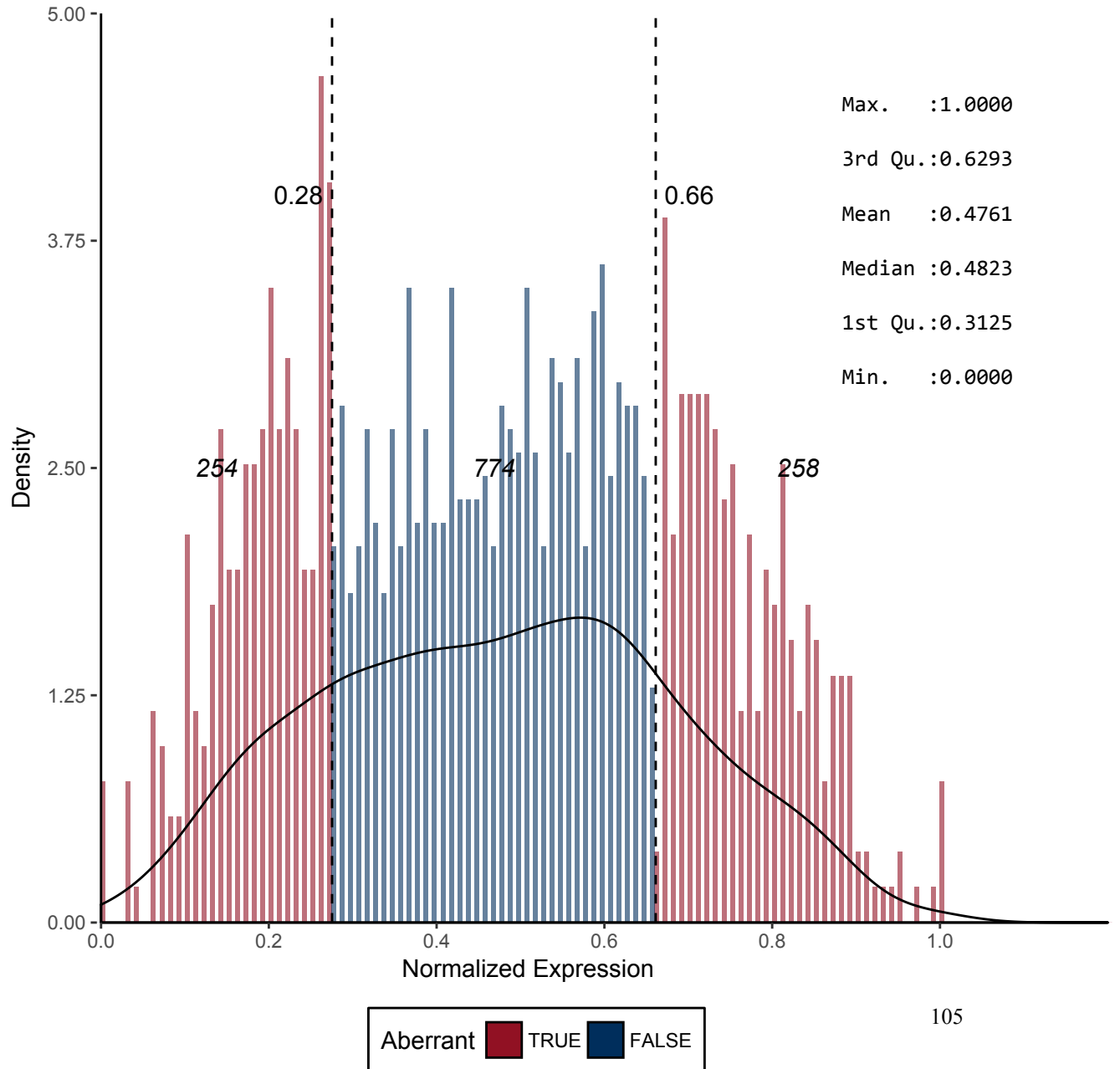


Figure 89 - CD80*

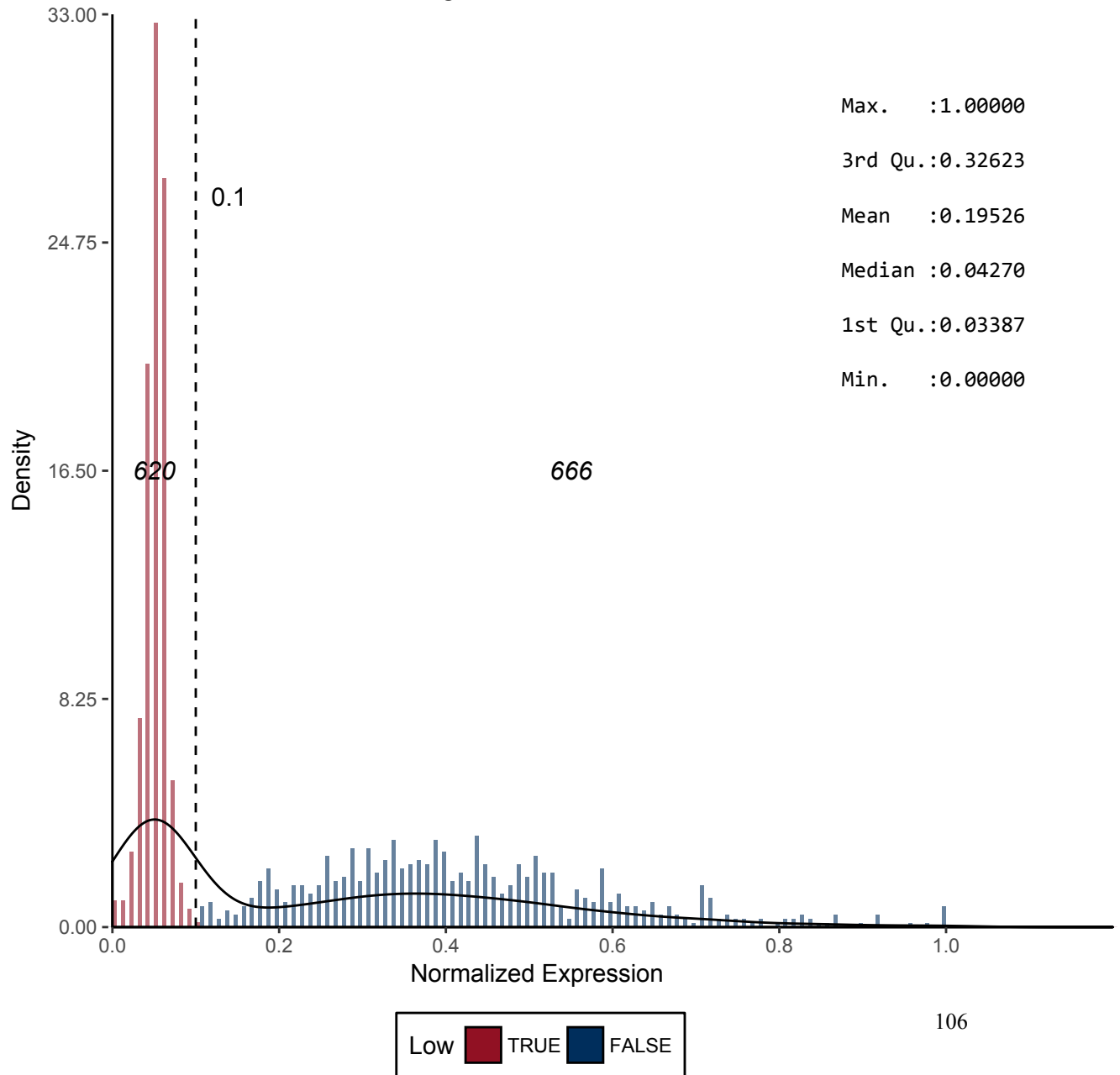


Figure 90 - CD81

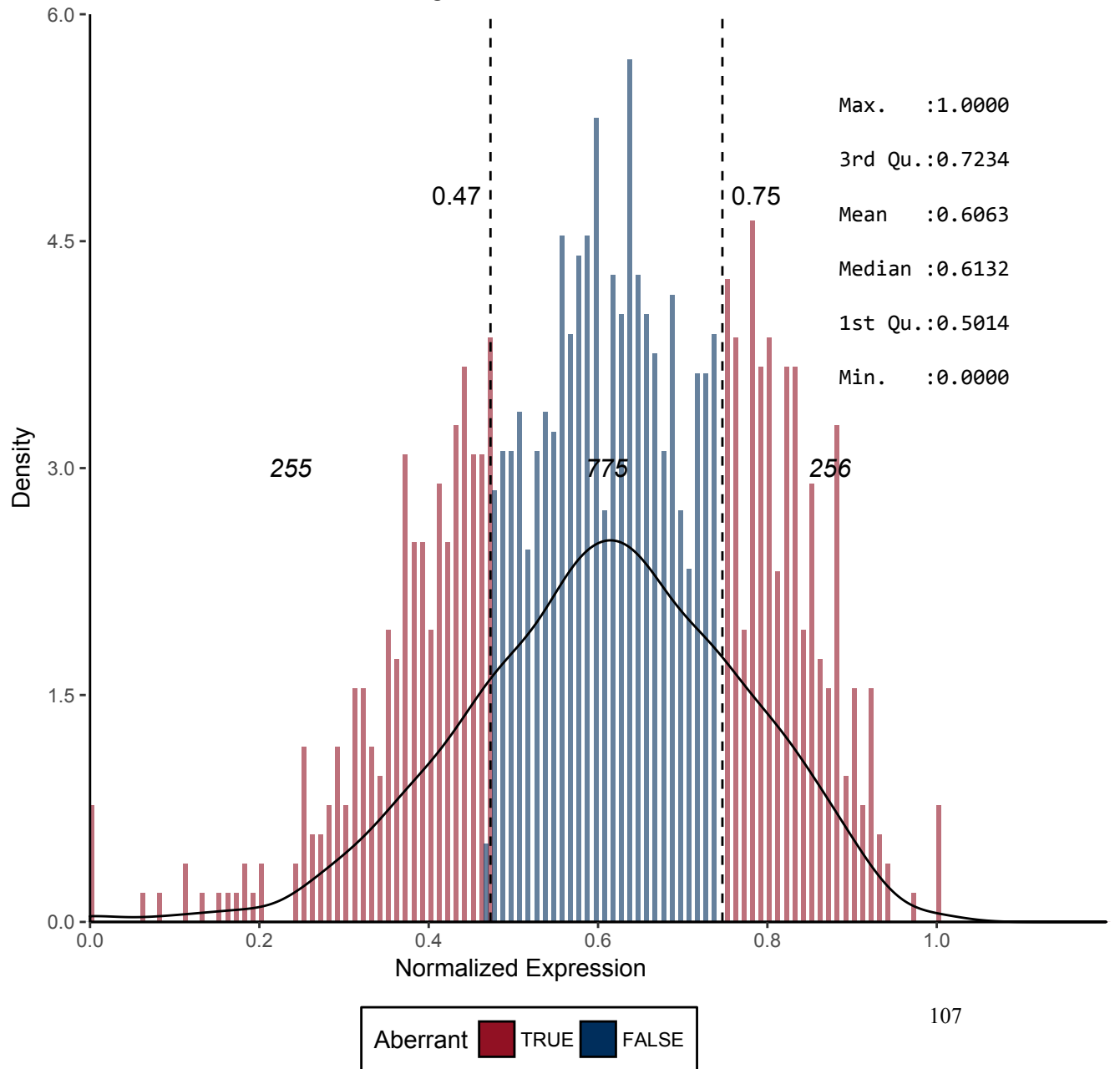


Figure 91 - CD82

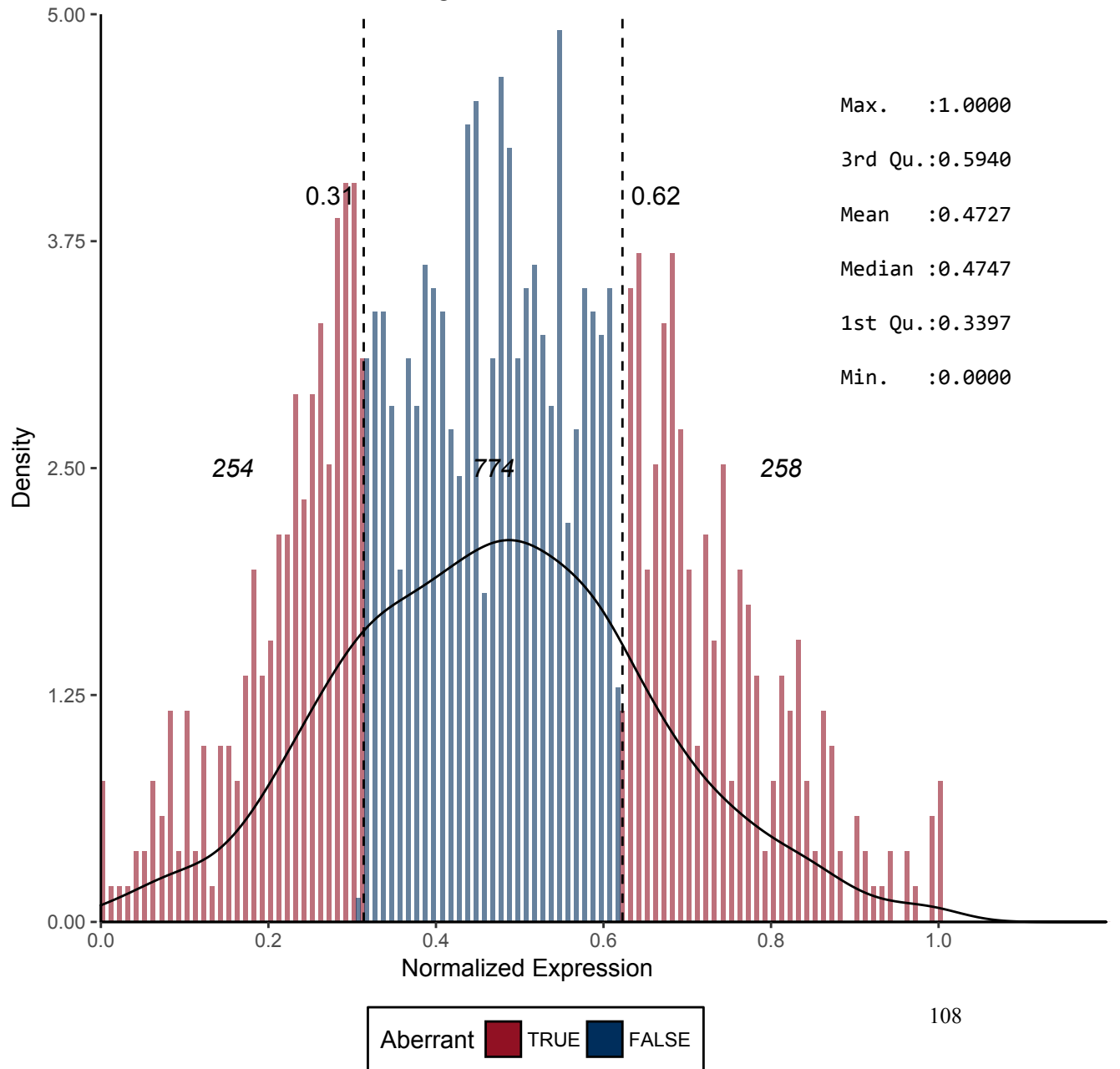


Figure 92 - CD83

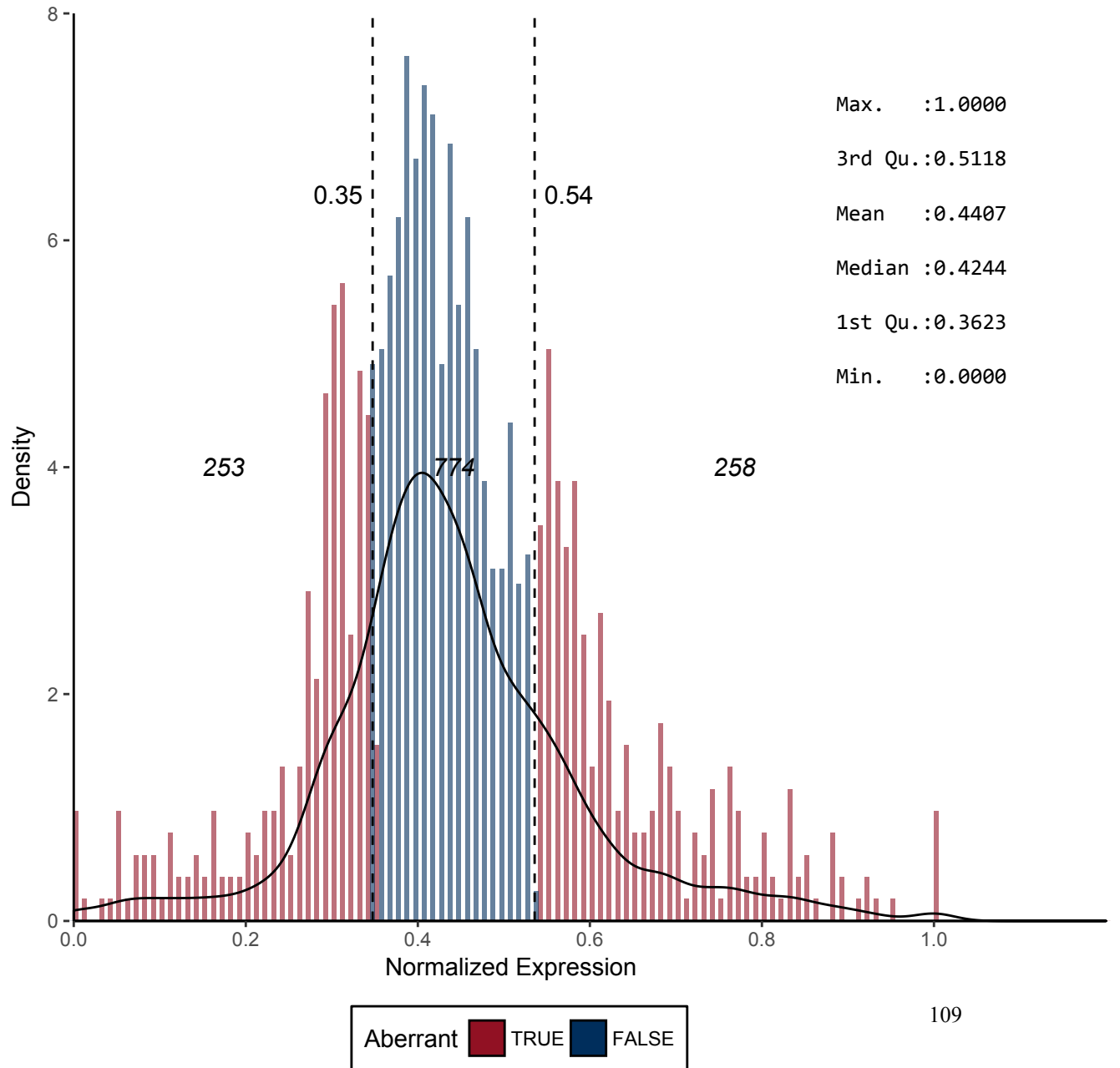


Figure 93 - CD84

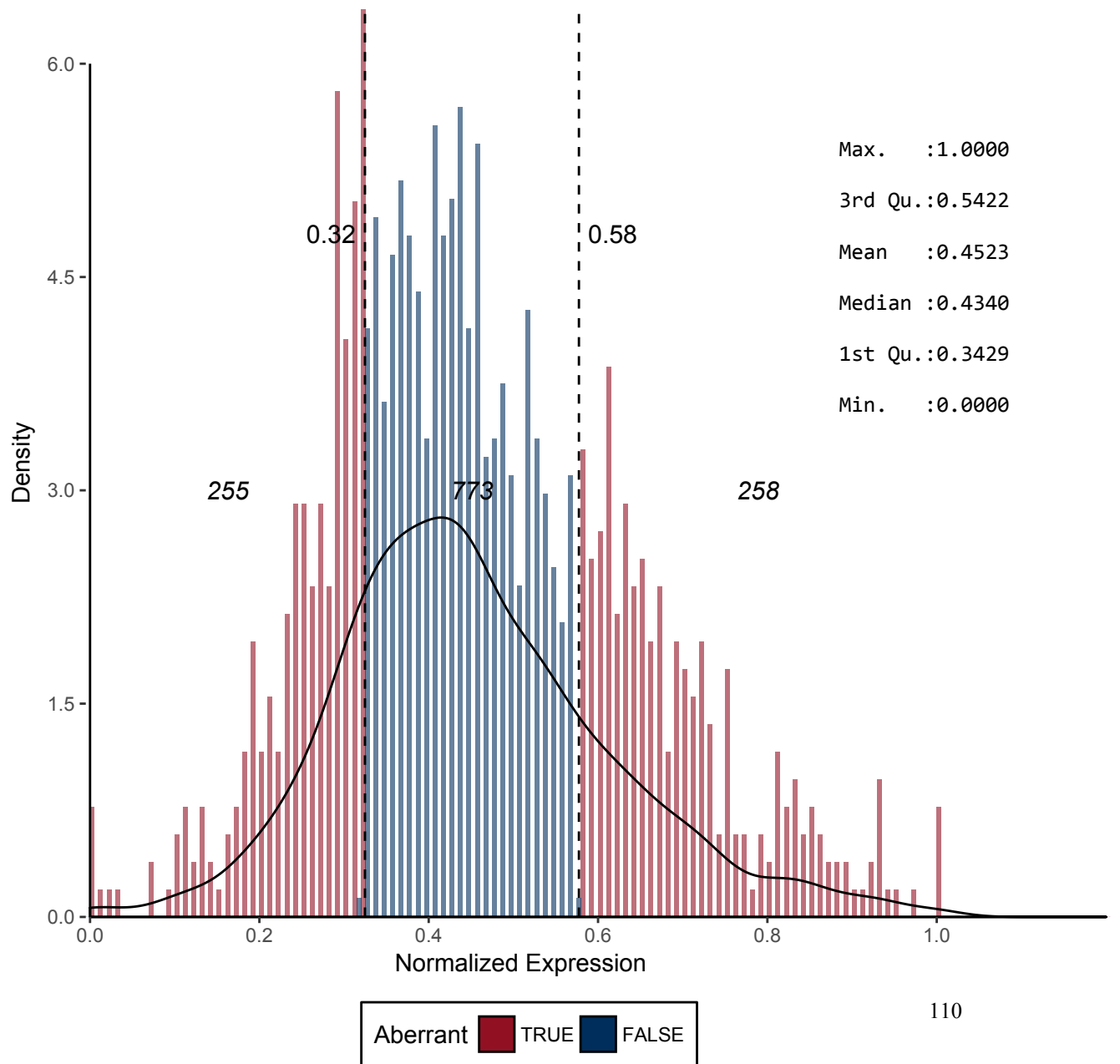


Figure 94 - CD85A

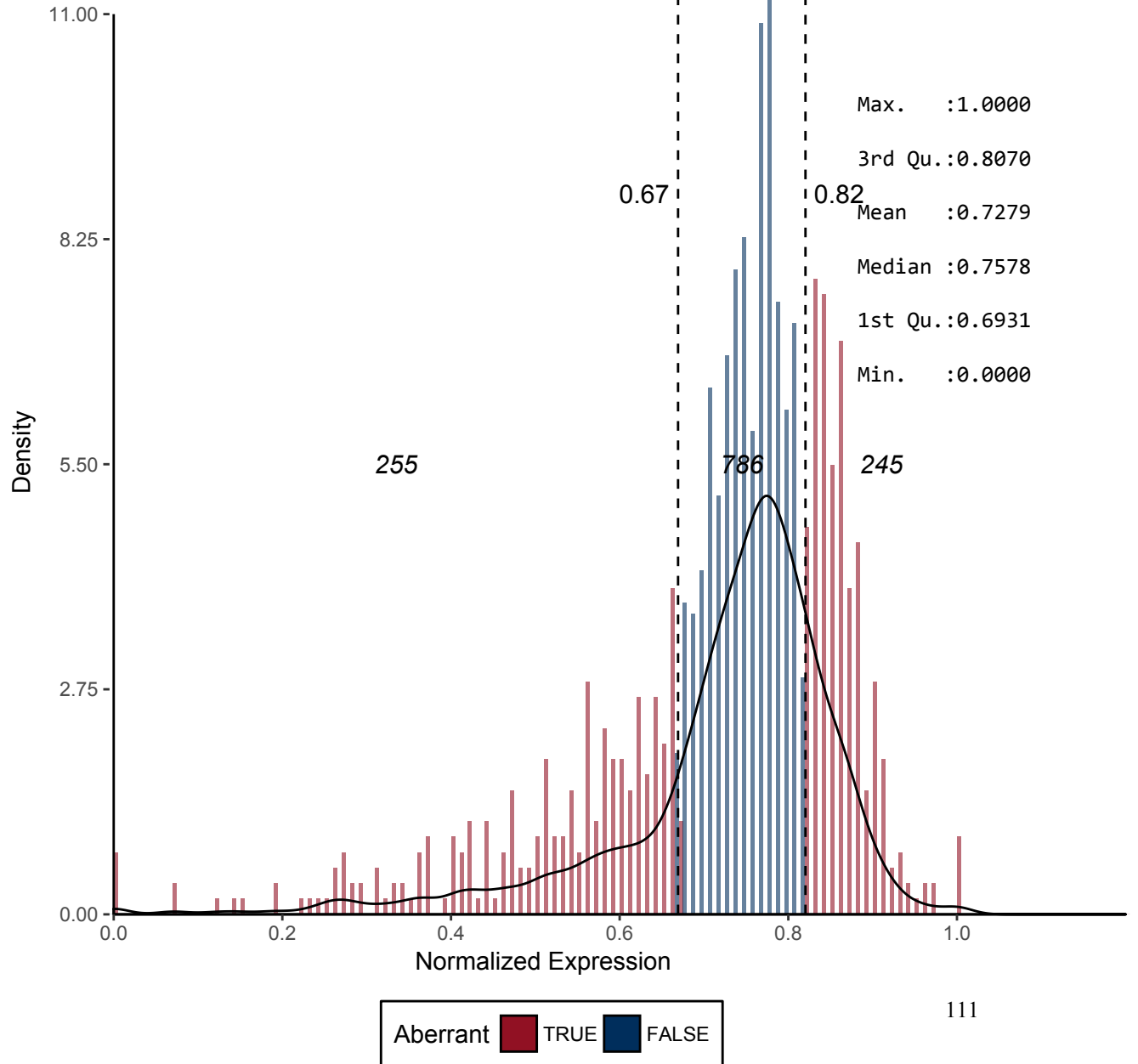


Figure 95 - CD85C*

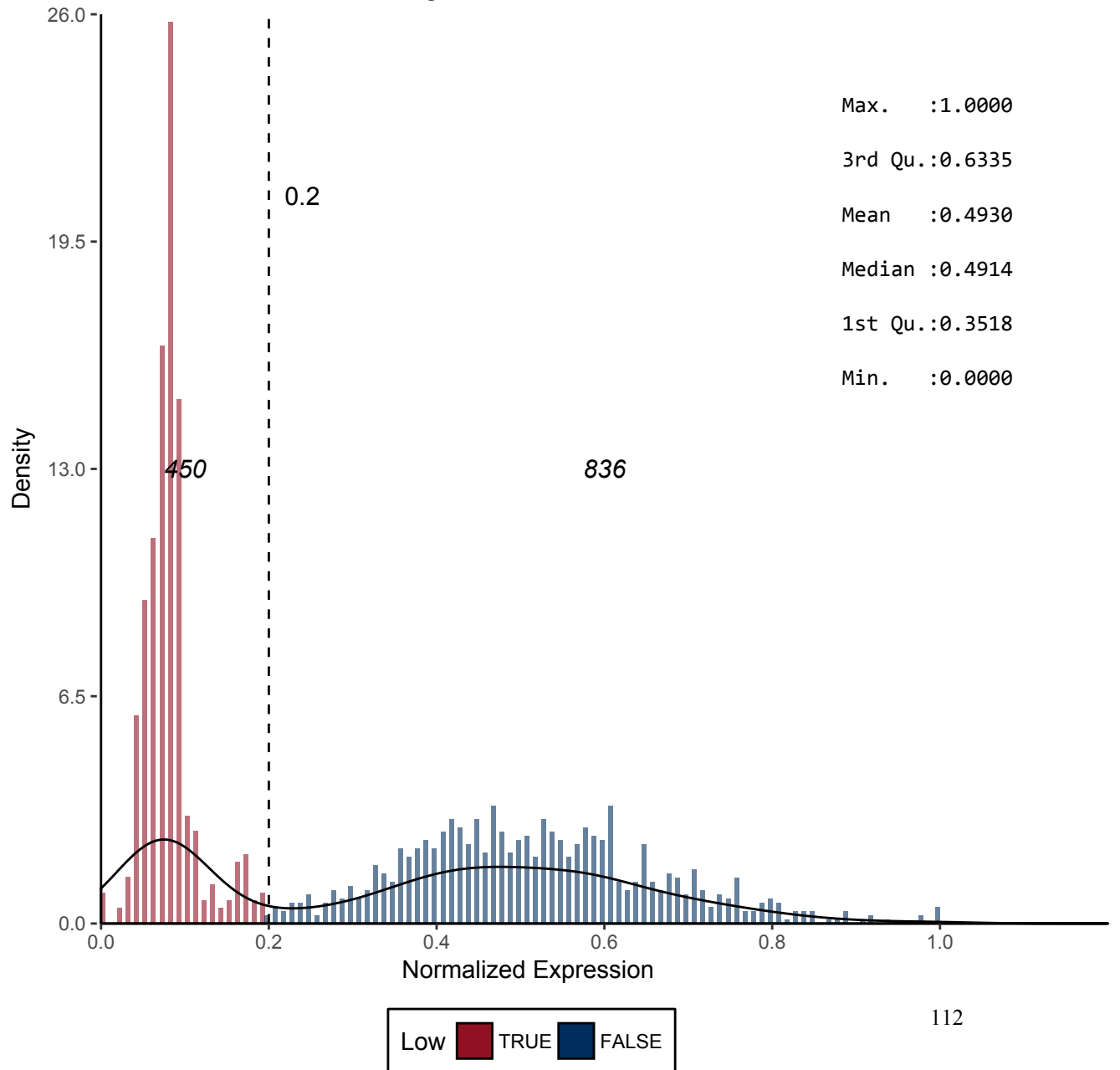


Figure 96 - CD85D

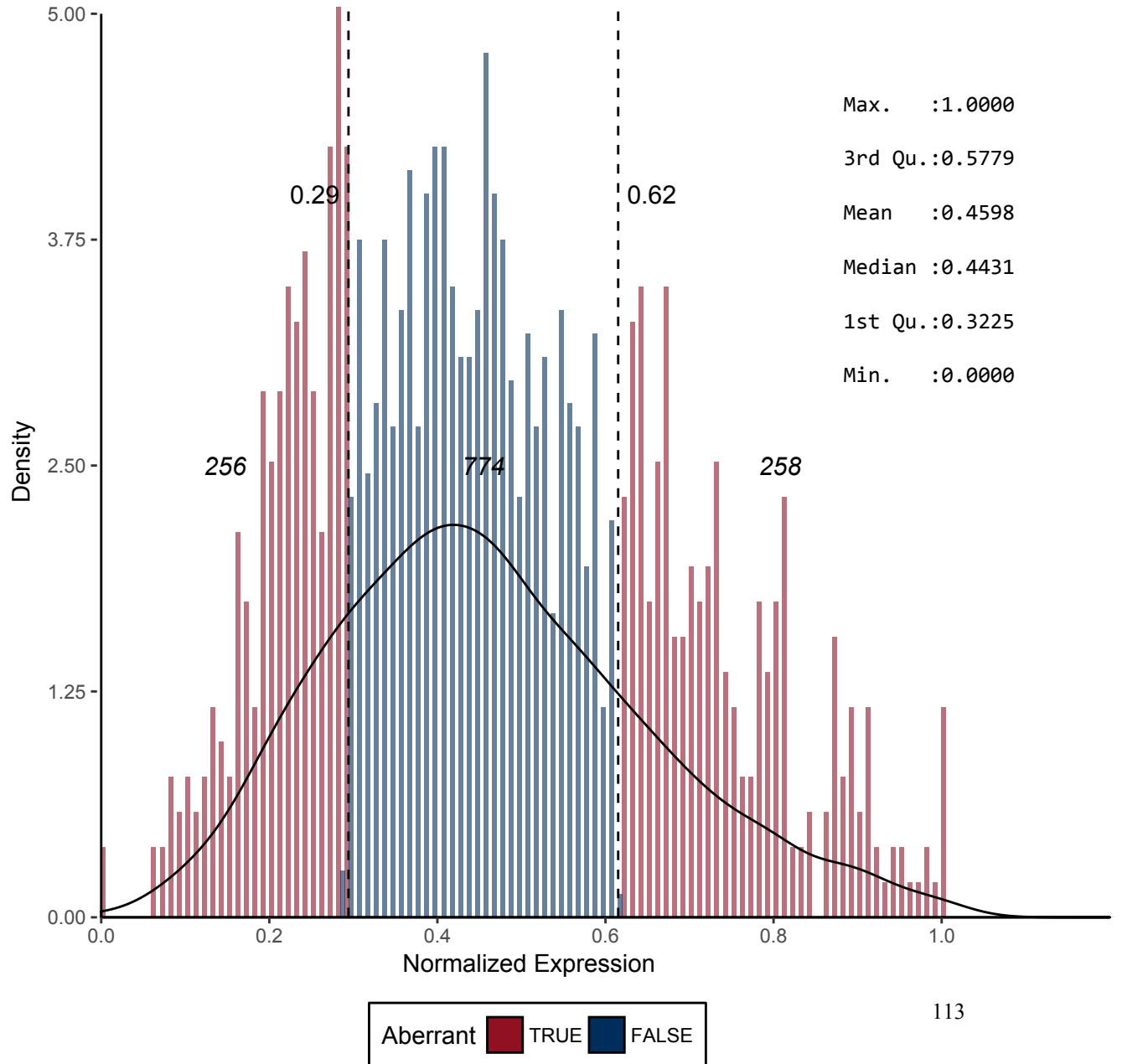


Figure 97 - CD85F

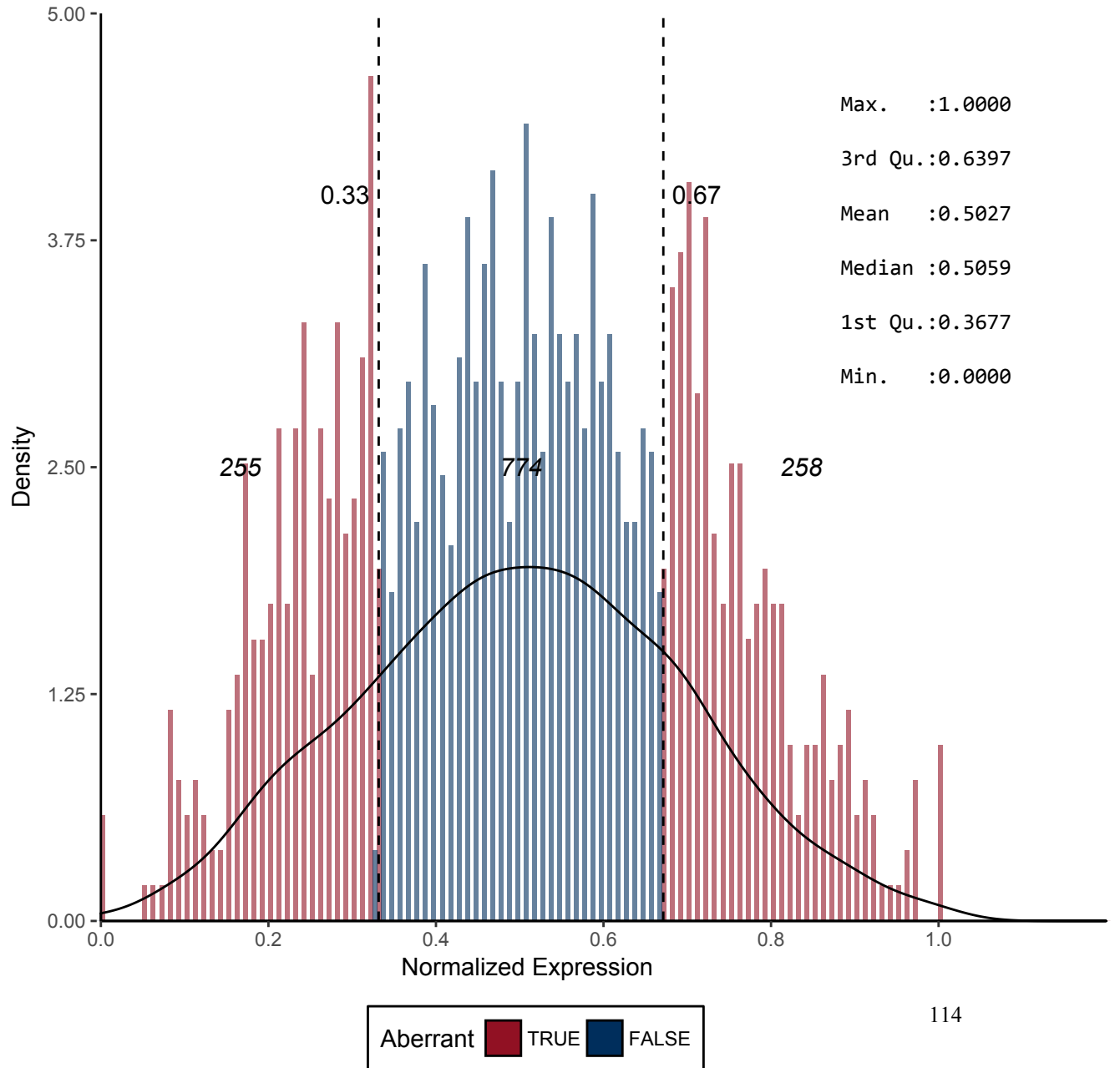


Figure 98 - CD85G

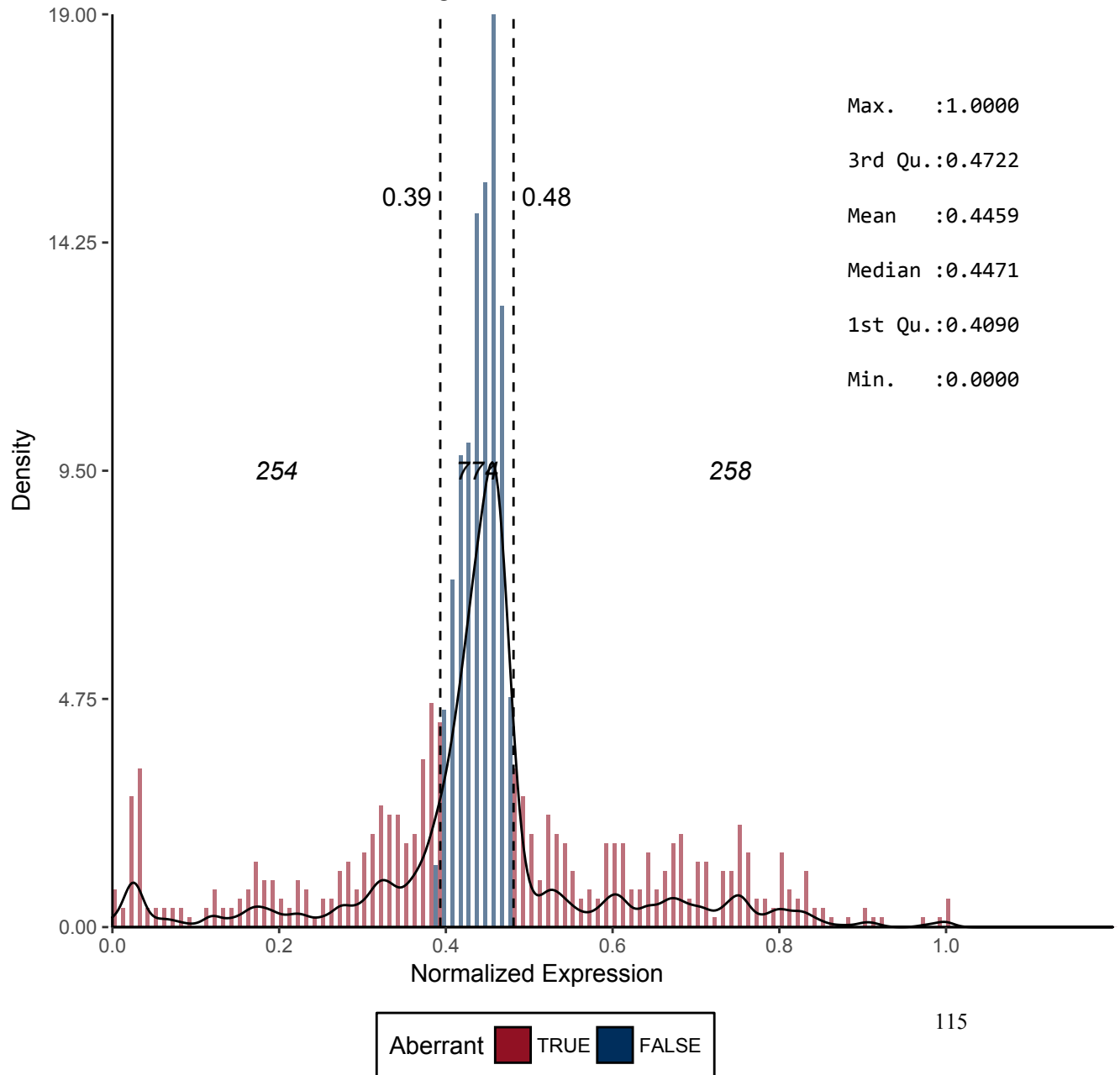


Figure 99 - CD85H

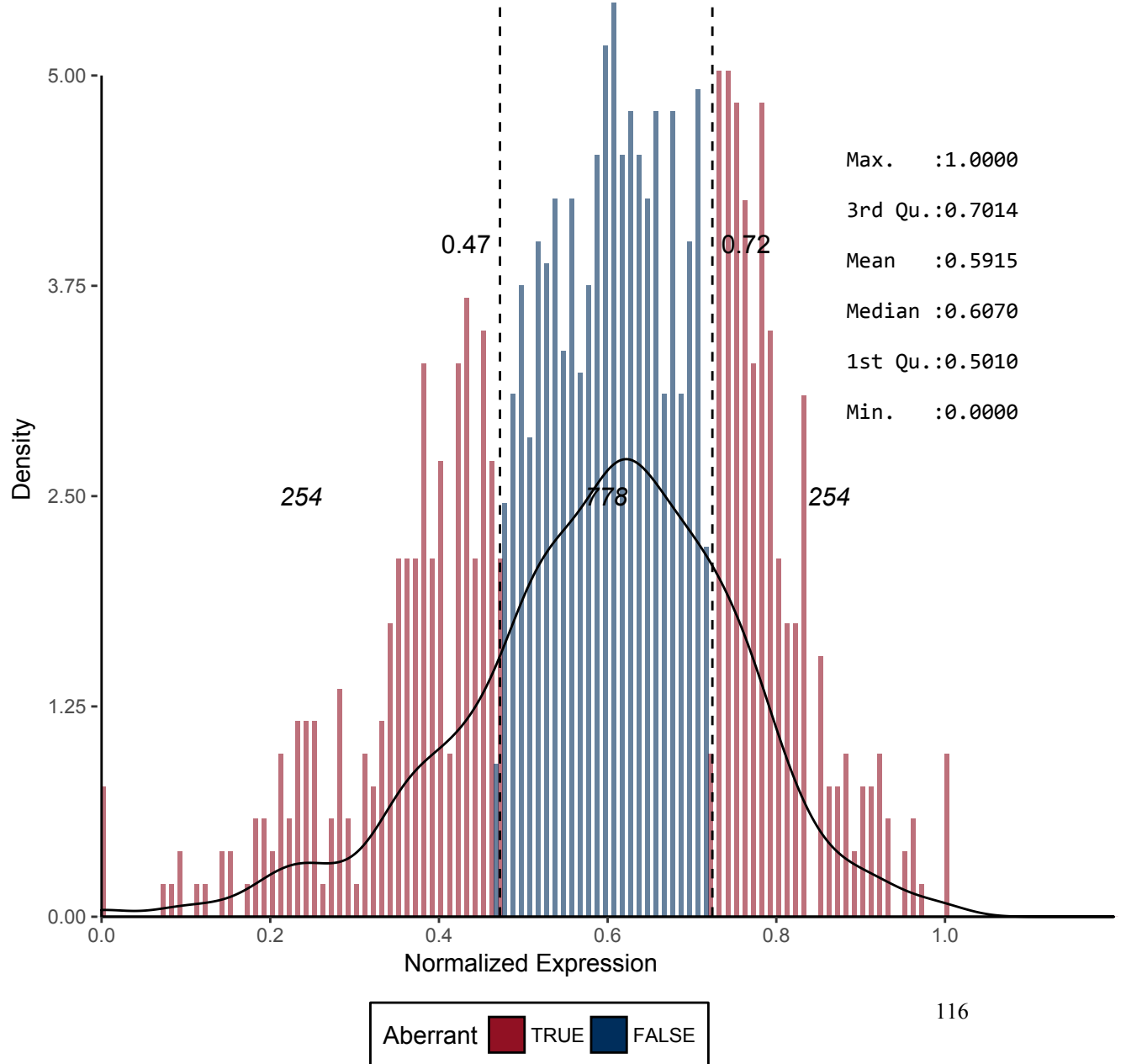
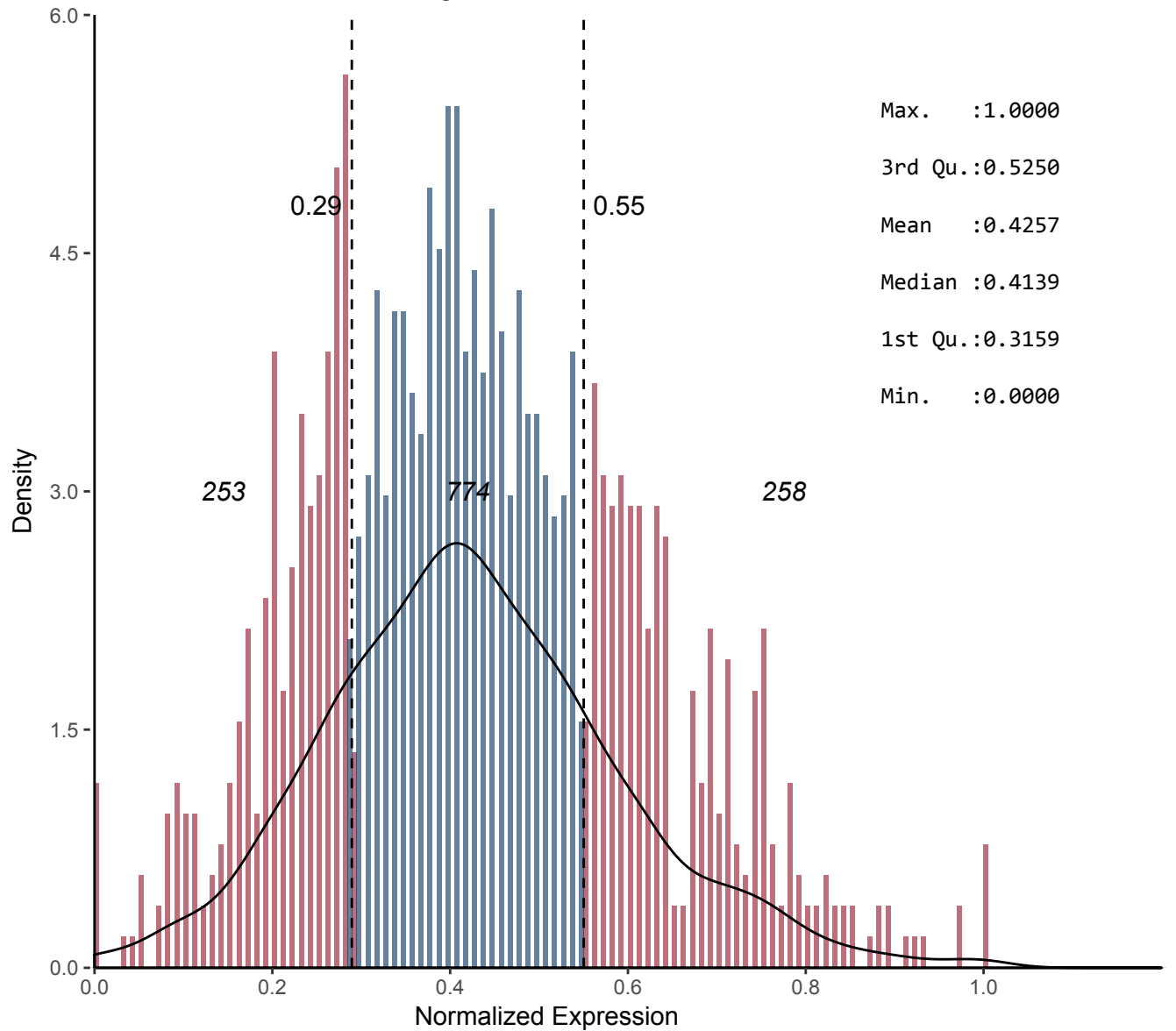


Figure 100 - CD85J



Aberrant TRUE FALSE

Figure 101 - CD85K

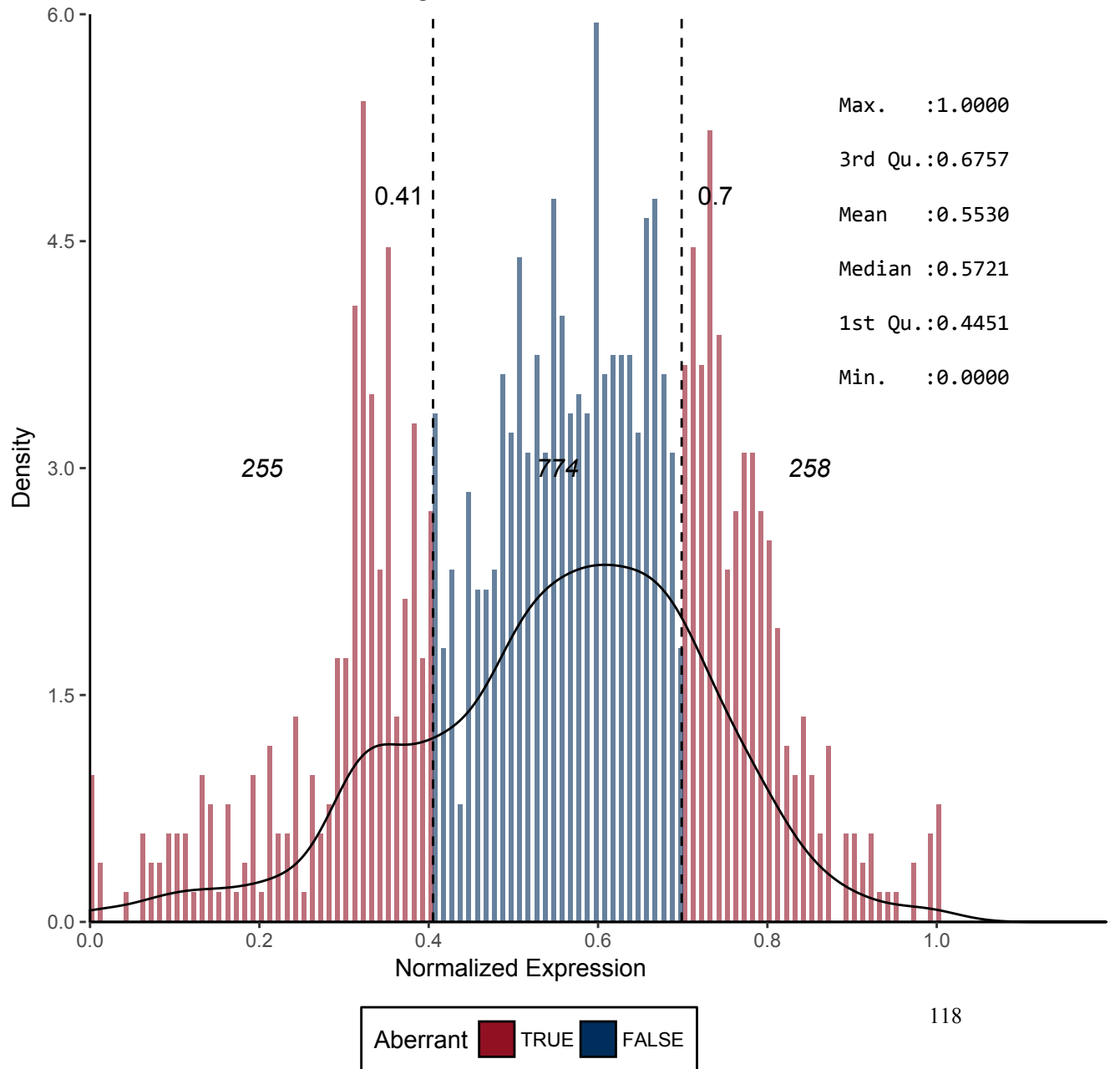


Figure 102 - CD85M*

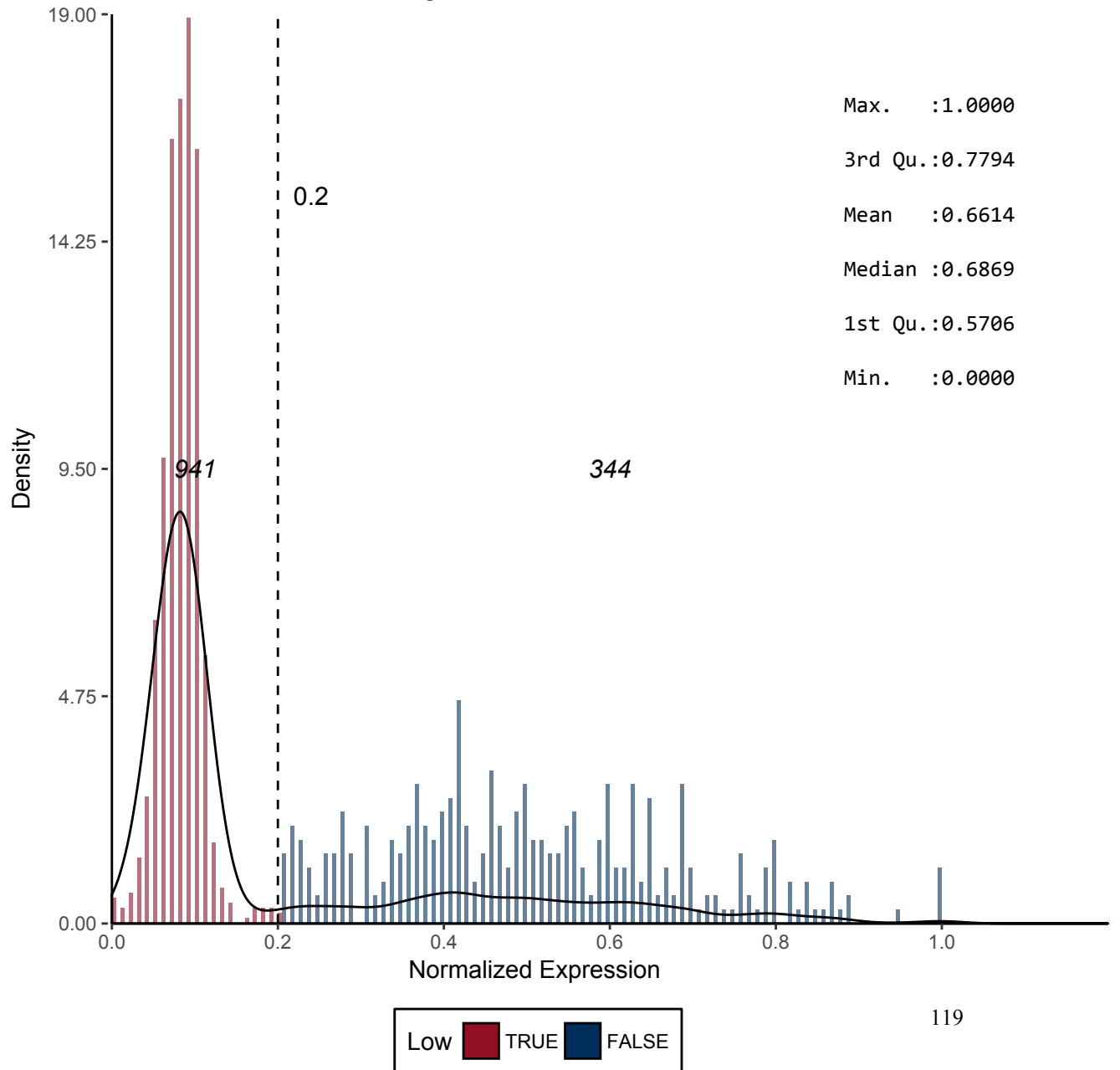
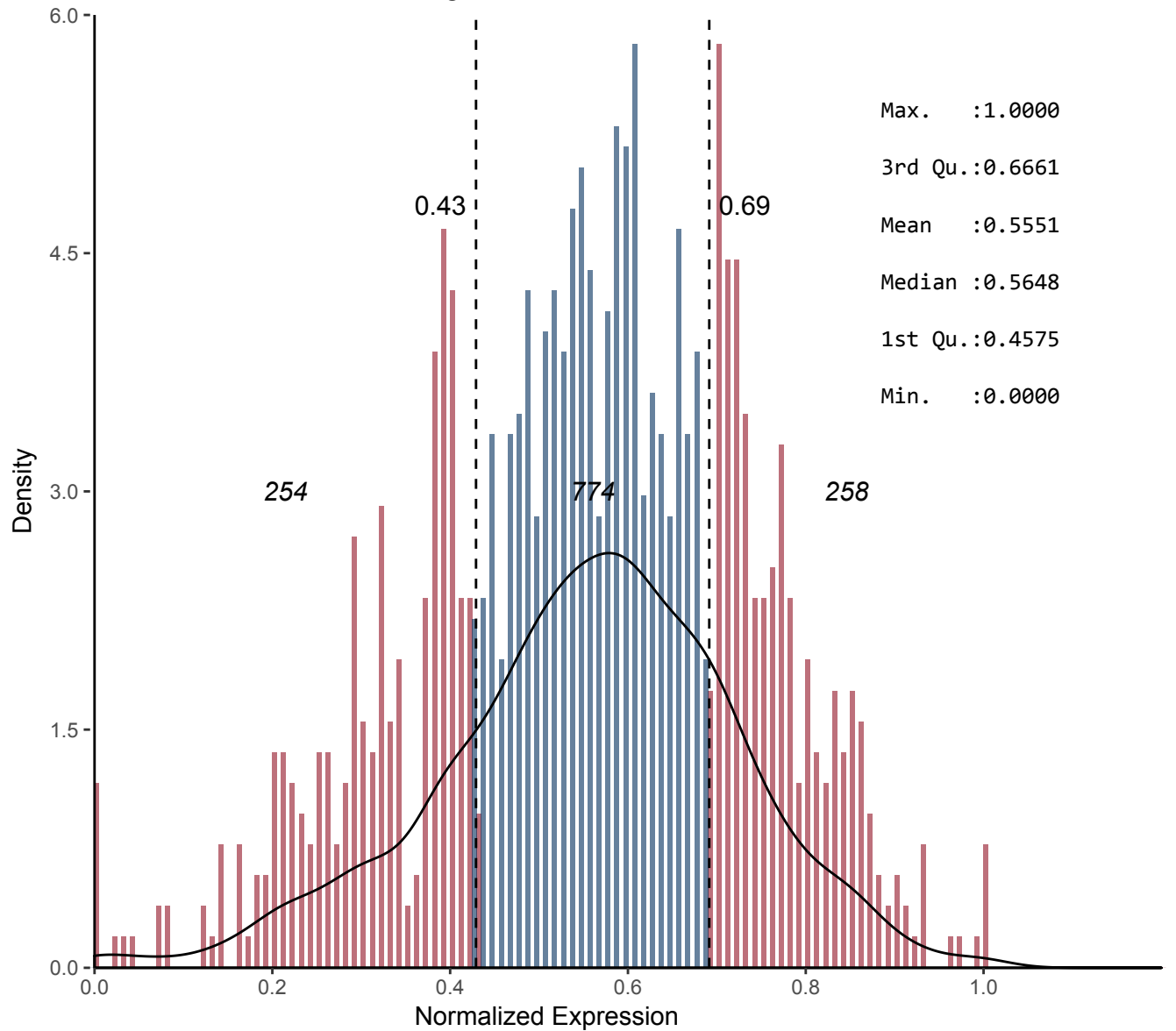


Figure 103 - CD86



Aberrant TRUE FALSE

Figure 104 - CD87

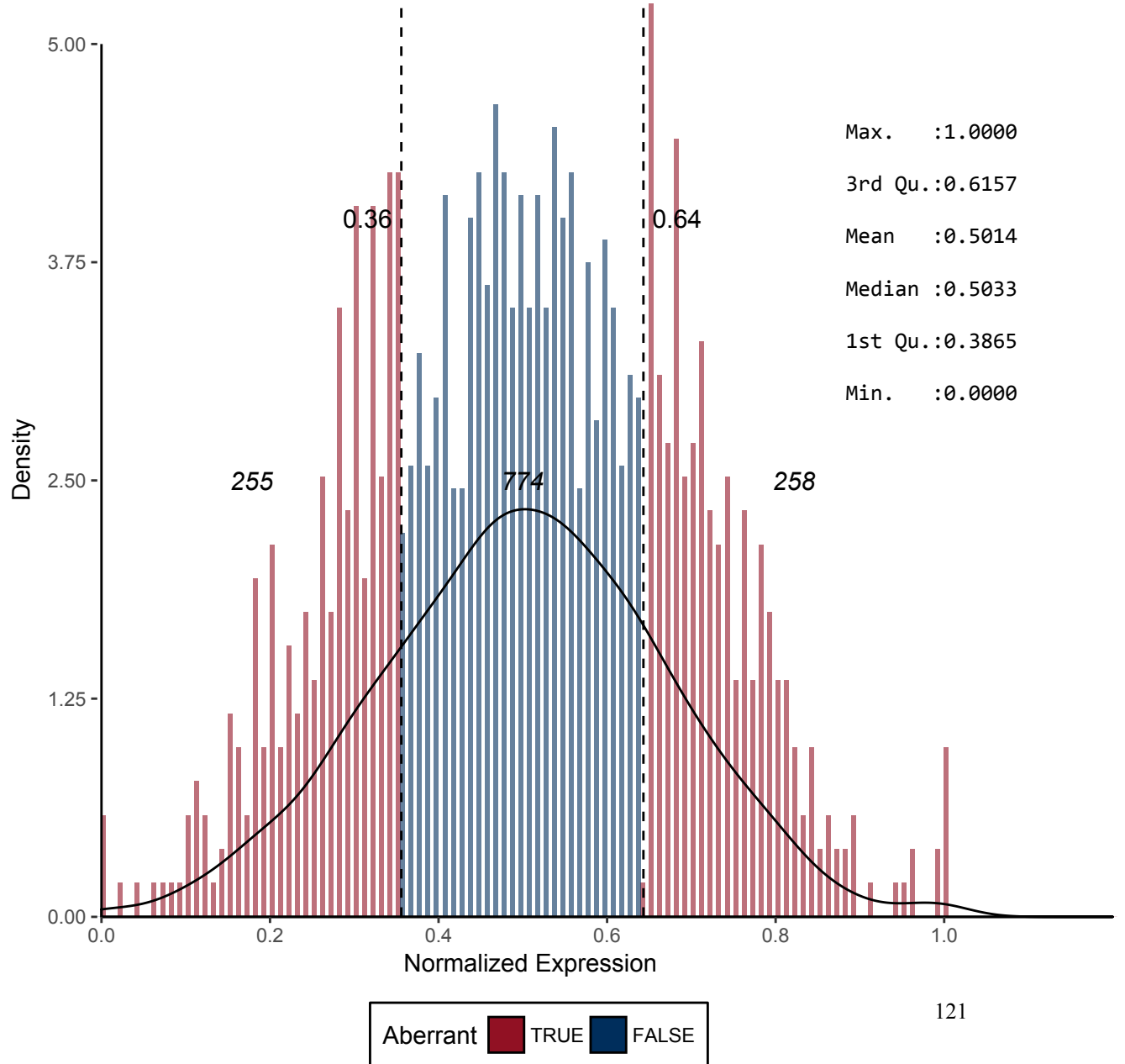
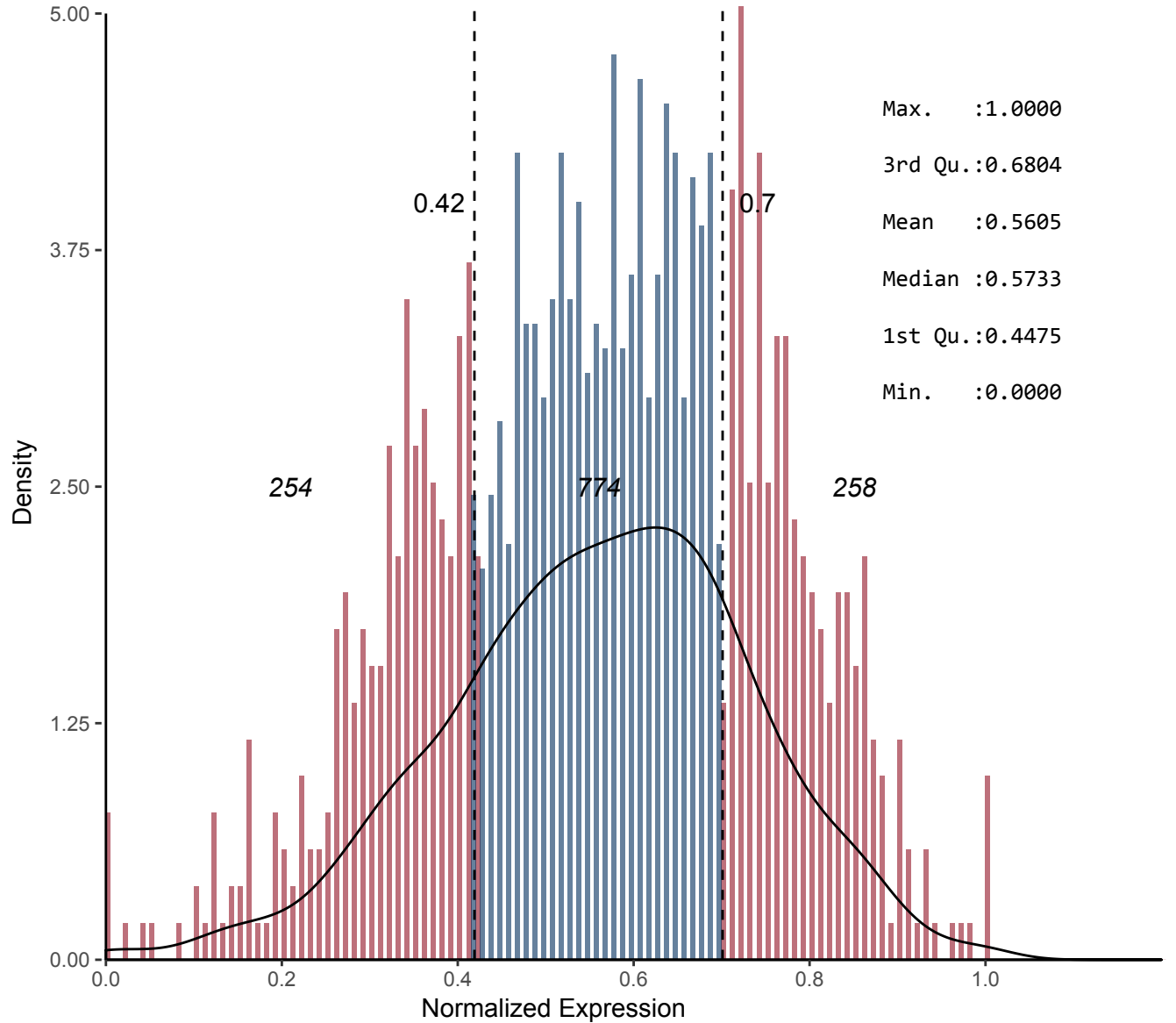
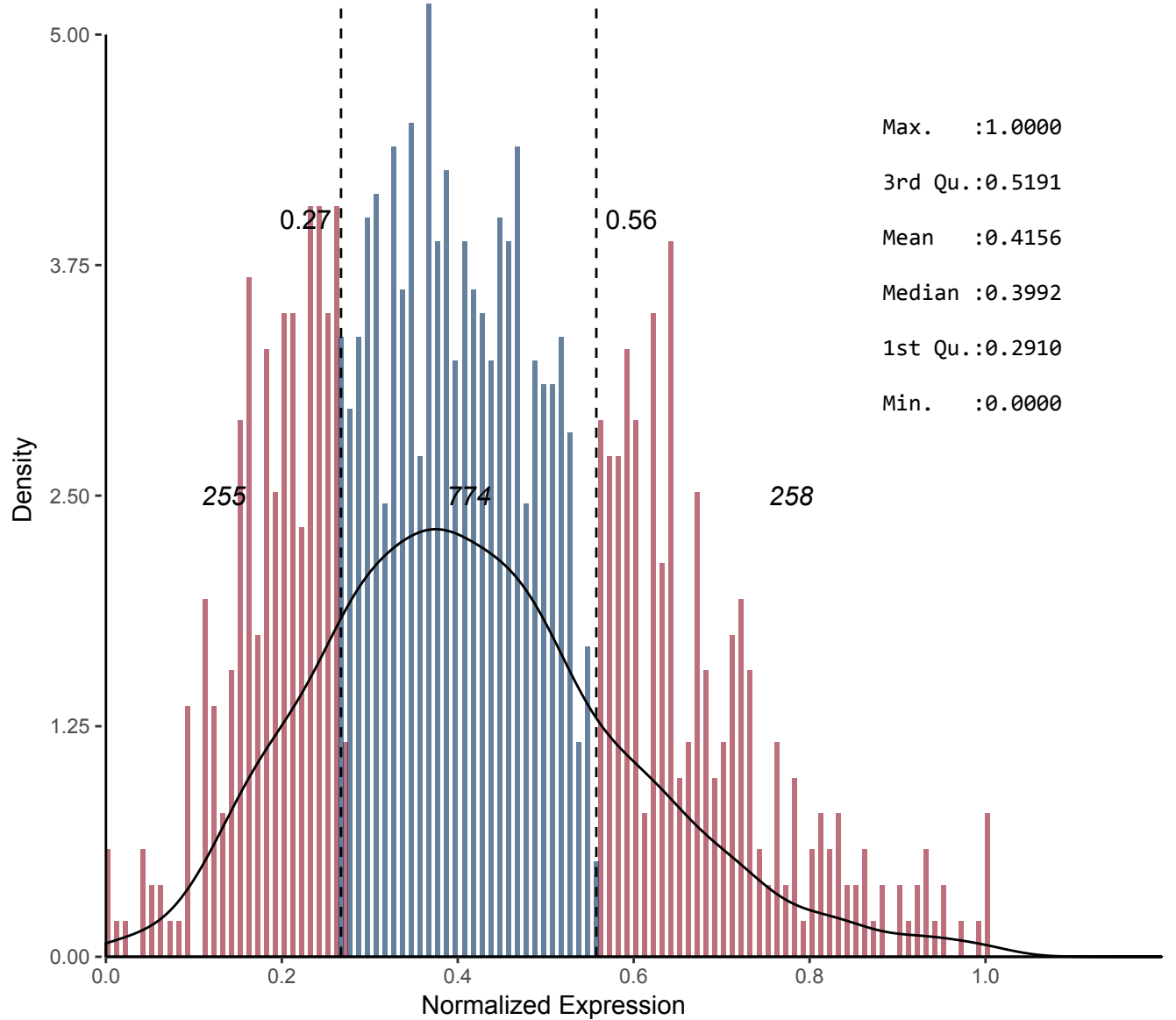


Figure 105 - CD88



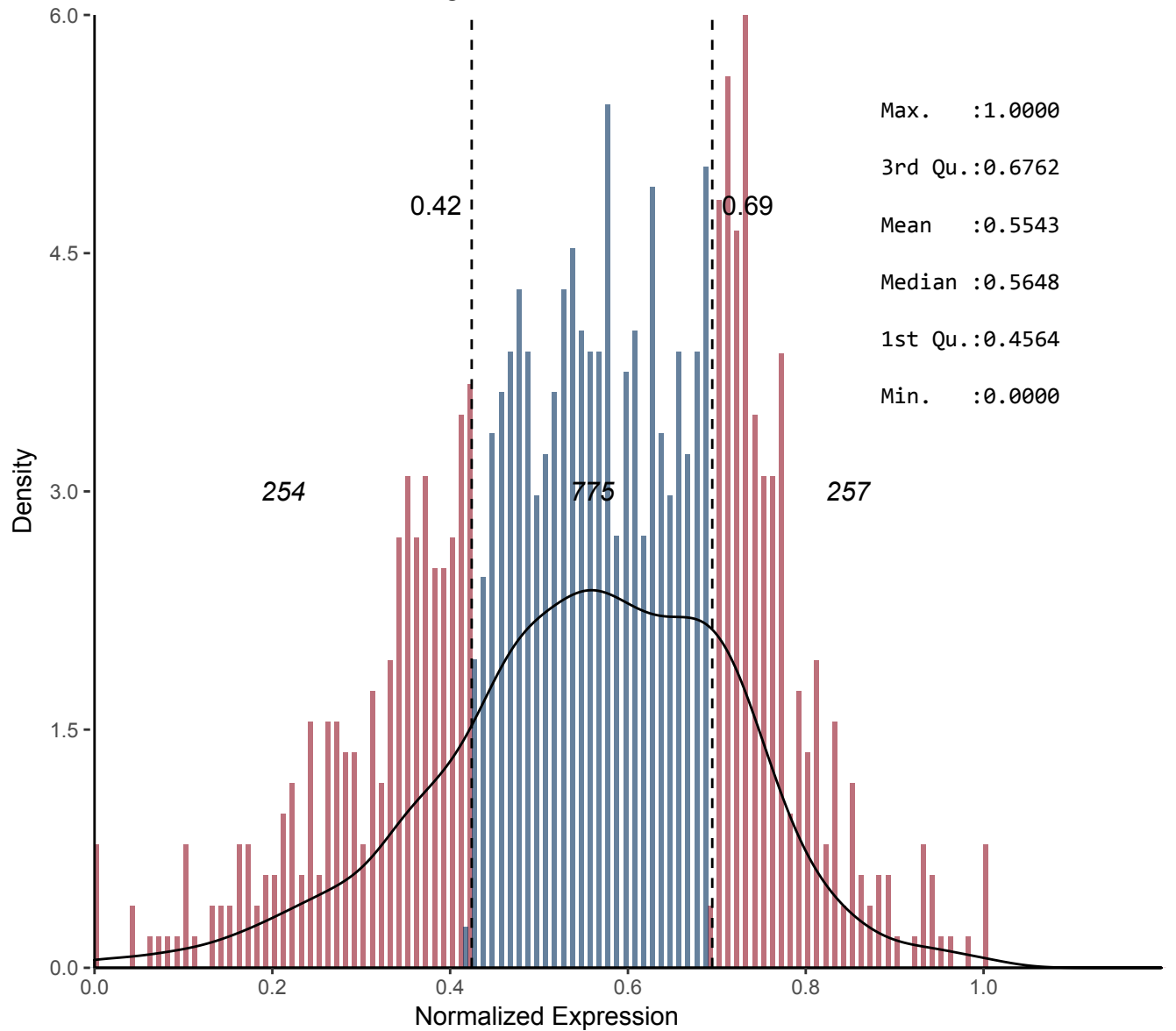
Aberrant TRUE FALSE

Figure 106 - CD89



Aberrant TRUE FALSE

Figure 107 - CD90



Aberrant TRUE FALSE

Figure 108 - CD91*

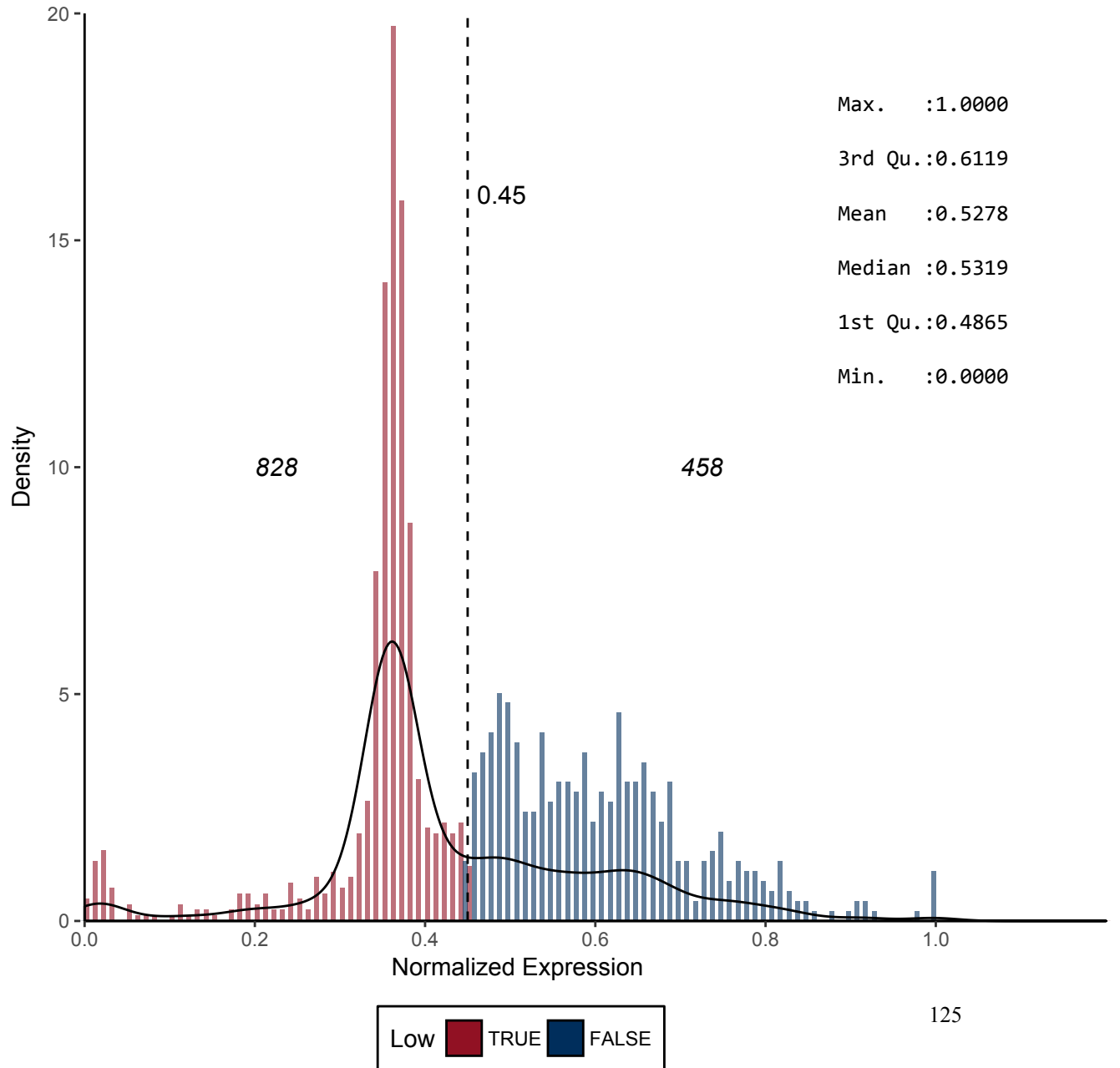
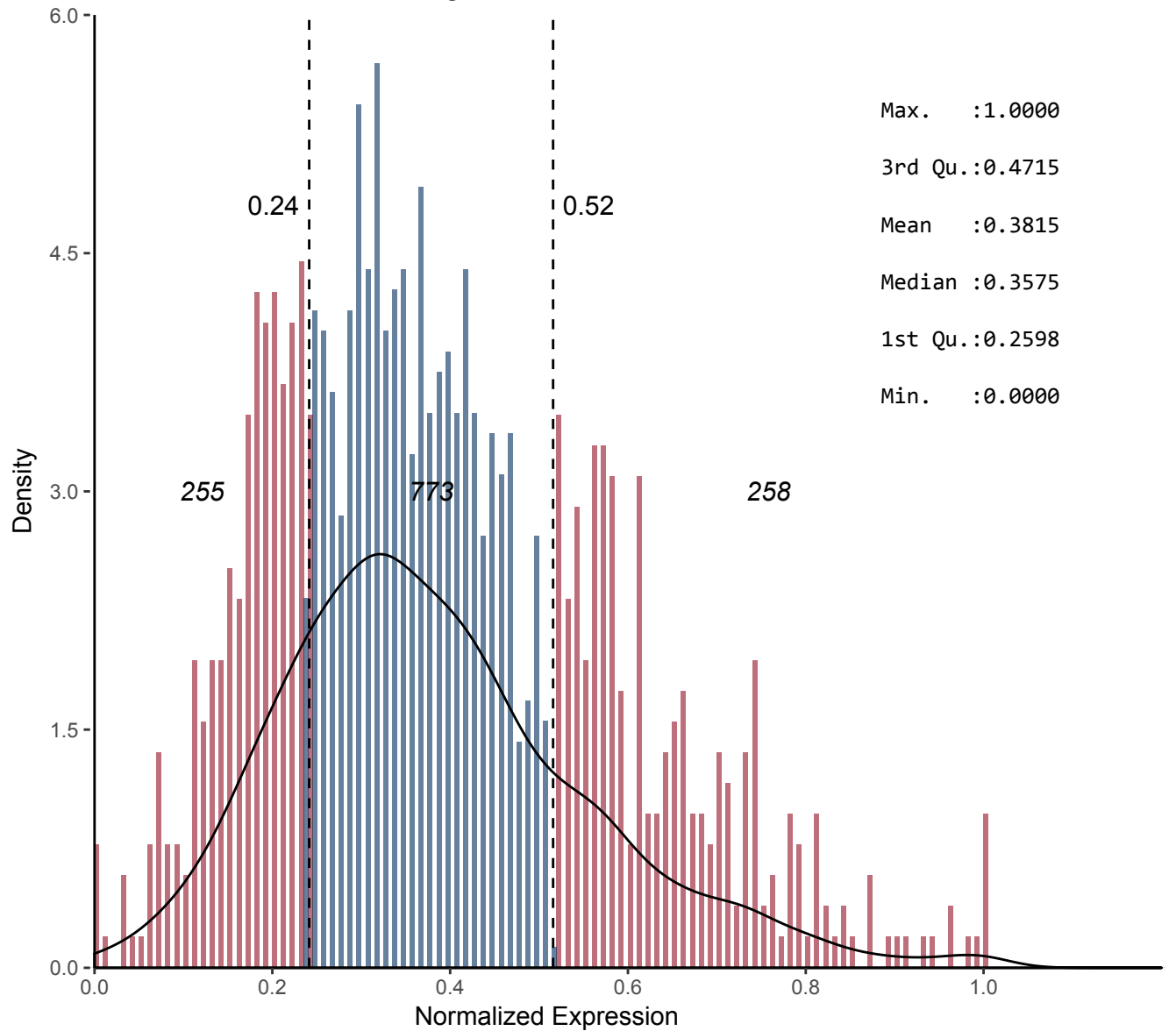


Figure 109 - CD92



Aberrant TRUE FALSE

Figure 110 - CD93

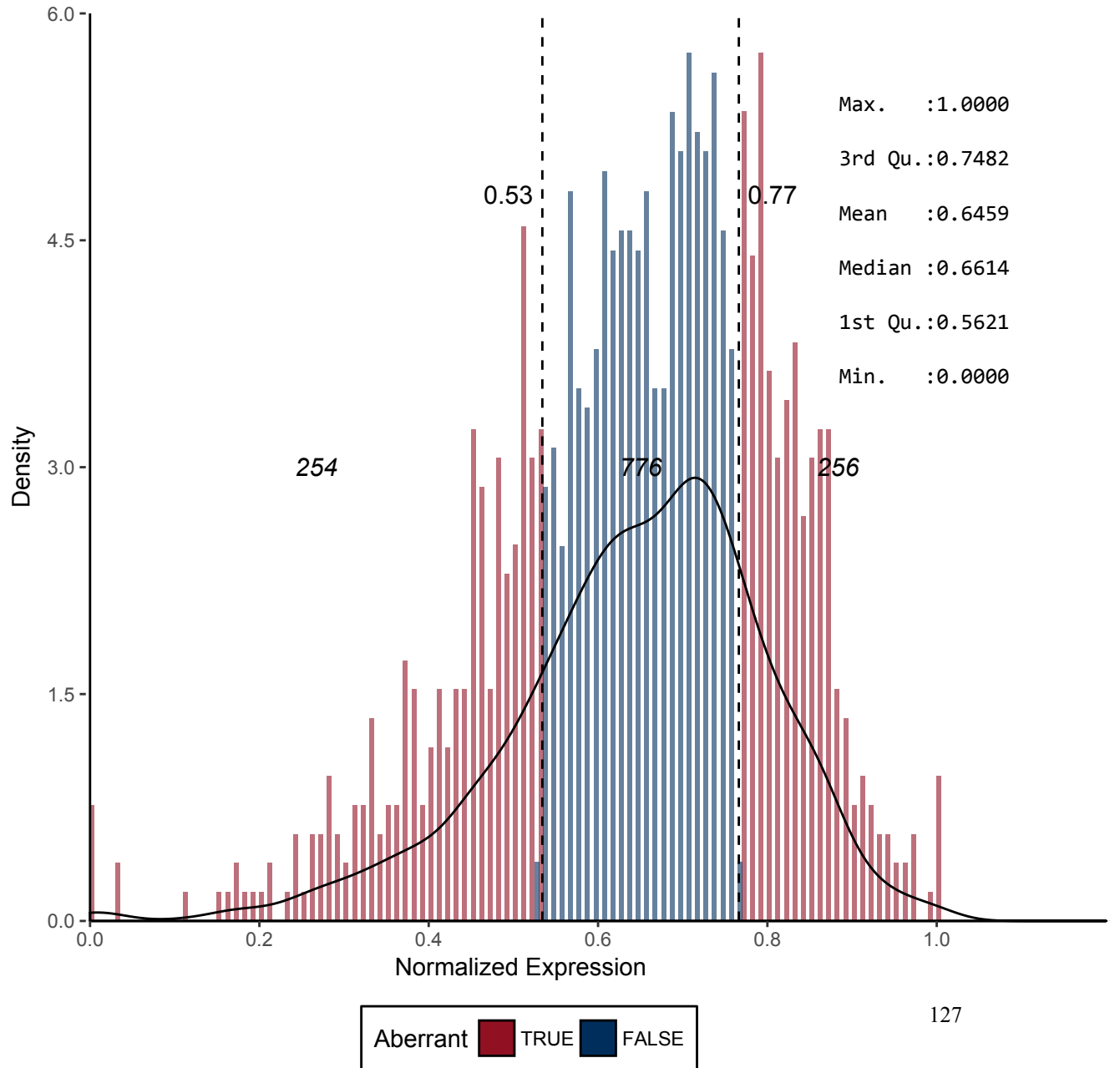
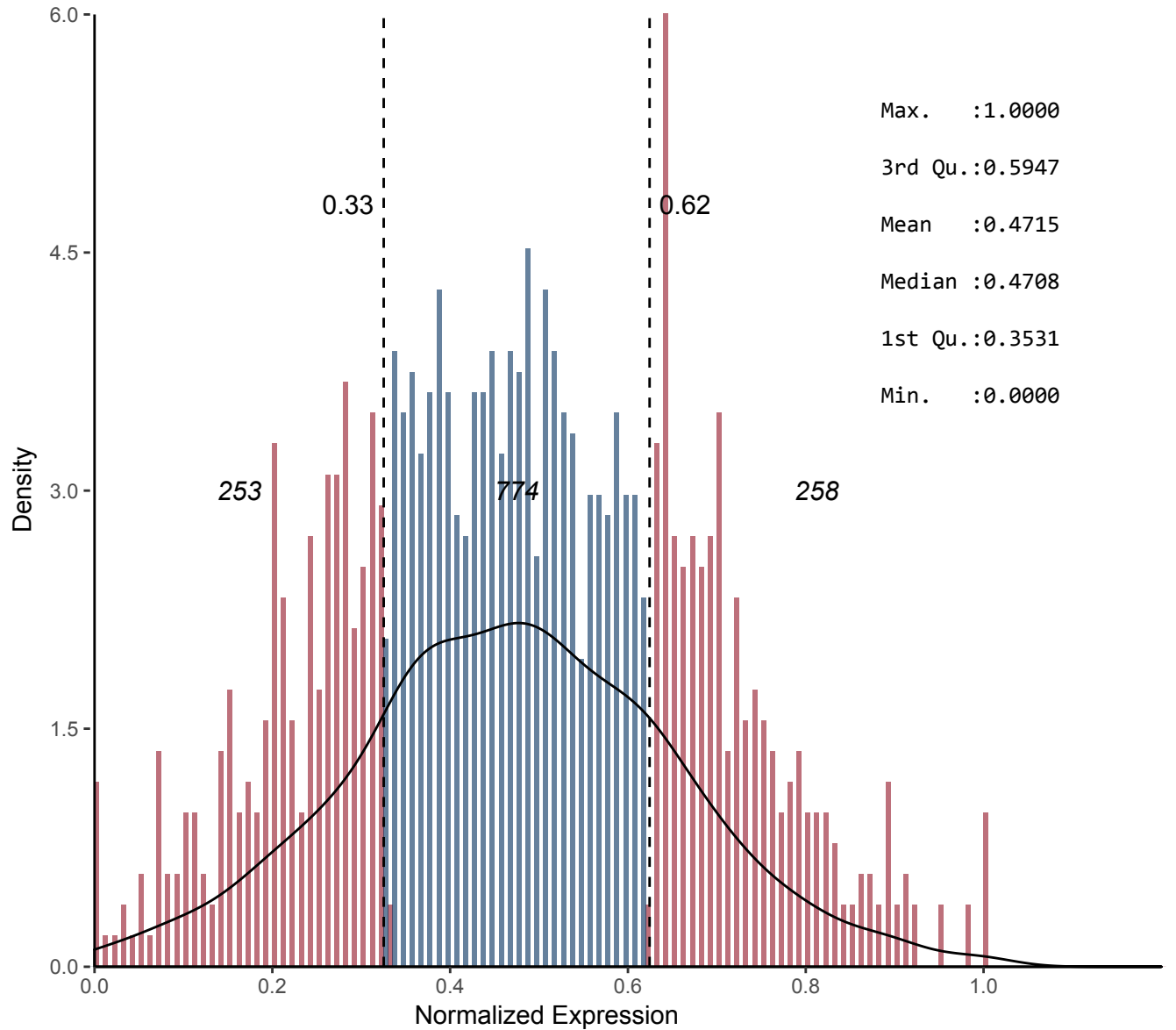


Figure 111 - CD94



Aberrant TRUE FALSE

Figure 112 - CD95

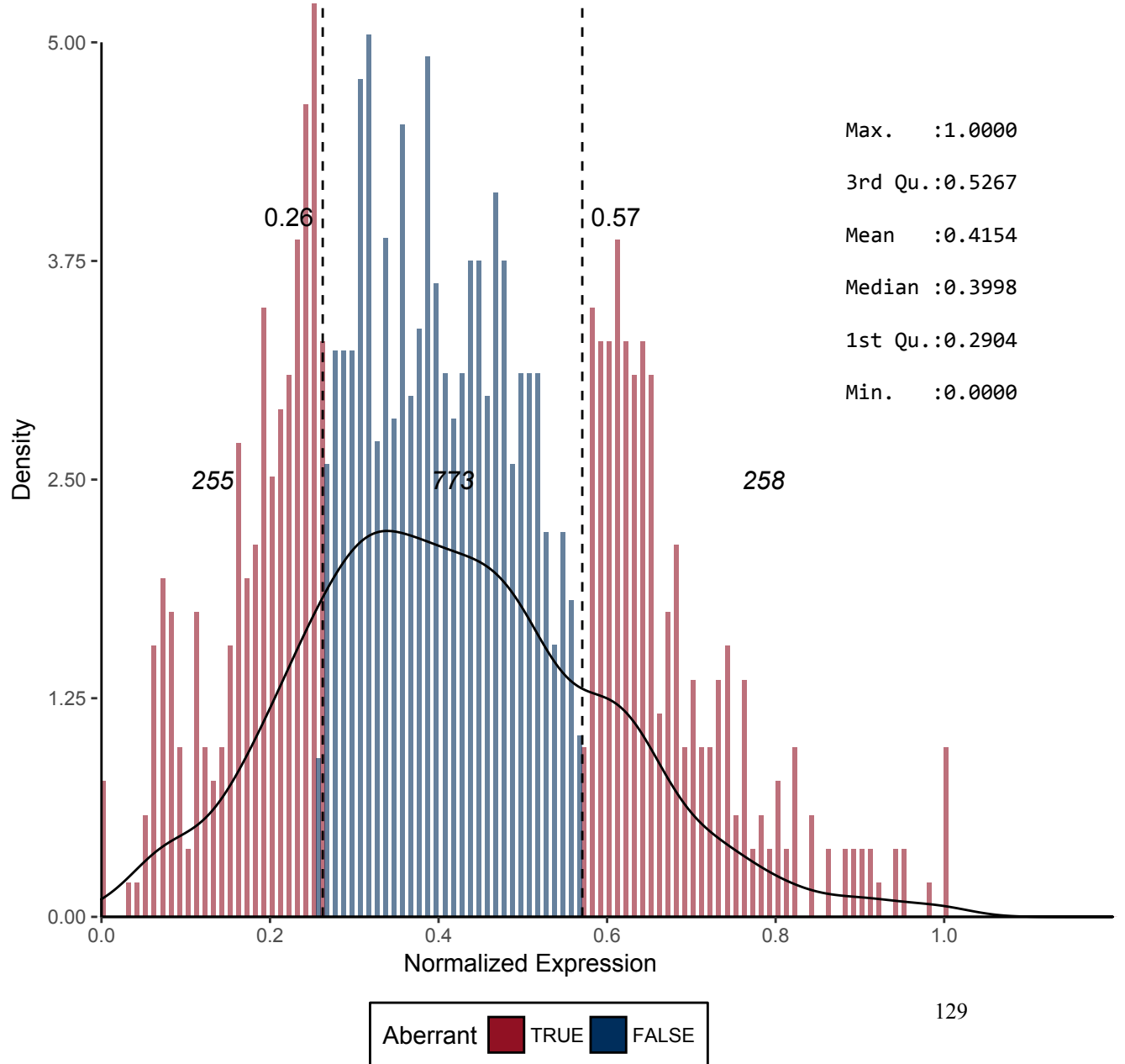


Figure 113 - CD96

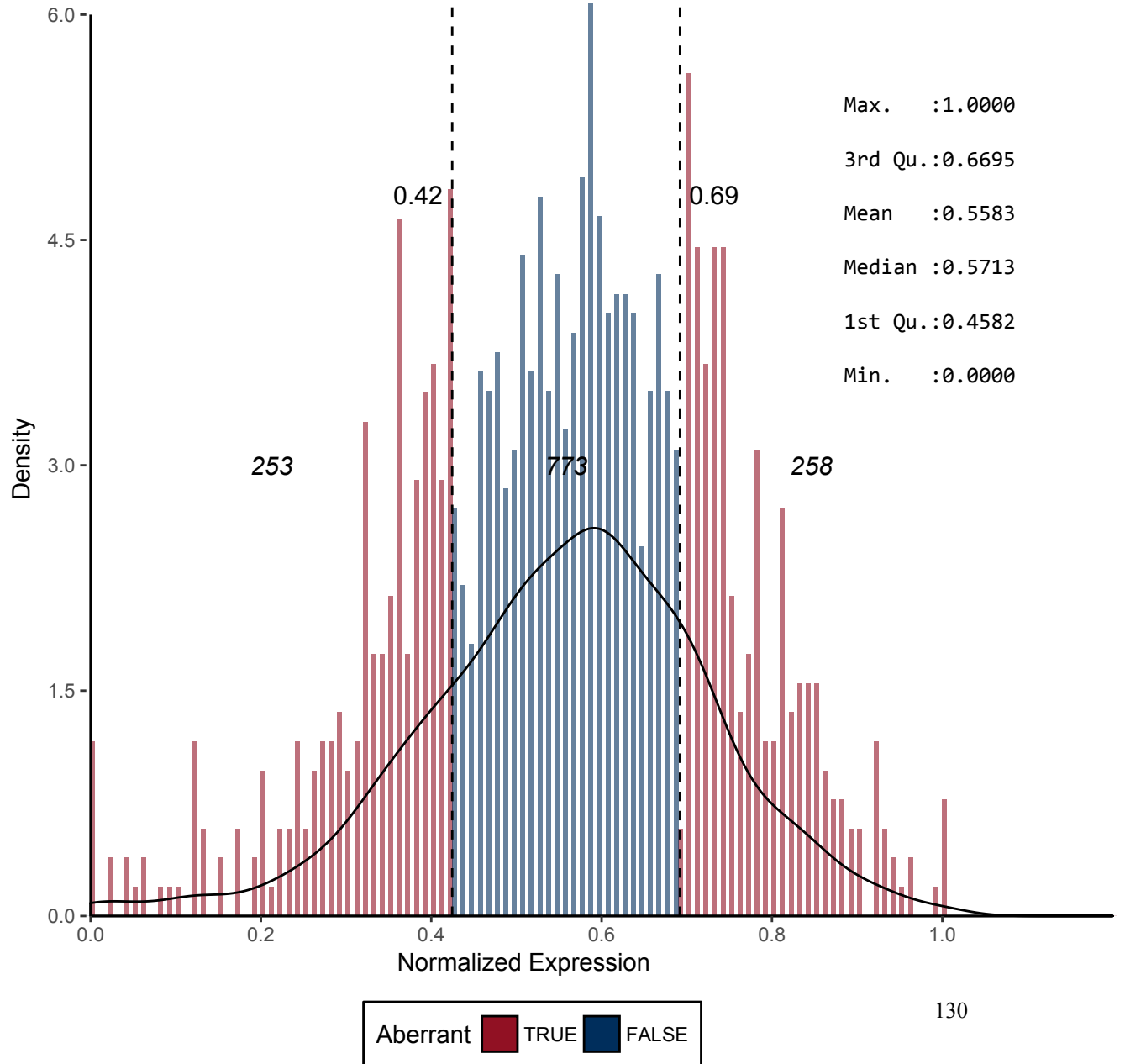


Figure 114 - CD97

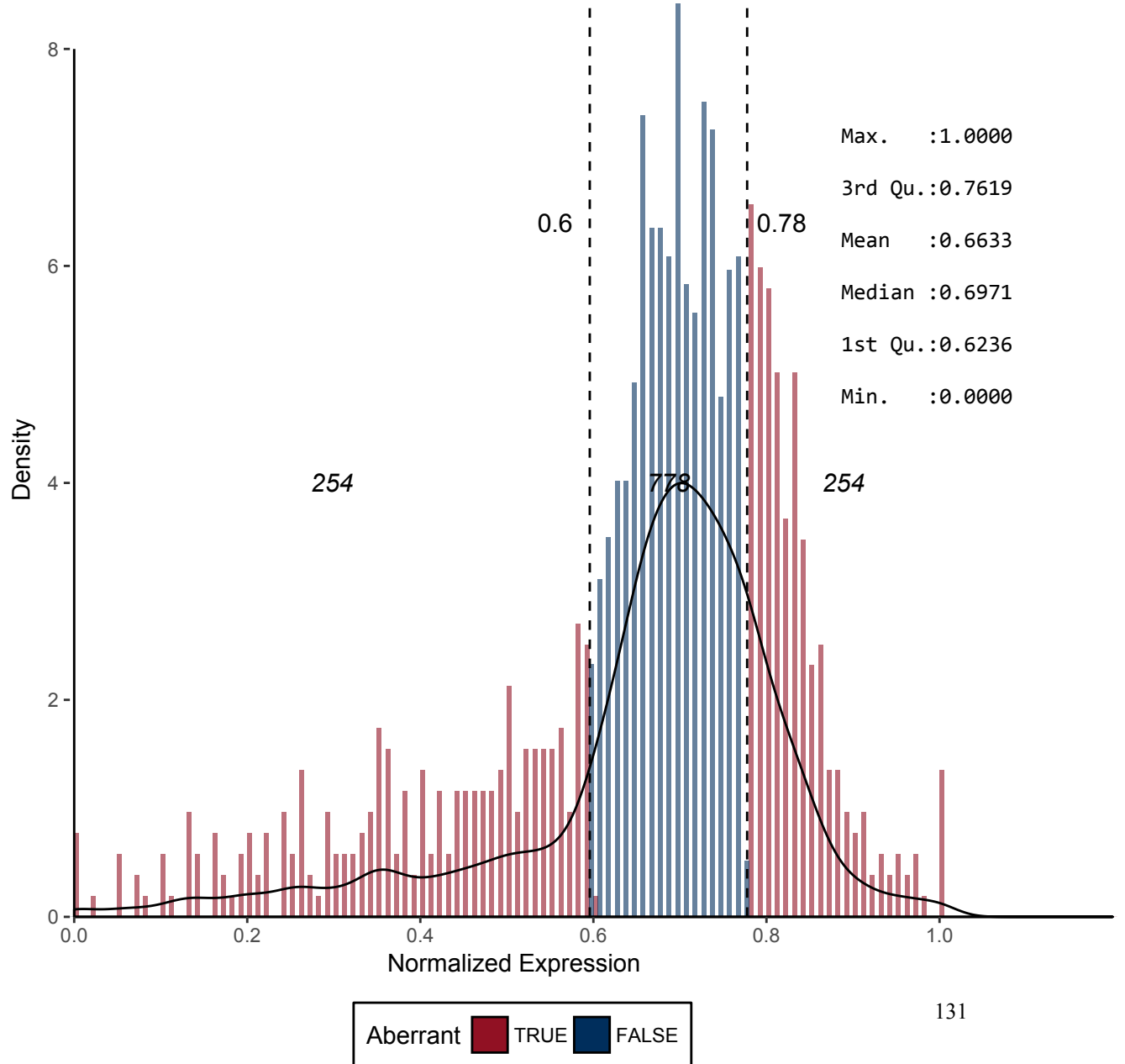


Figure 115 - CD98

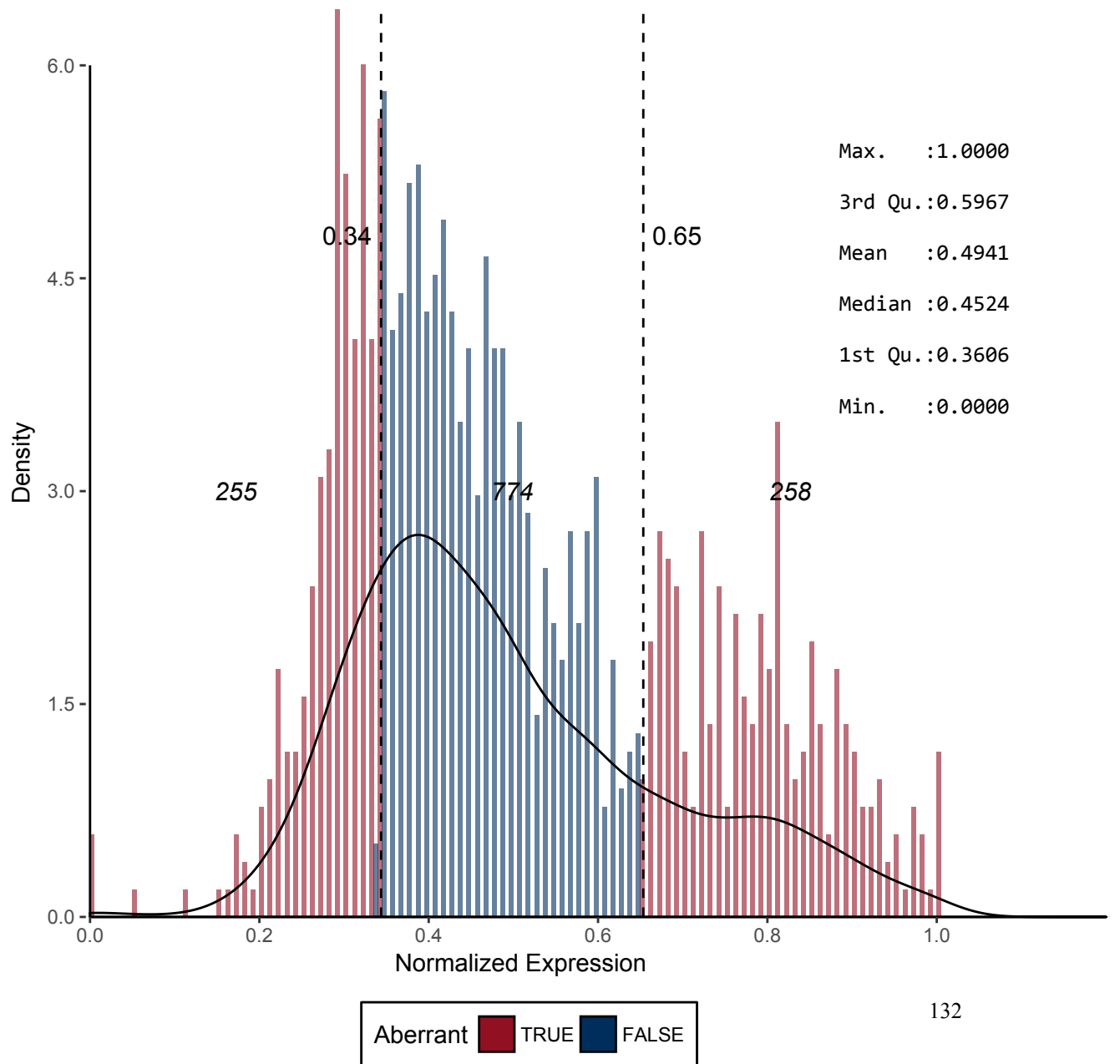


Figure 116 - CD99

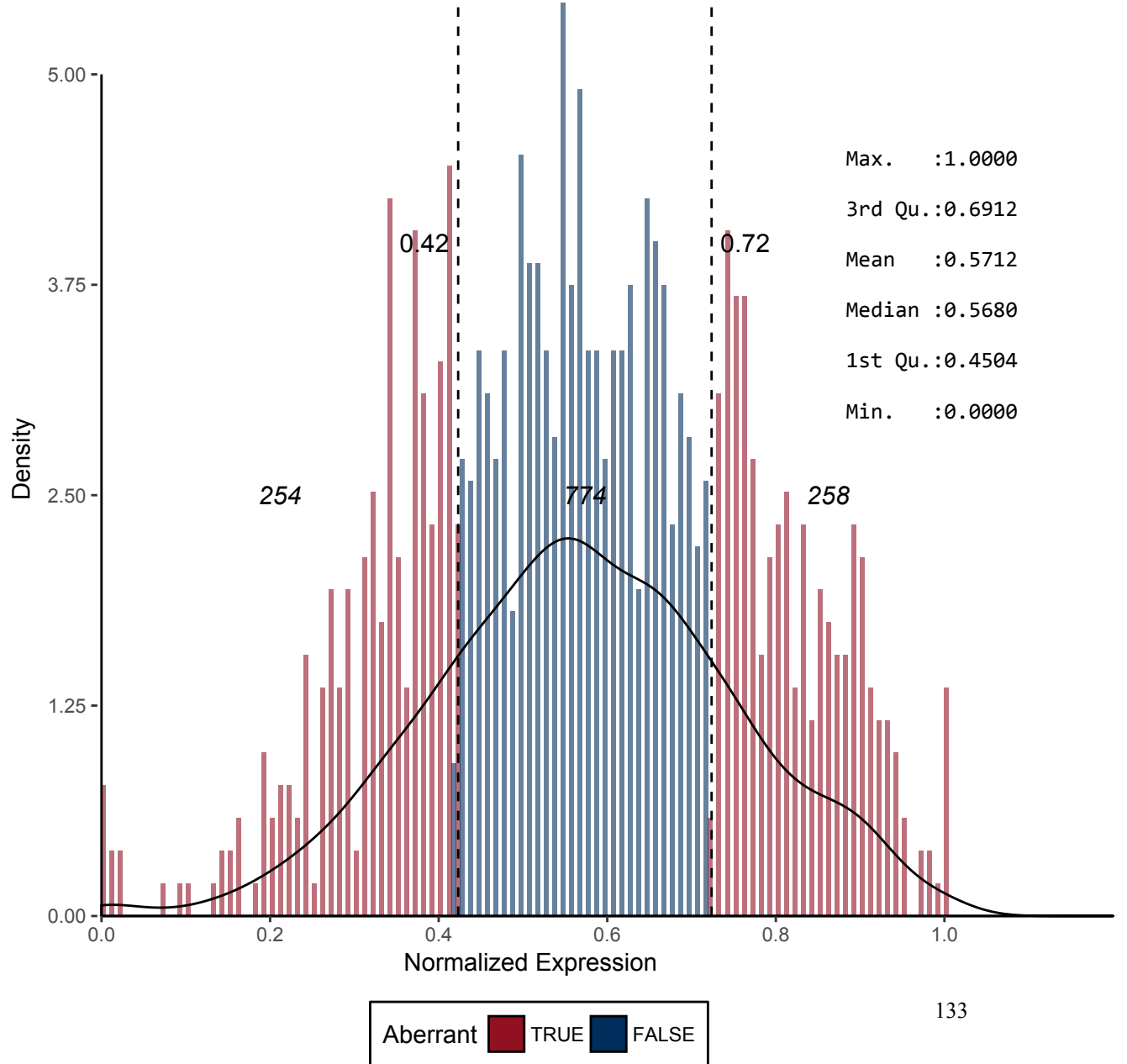
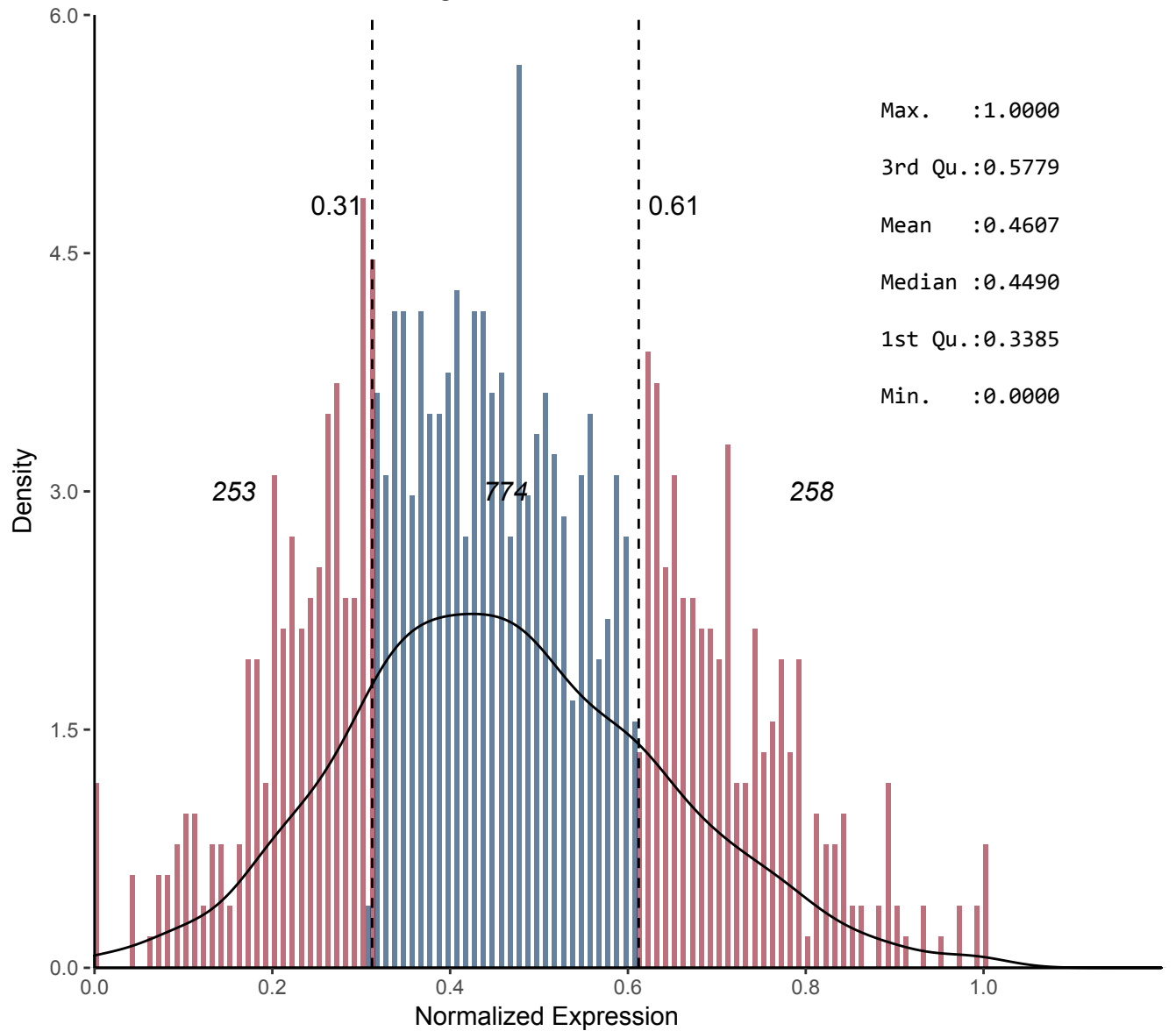


Figure 117 - CD100



Aberrant TRUE FALSE

Figure 118 - CD101

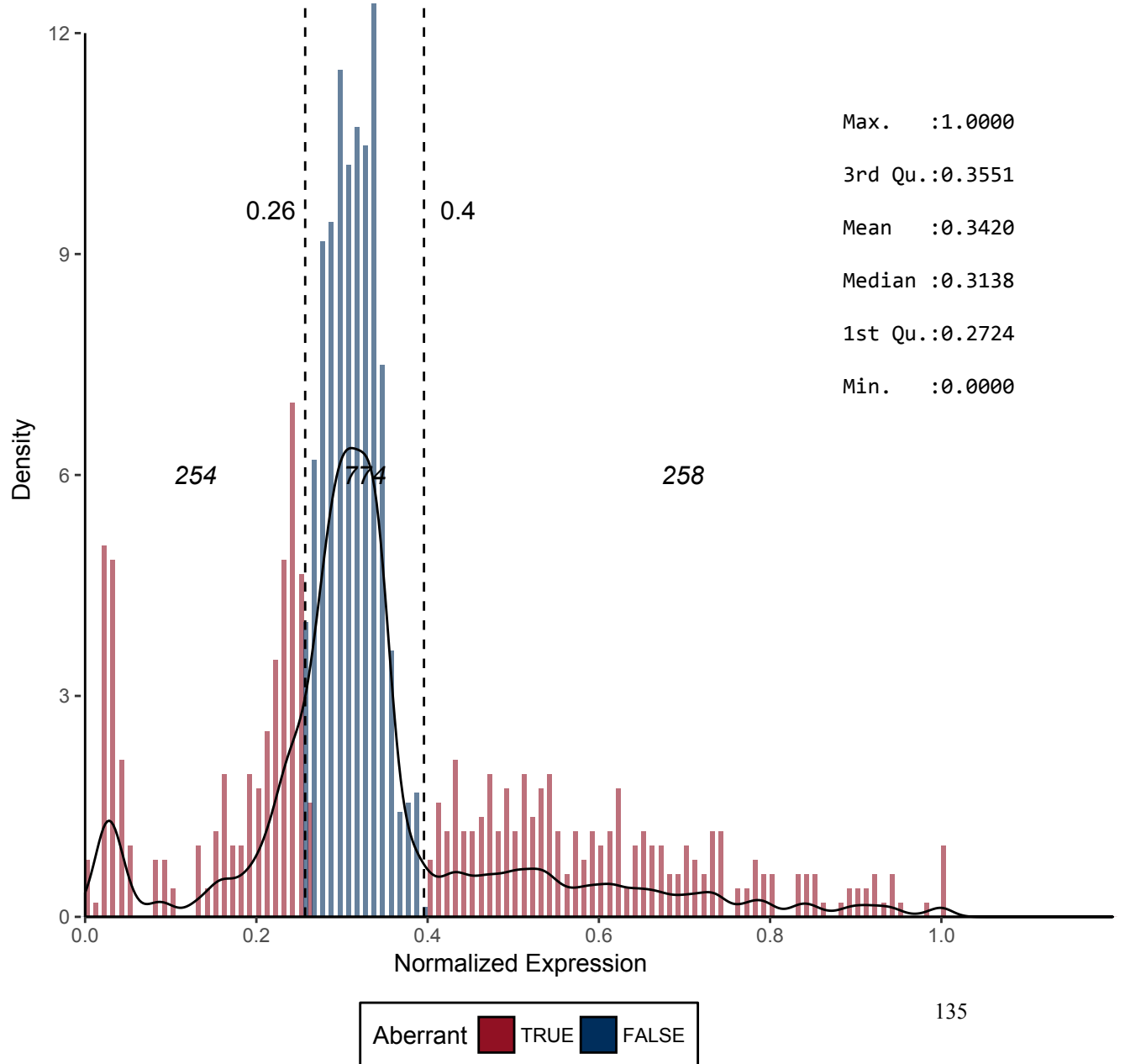


Figure 119 - CD102

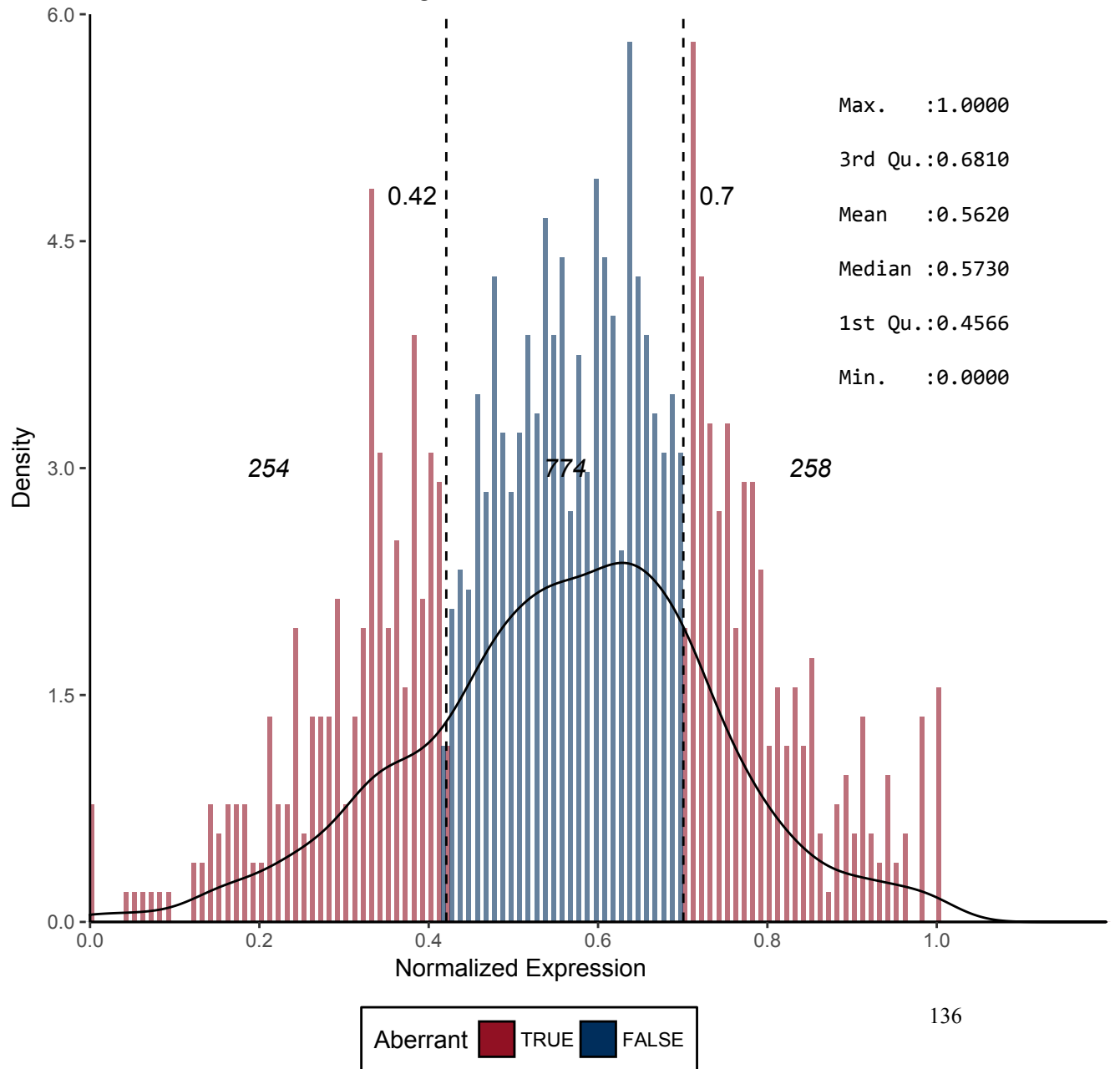


Figure 120 - CD103

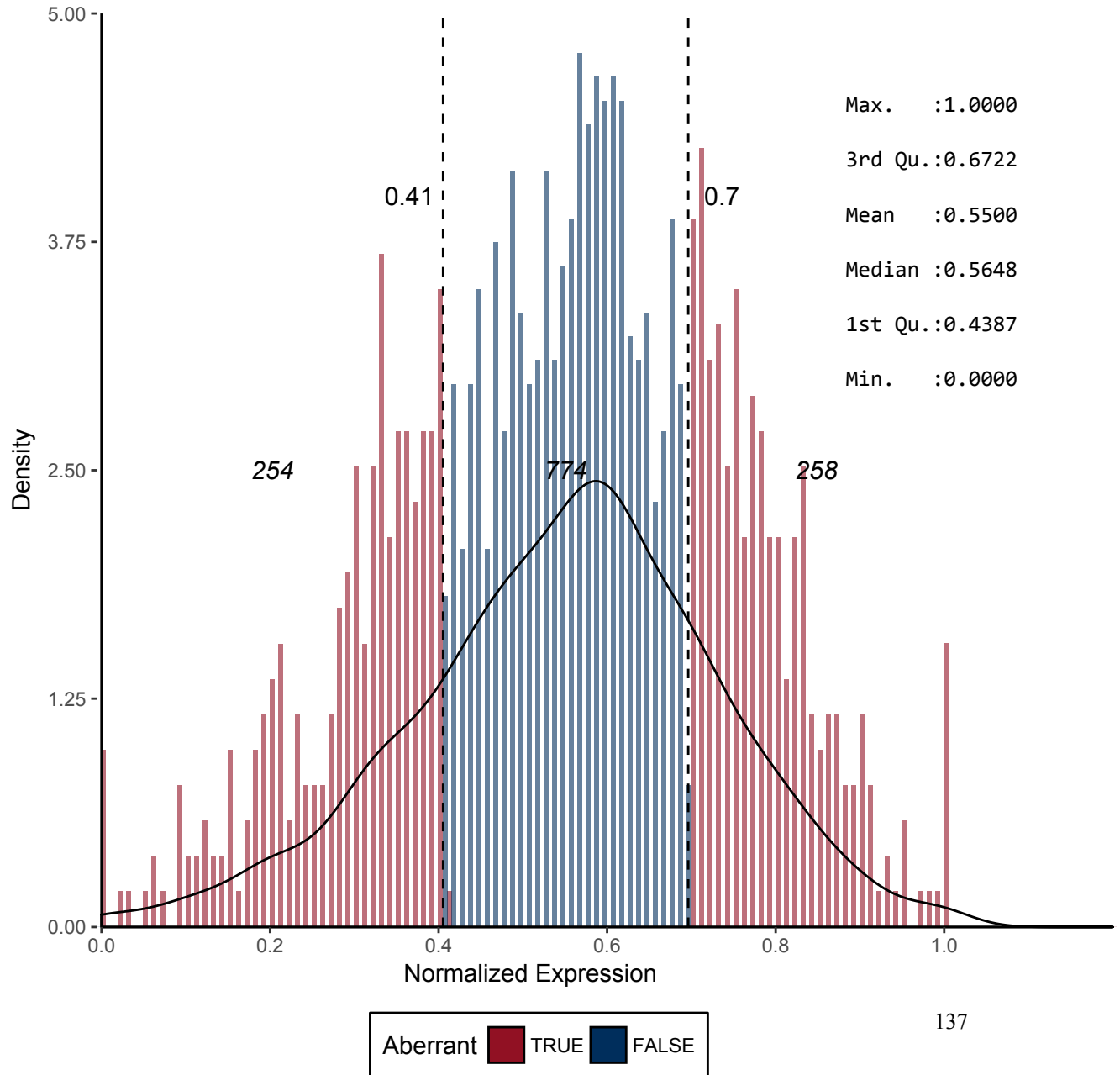


Figure 121 - CD104*

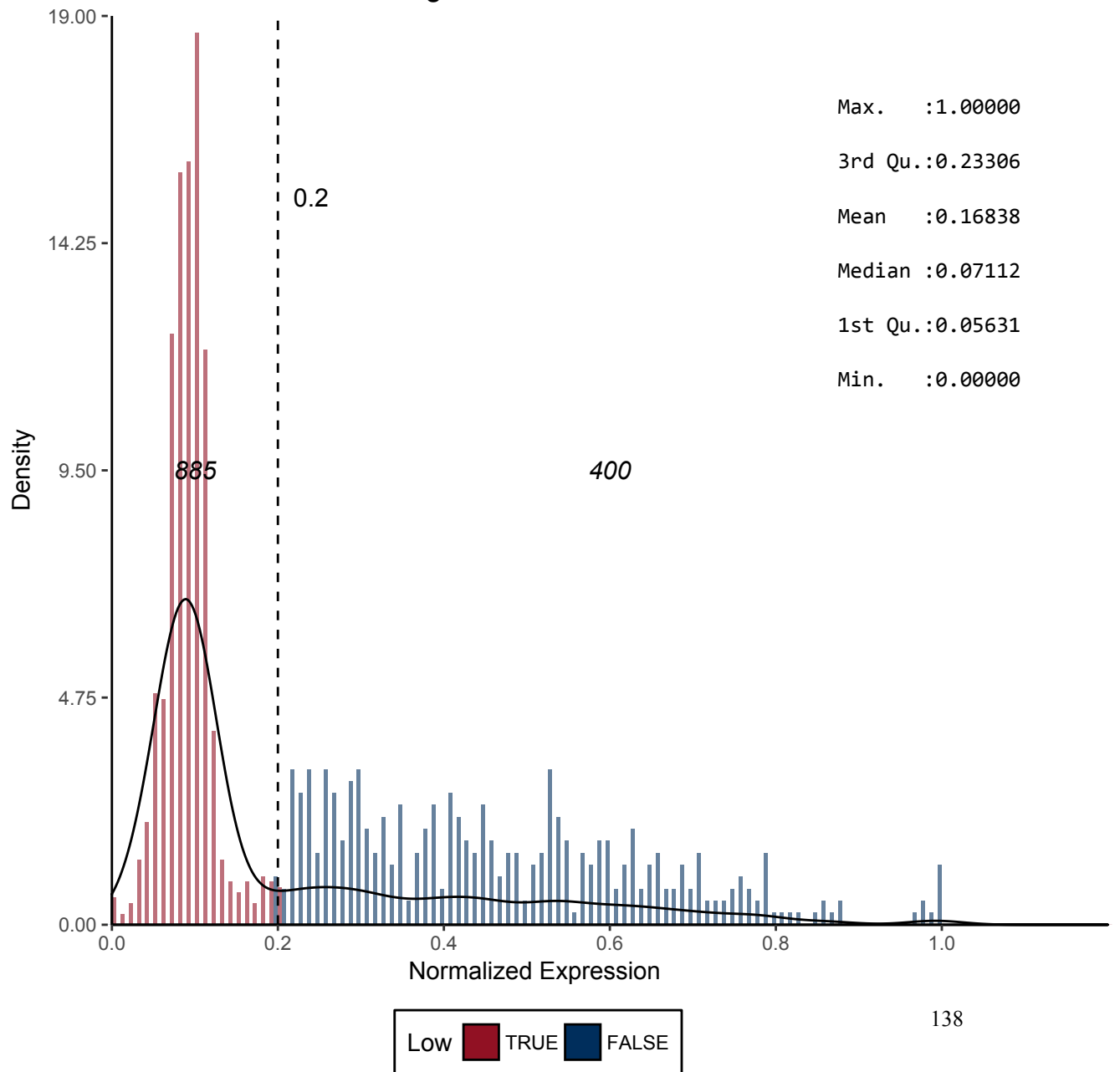


Figure 122 - CD105*

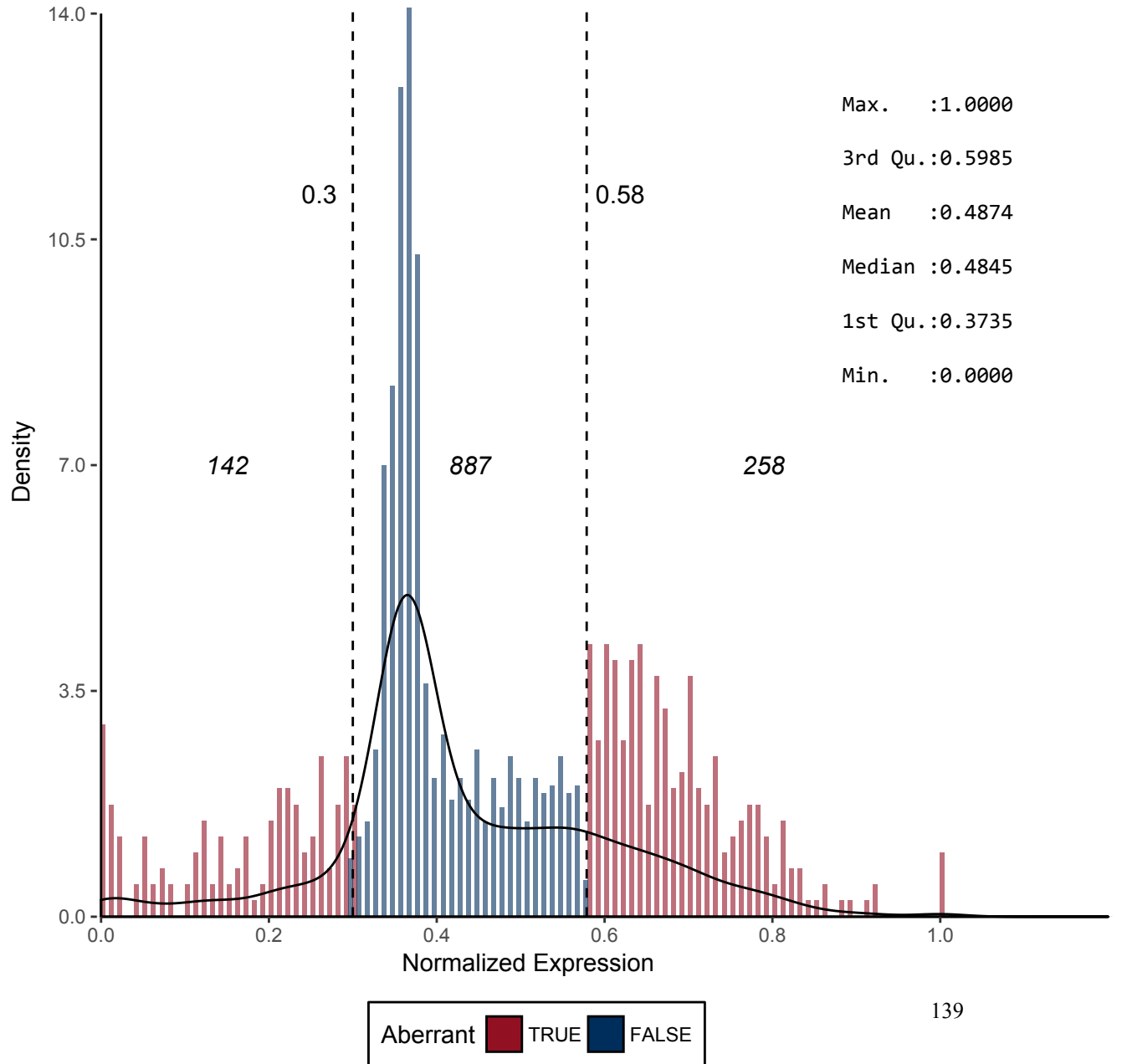


Figure 123 - CD106*

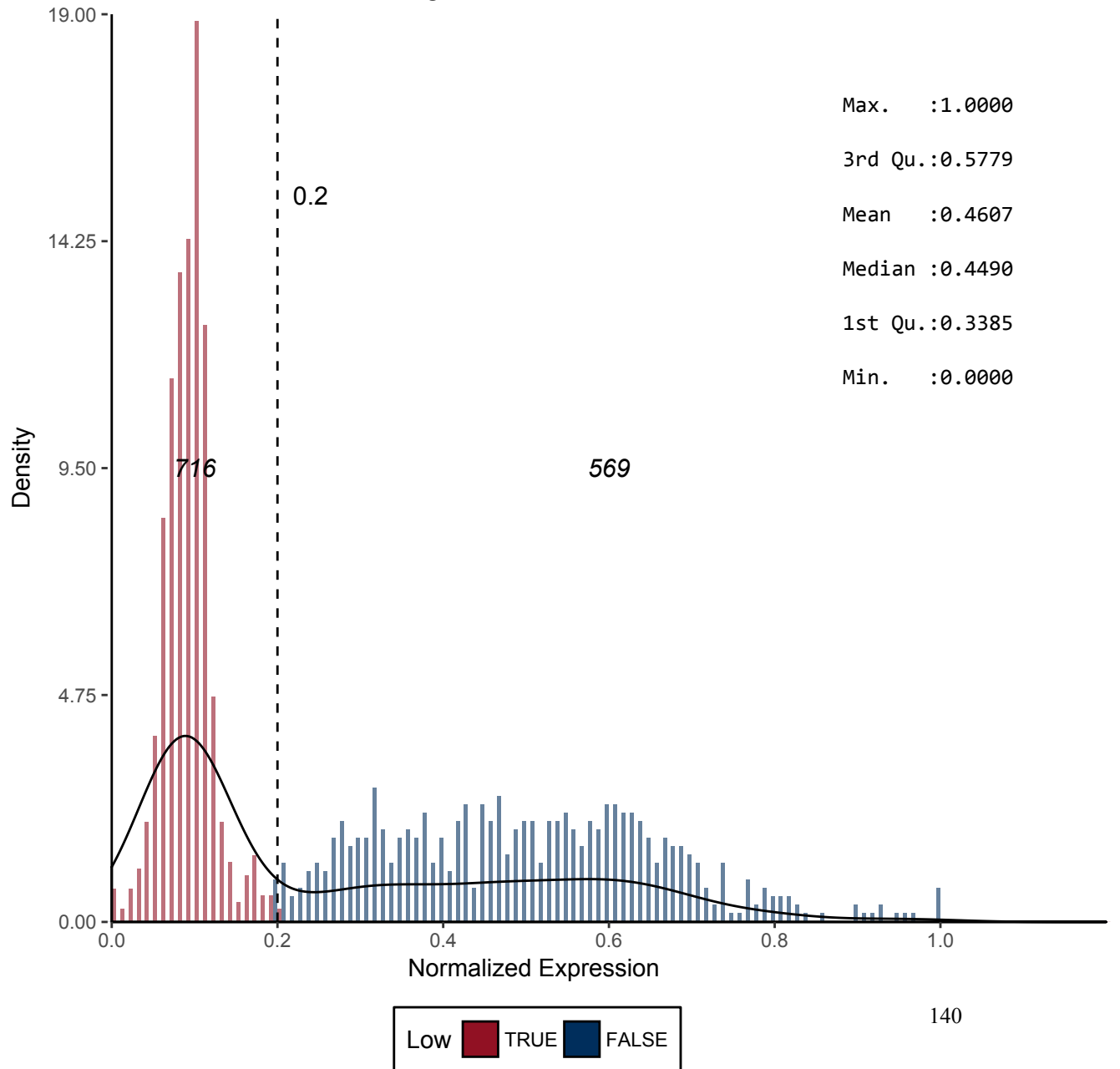


Figure 124 - CD107A

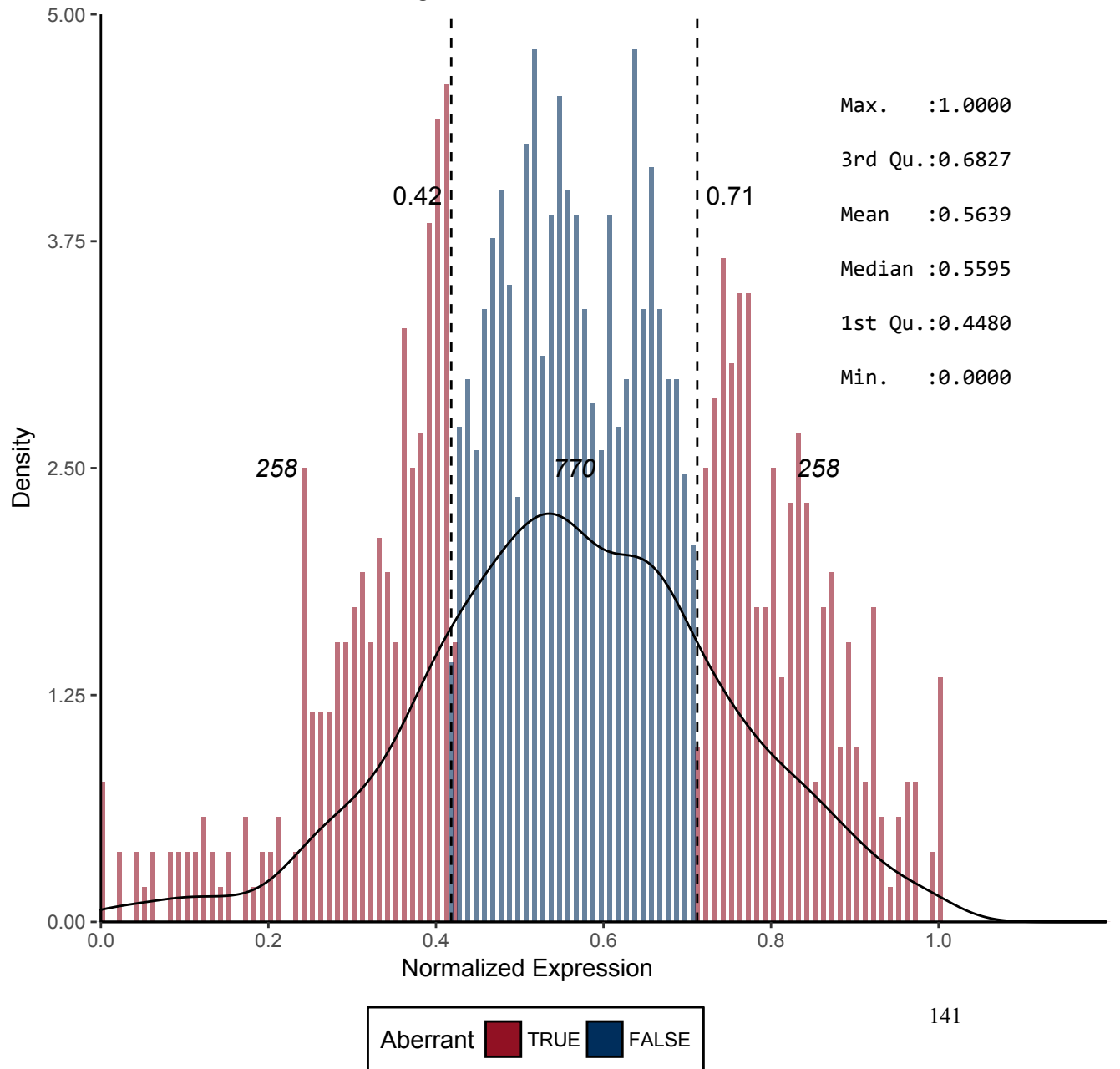


Figure 125 - CD107B

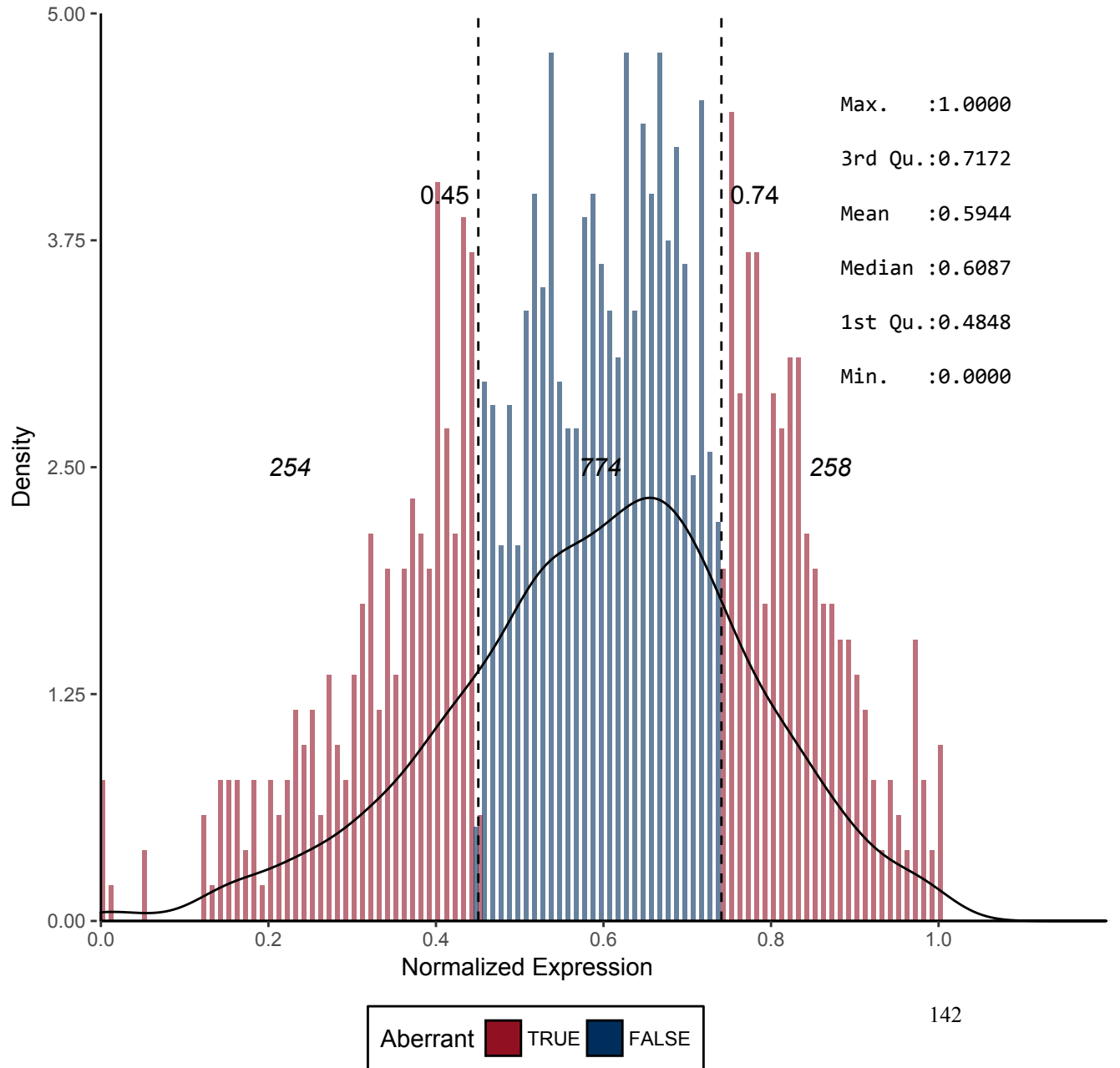


Figure 126 - CD108*

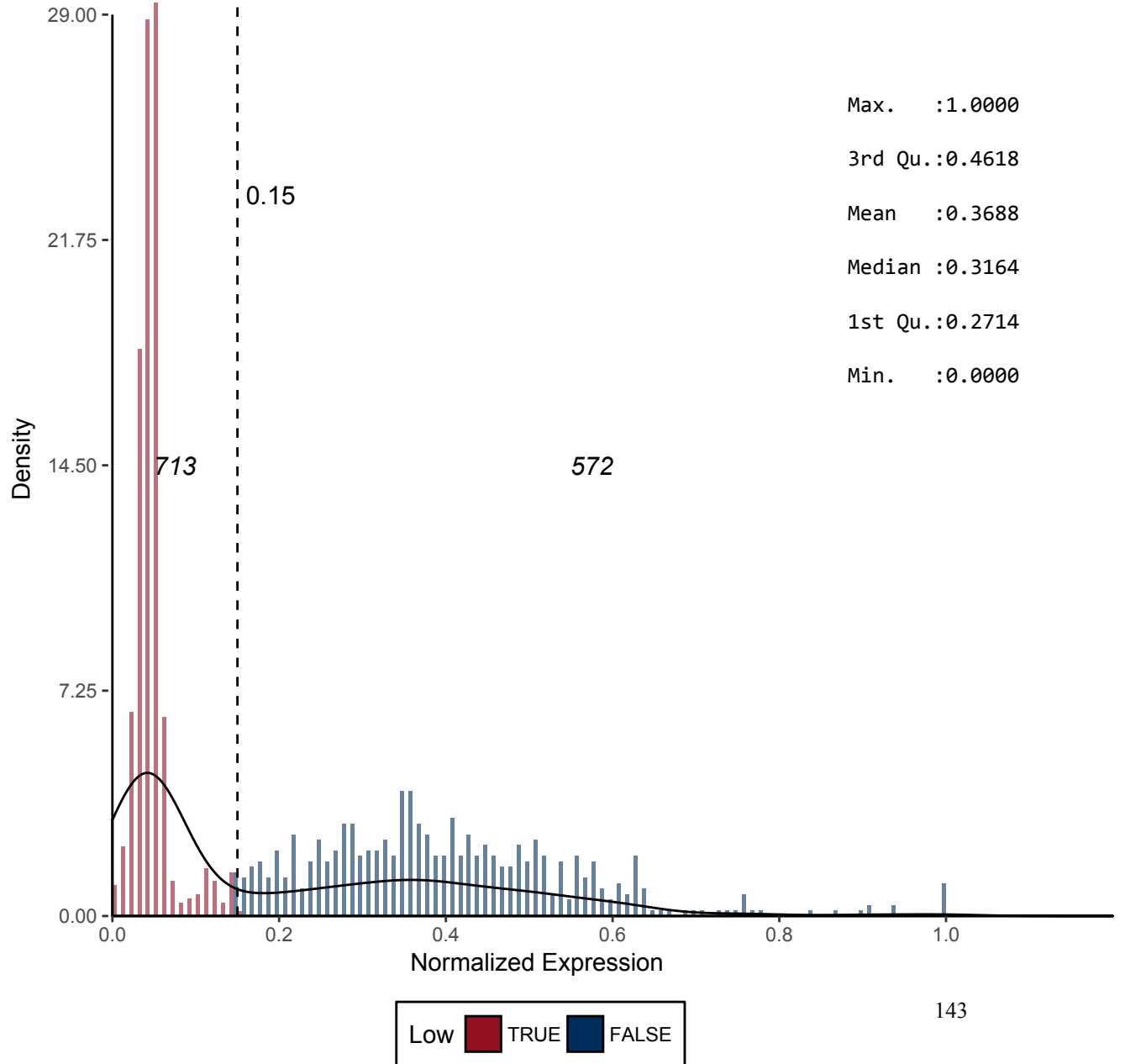
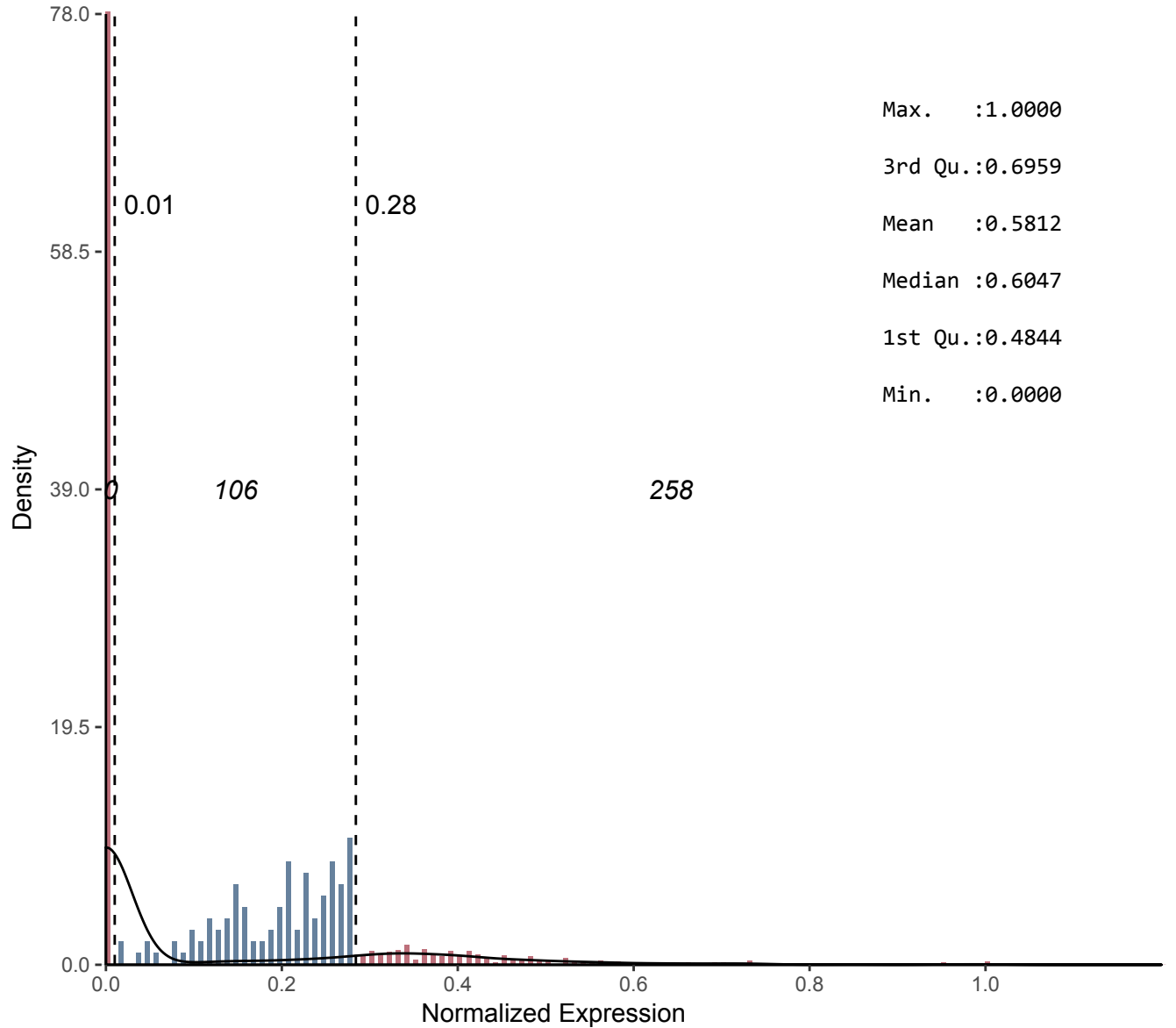


Figure 127 - CD109*



Aberrant TRUE FALSE

Figure 128 - CD110

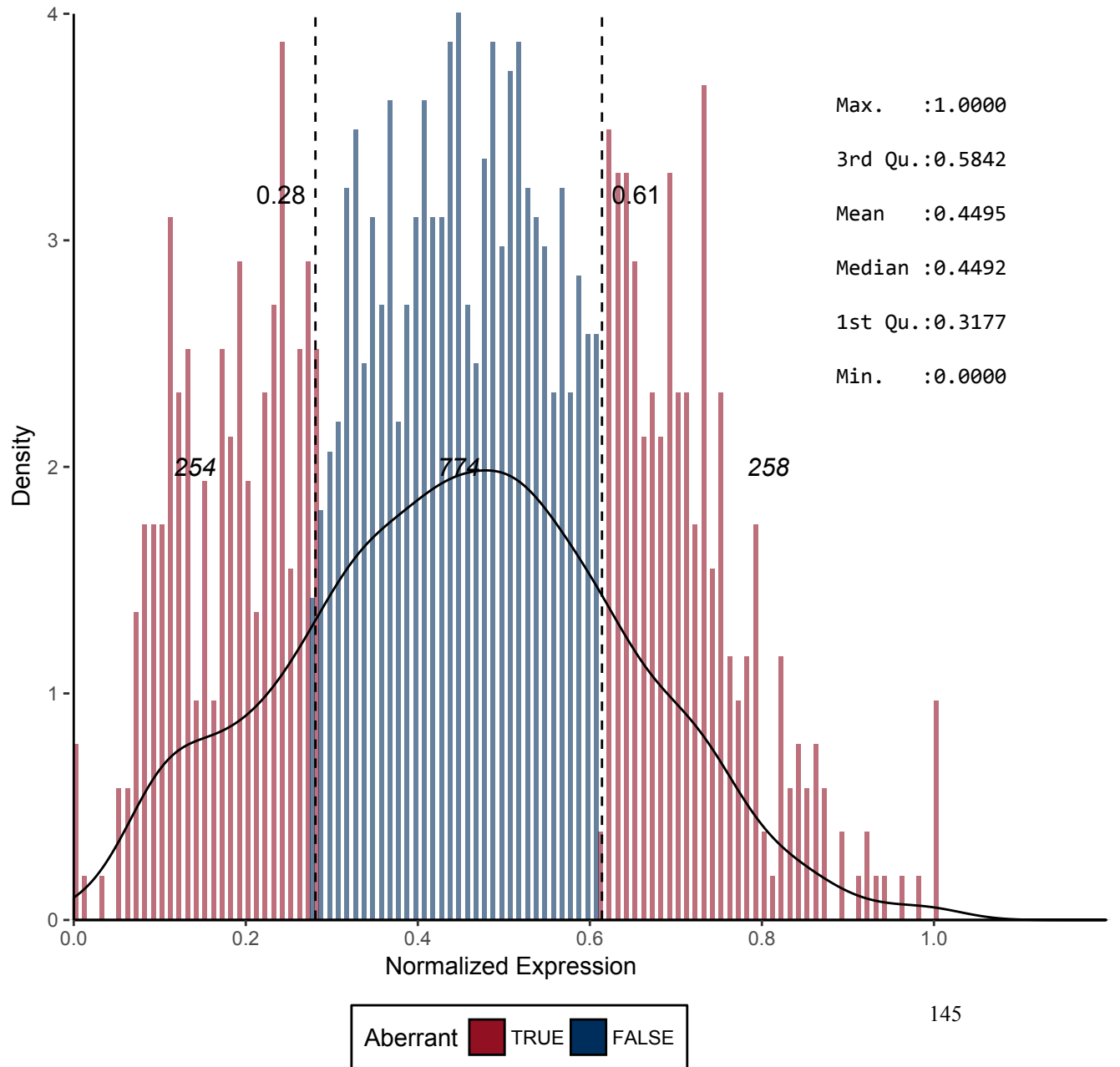


Figure 129 - CD111*

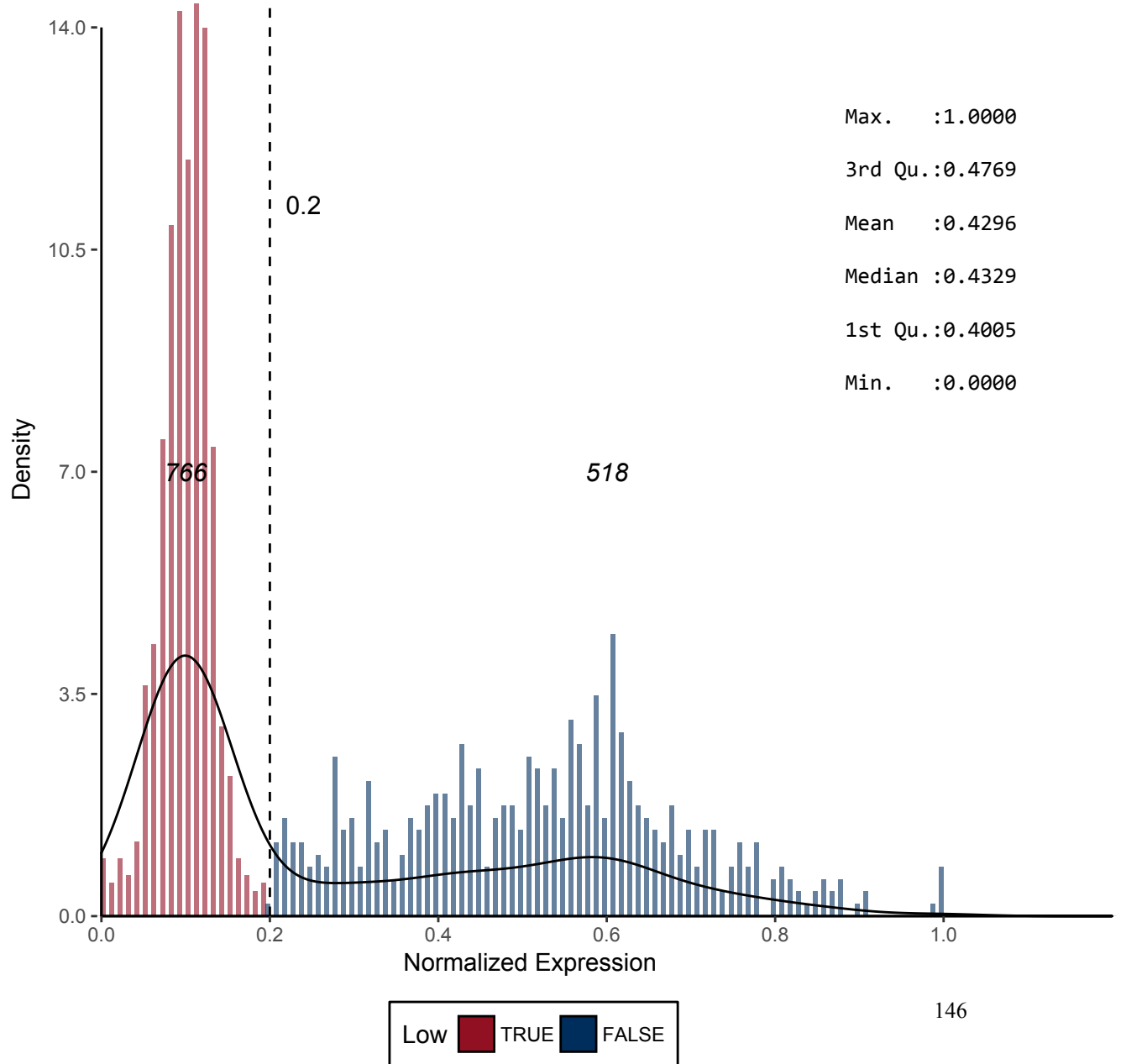


Figure 130 - CD112

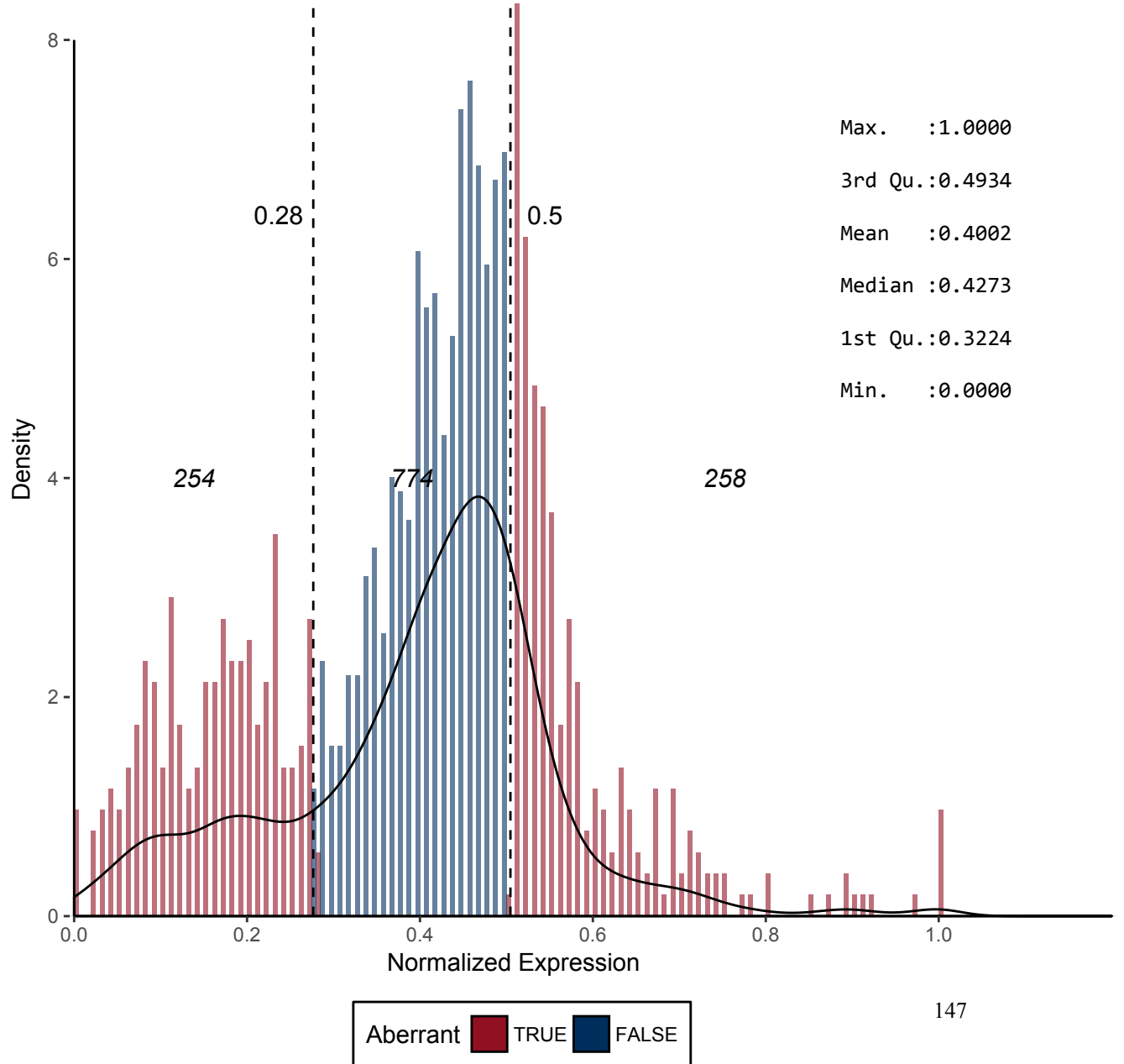


Figure 131 - CD113*

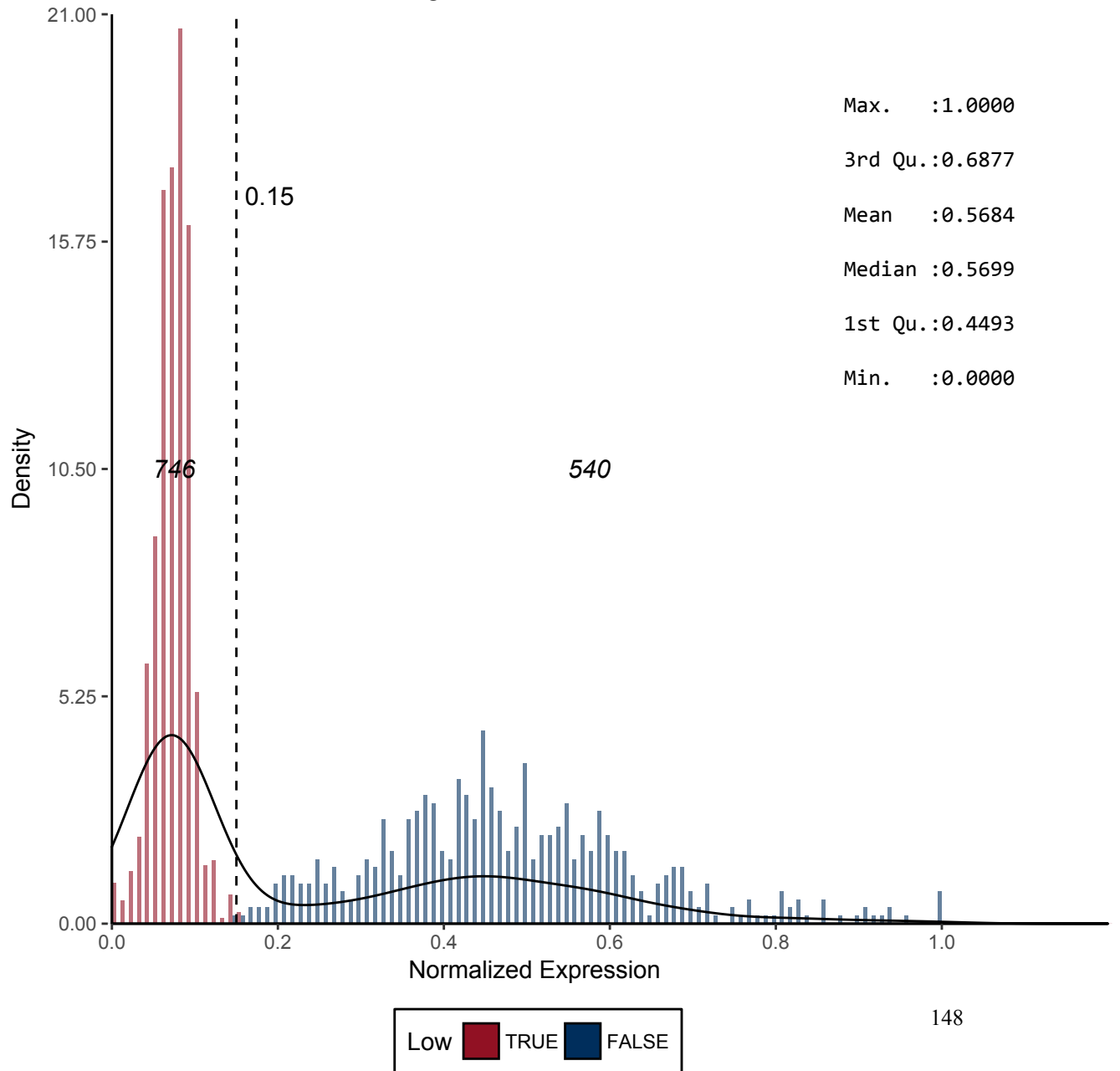


Figure 132 - CD114

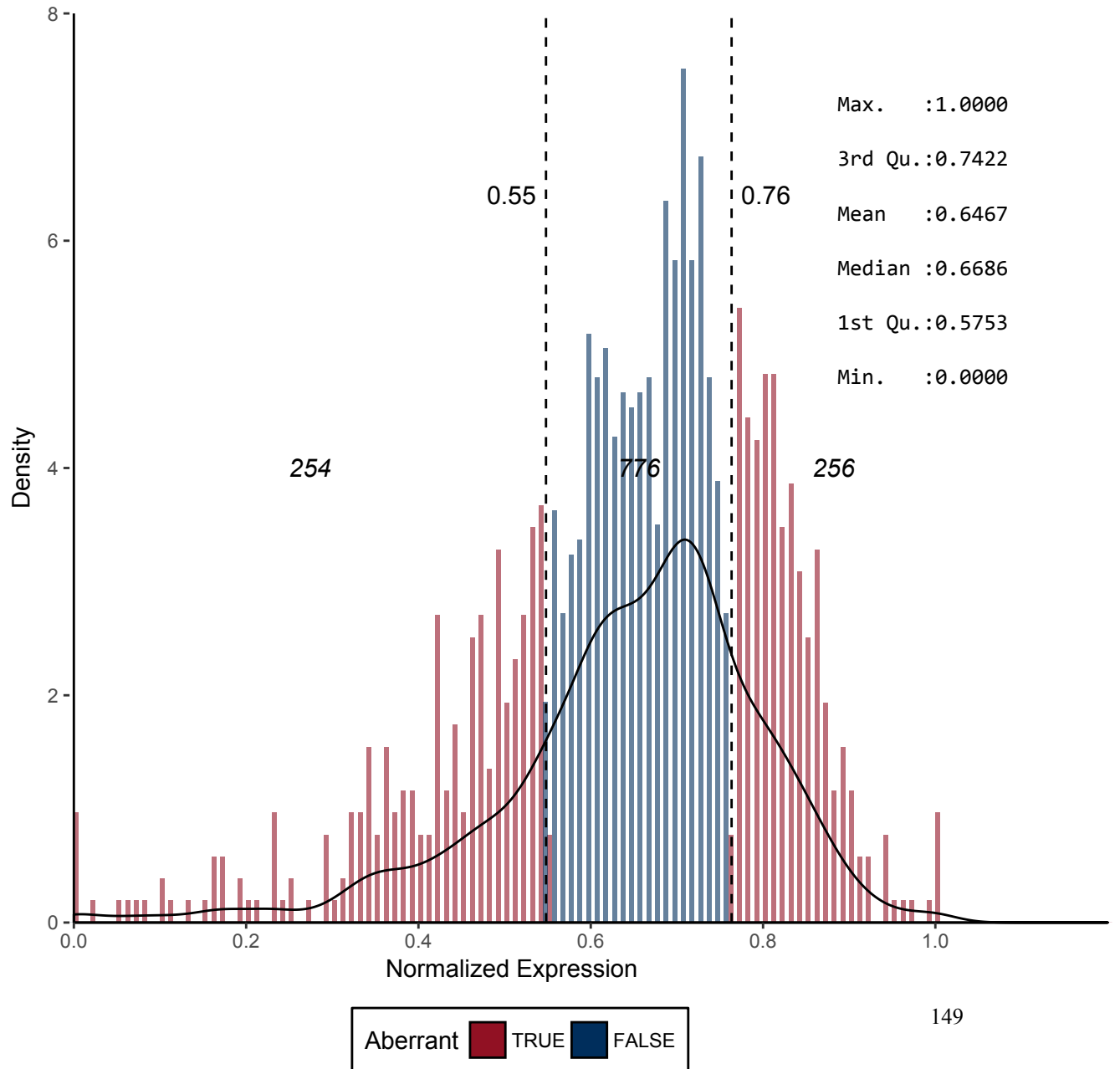


Figure 133 - CD115

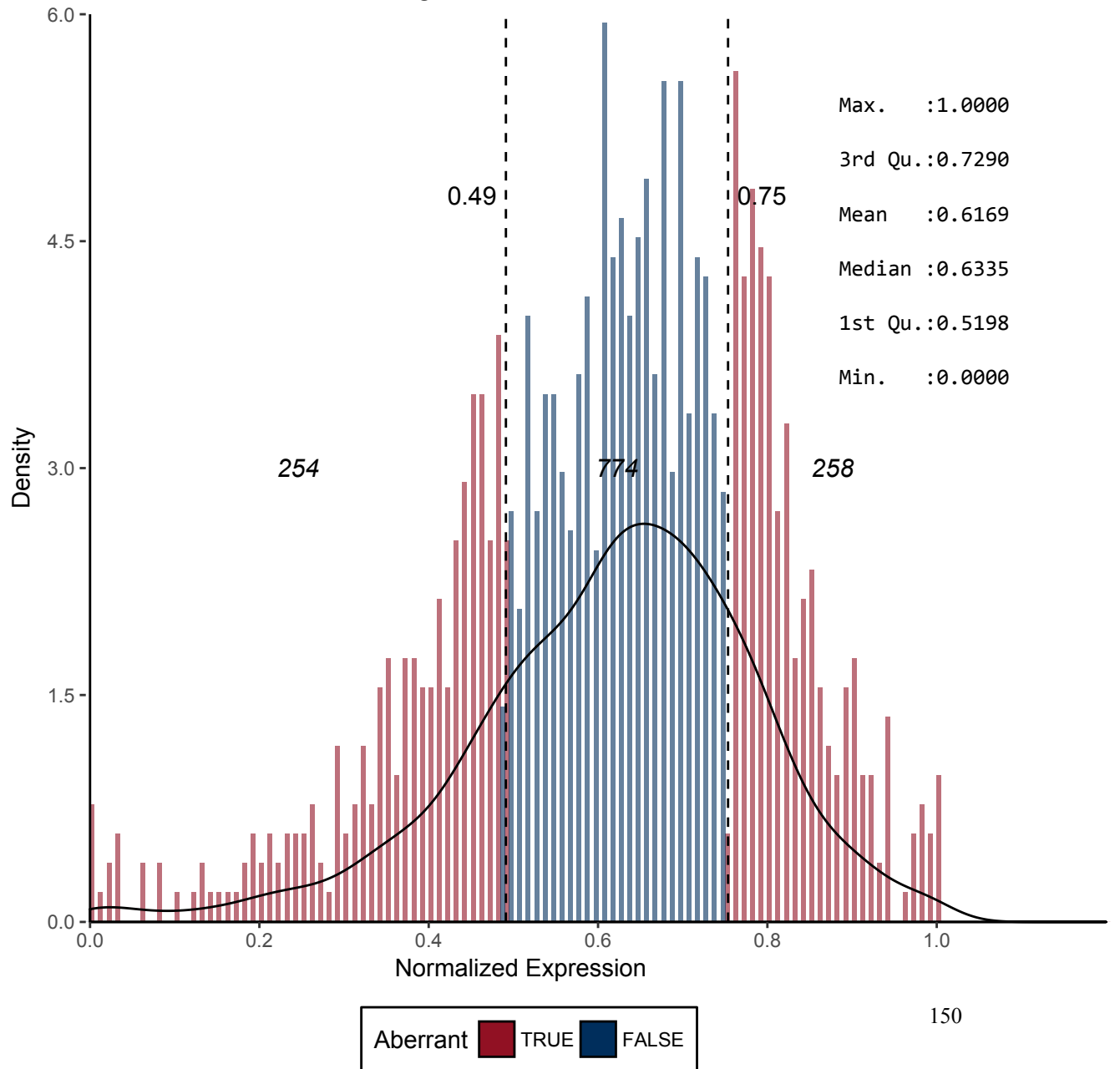


Figure 134 - CD116

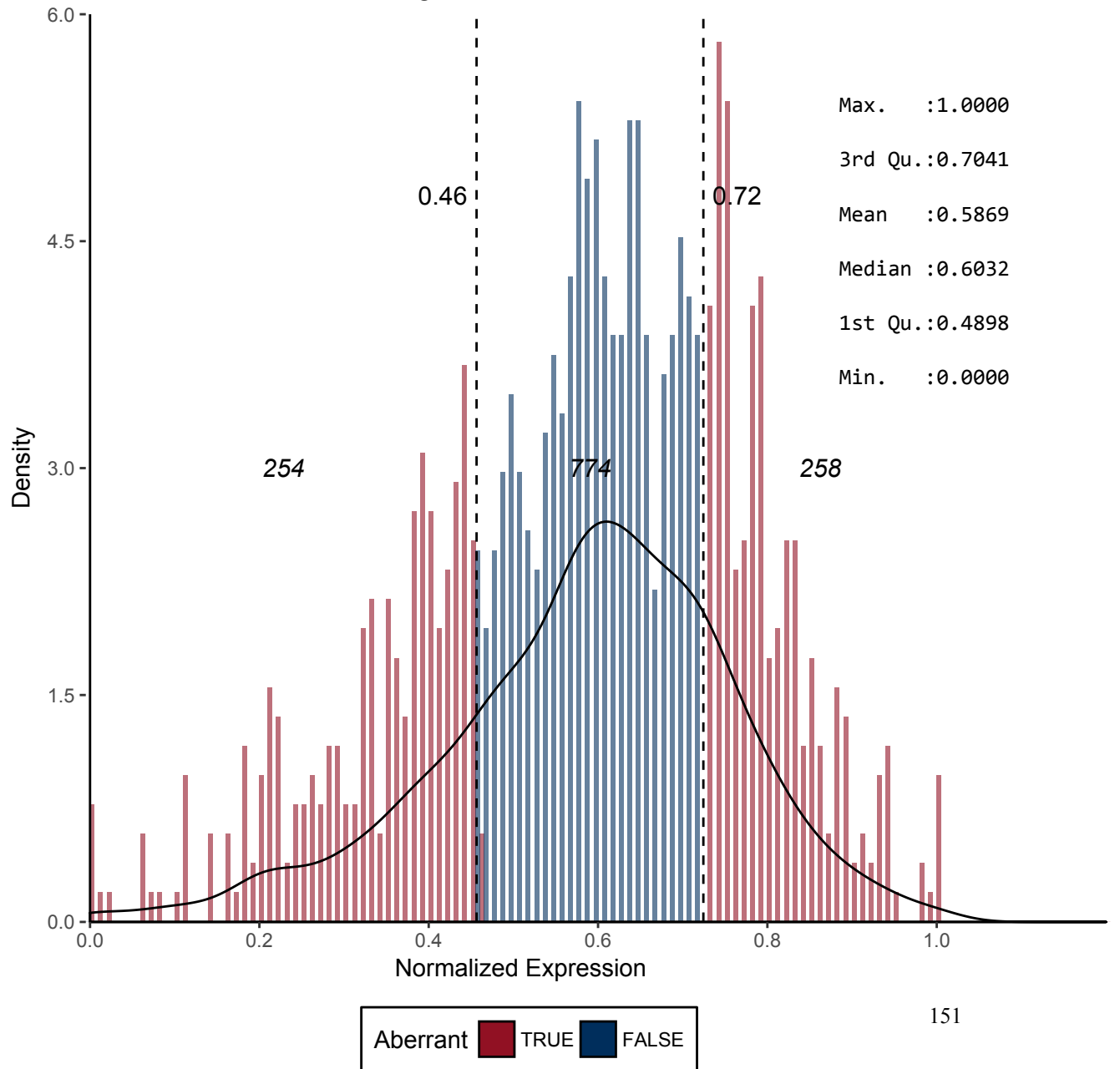


Figure 135 - CD117

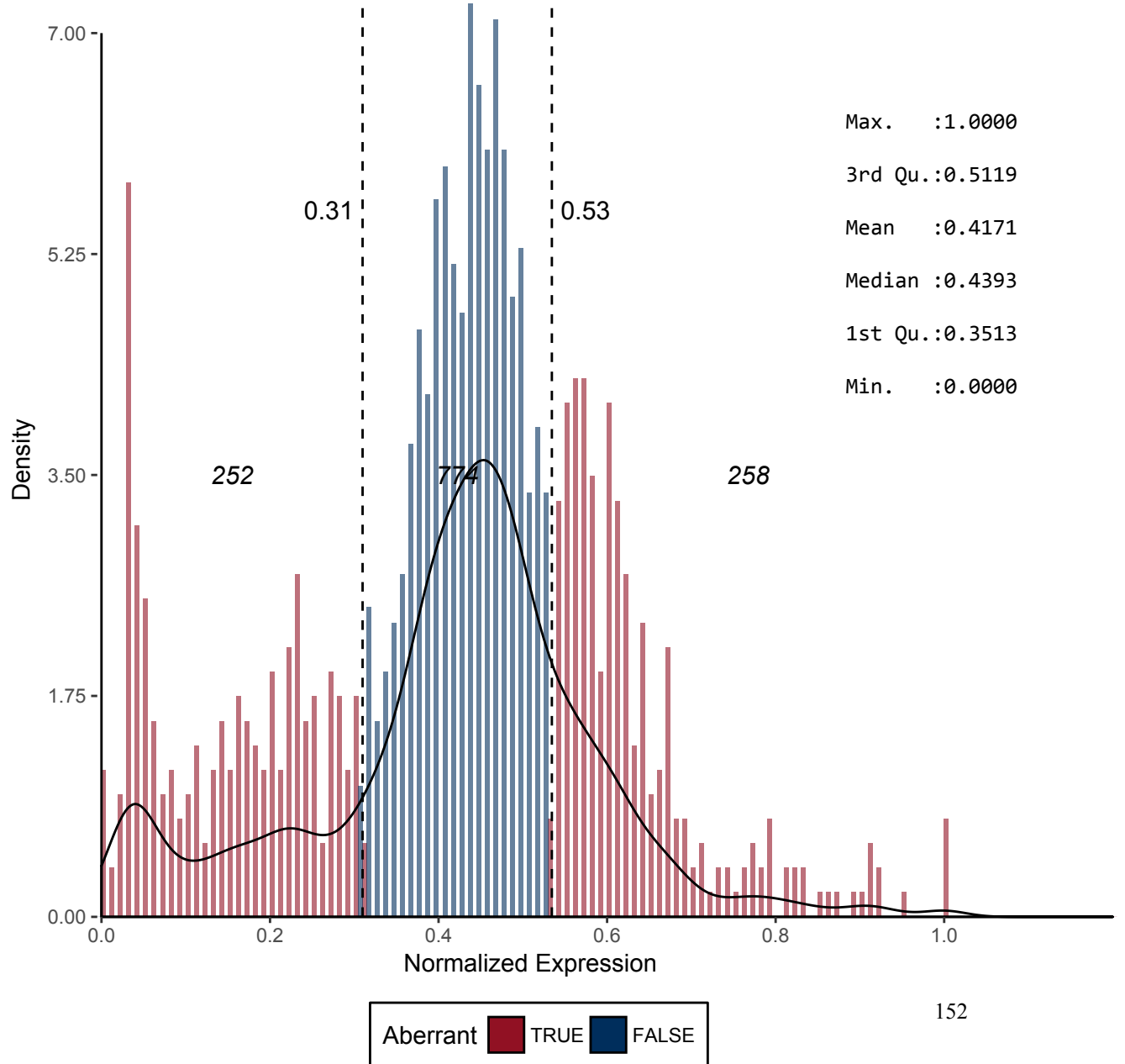


Figure 136 - CD118*

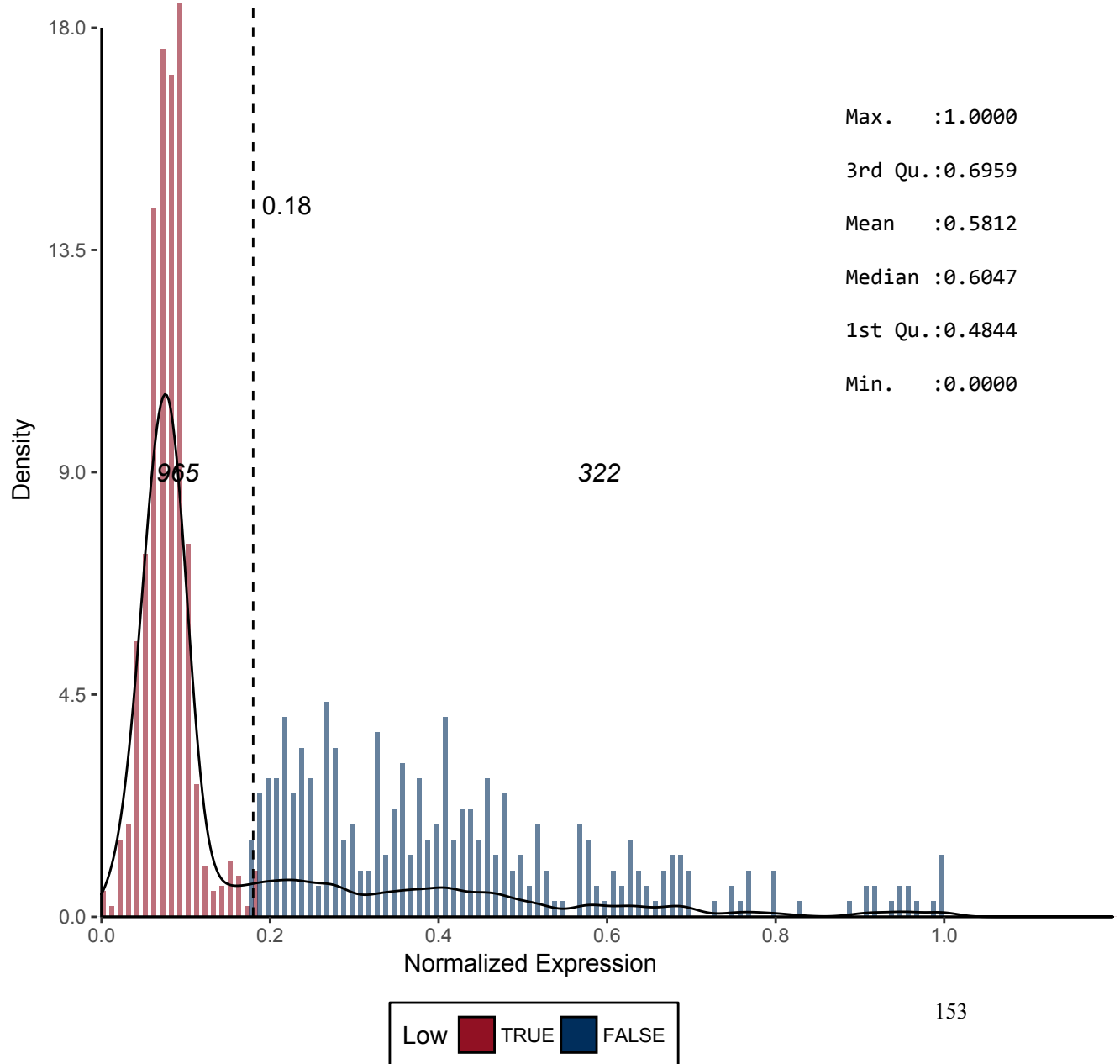


Figure 137 - CD119

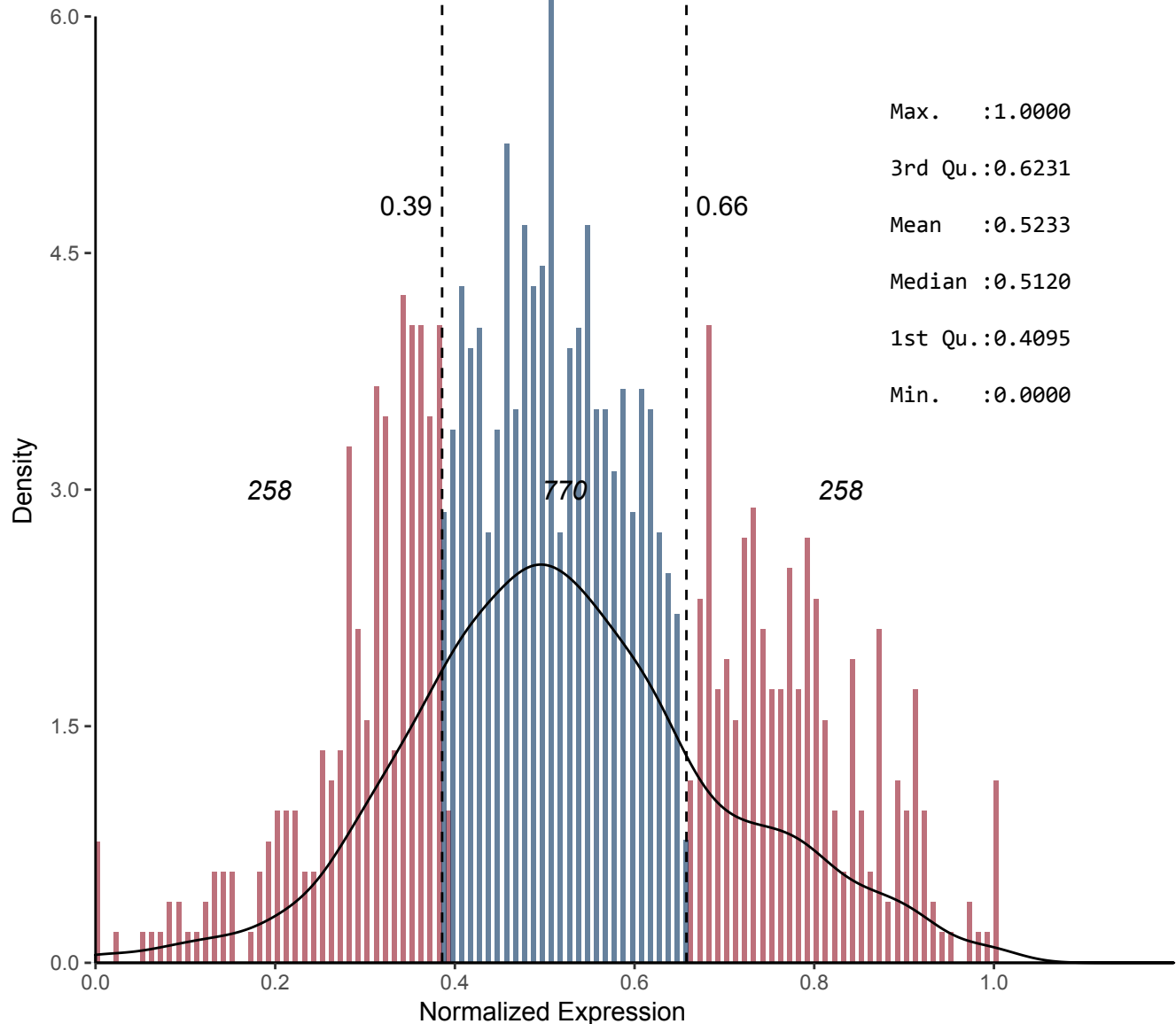
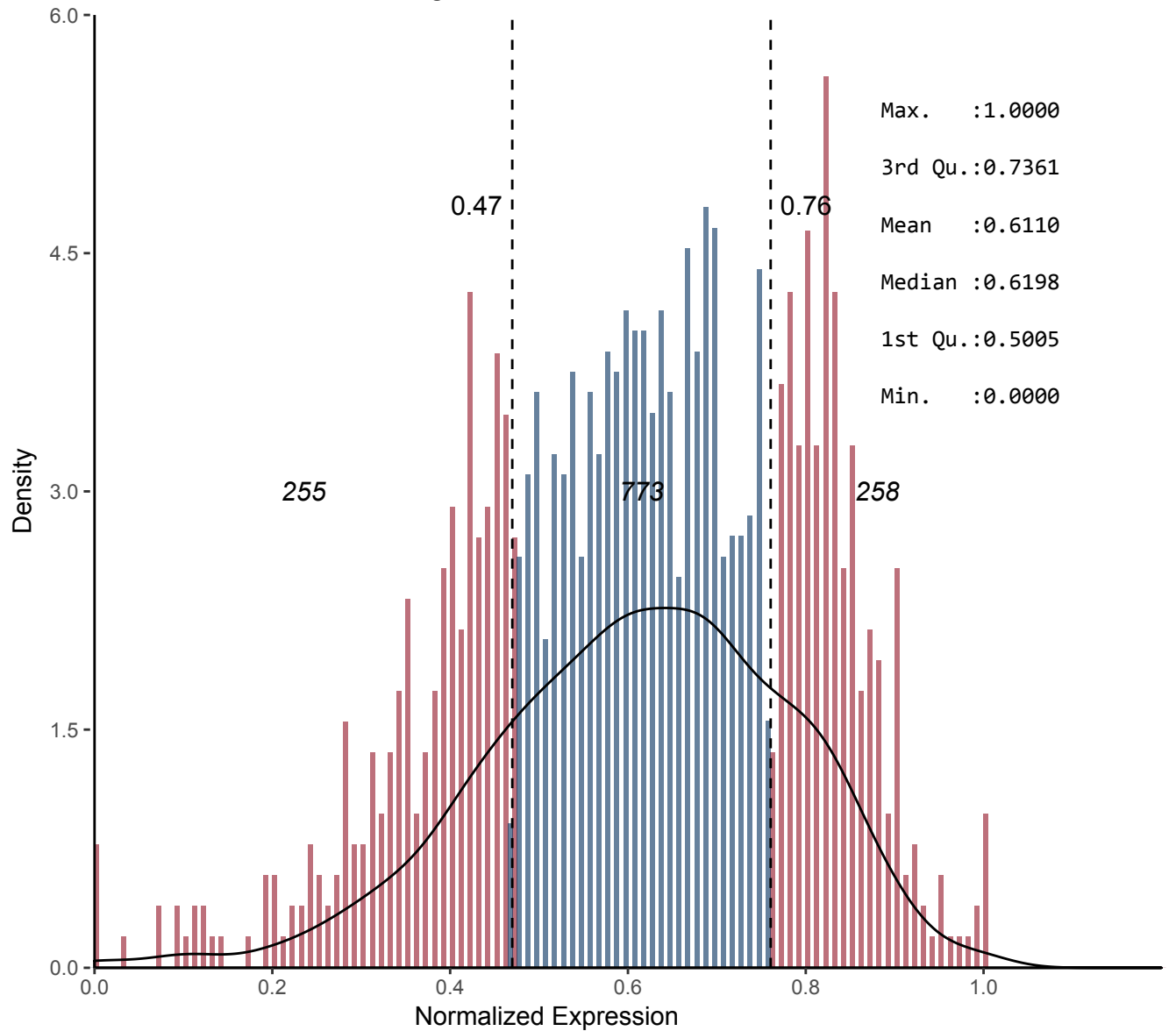


Figure 138 - CD120A



Aberrant TRUE FALSE

Figure 139 - CD120B

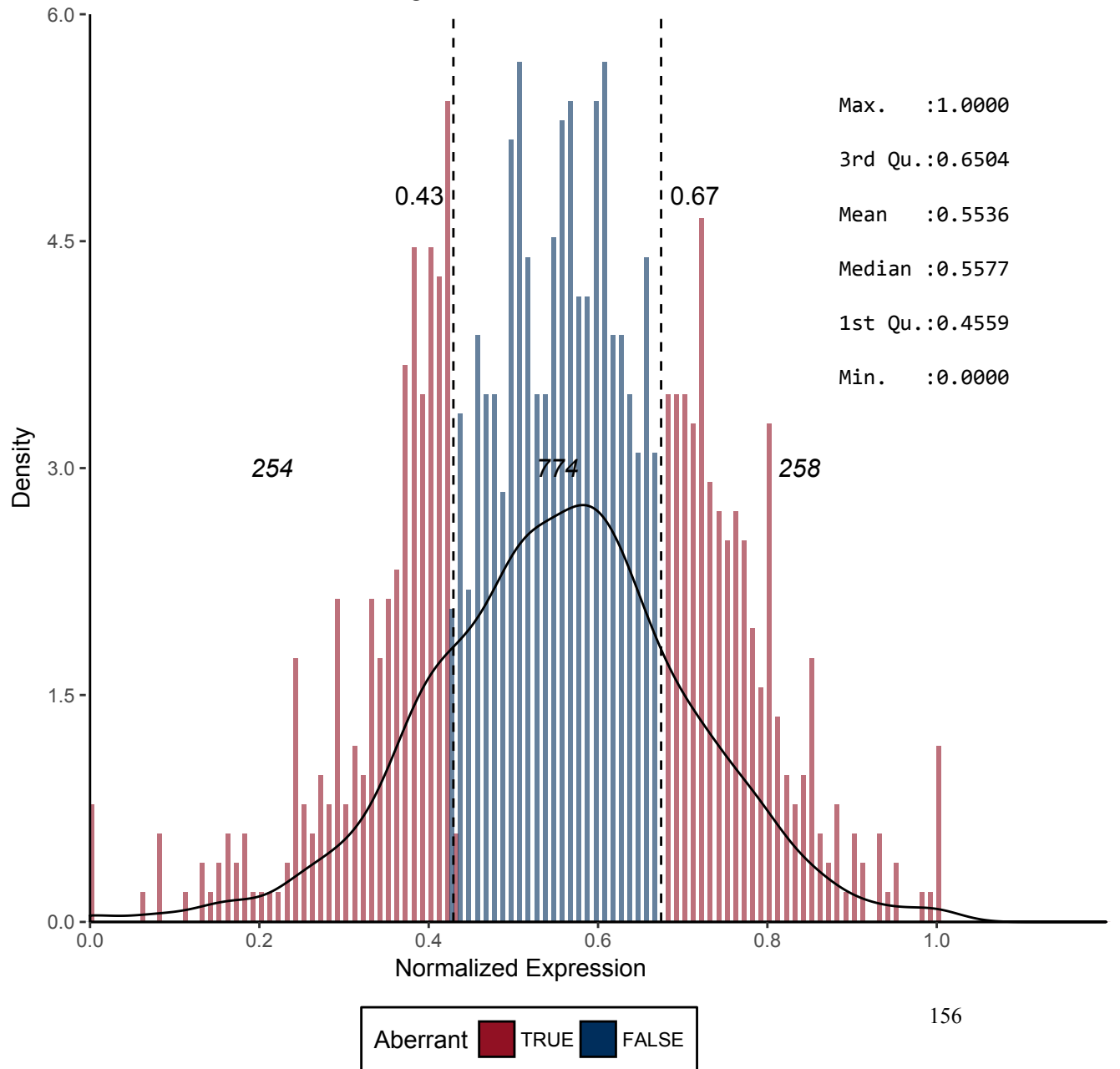


Figure 140 - CD121A*

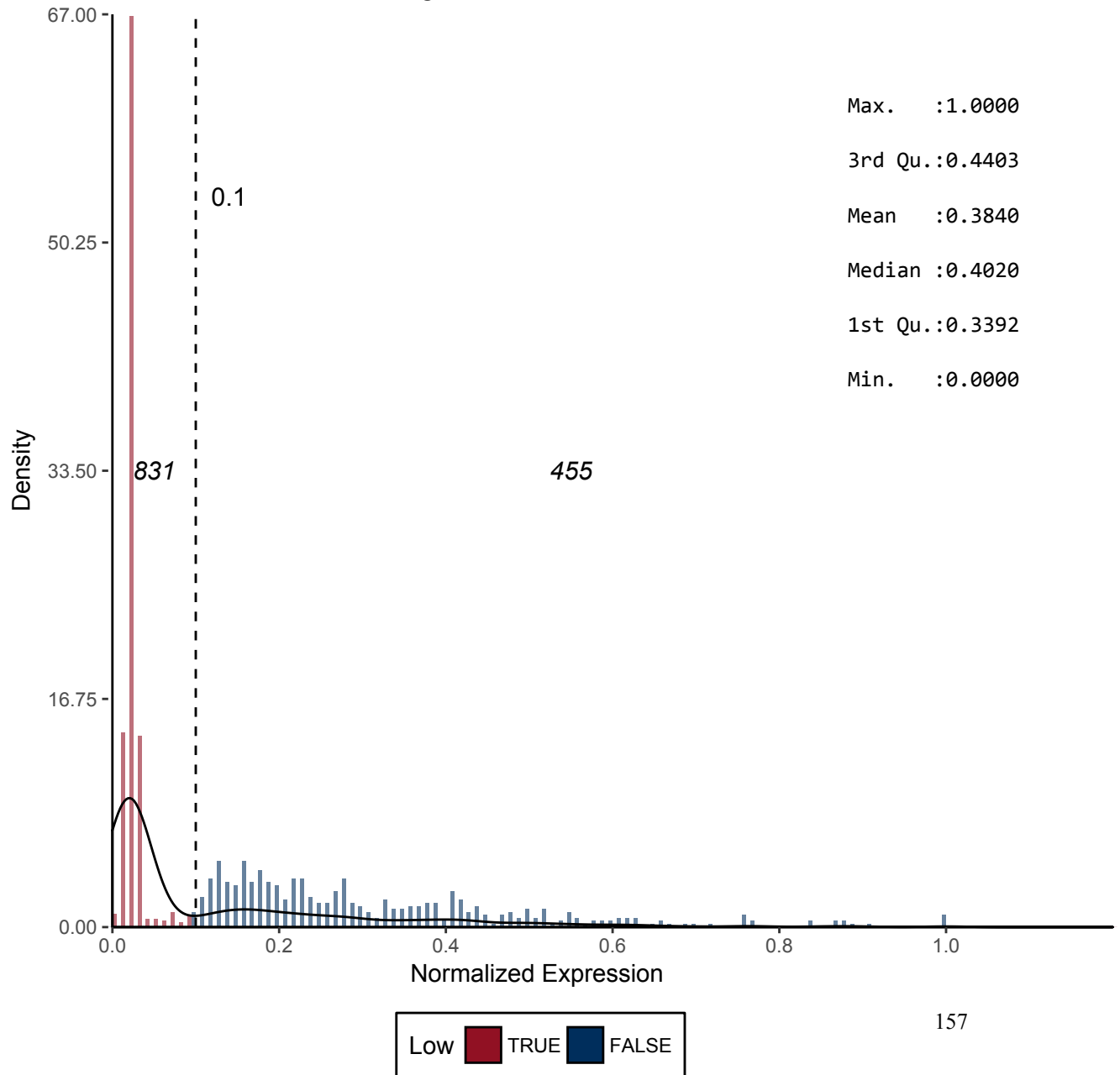


Figure 141 - CD121B

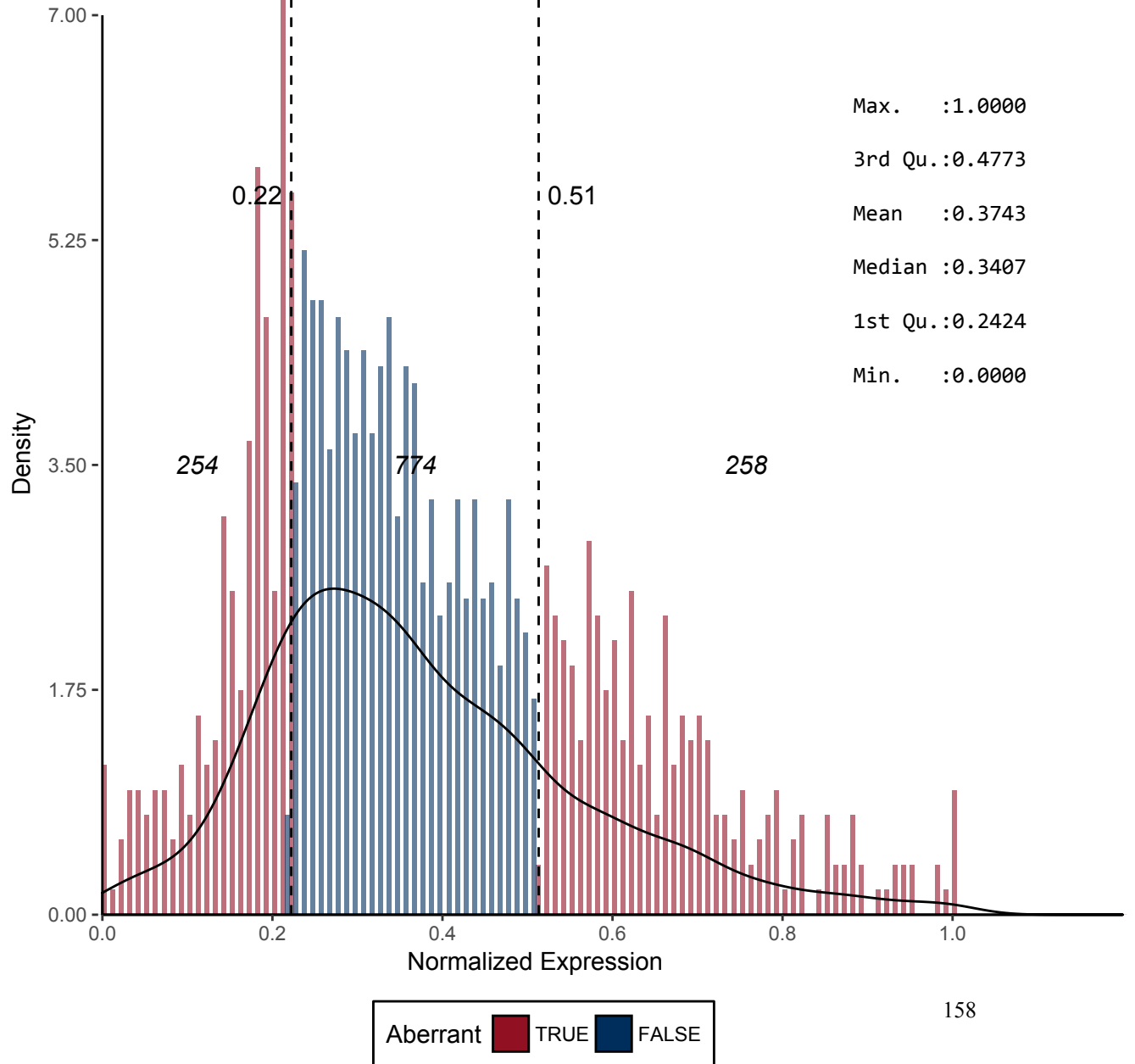


Figure 142 - CD122

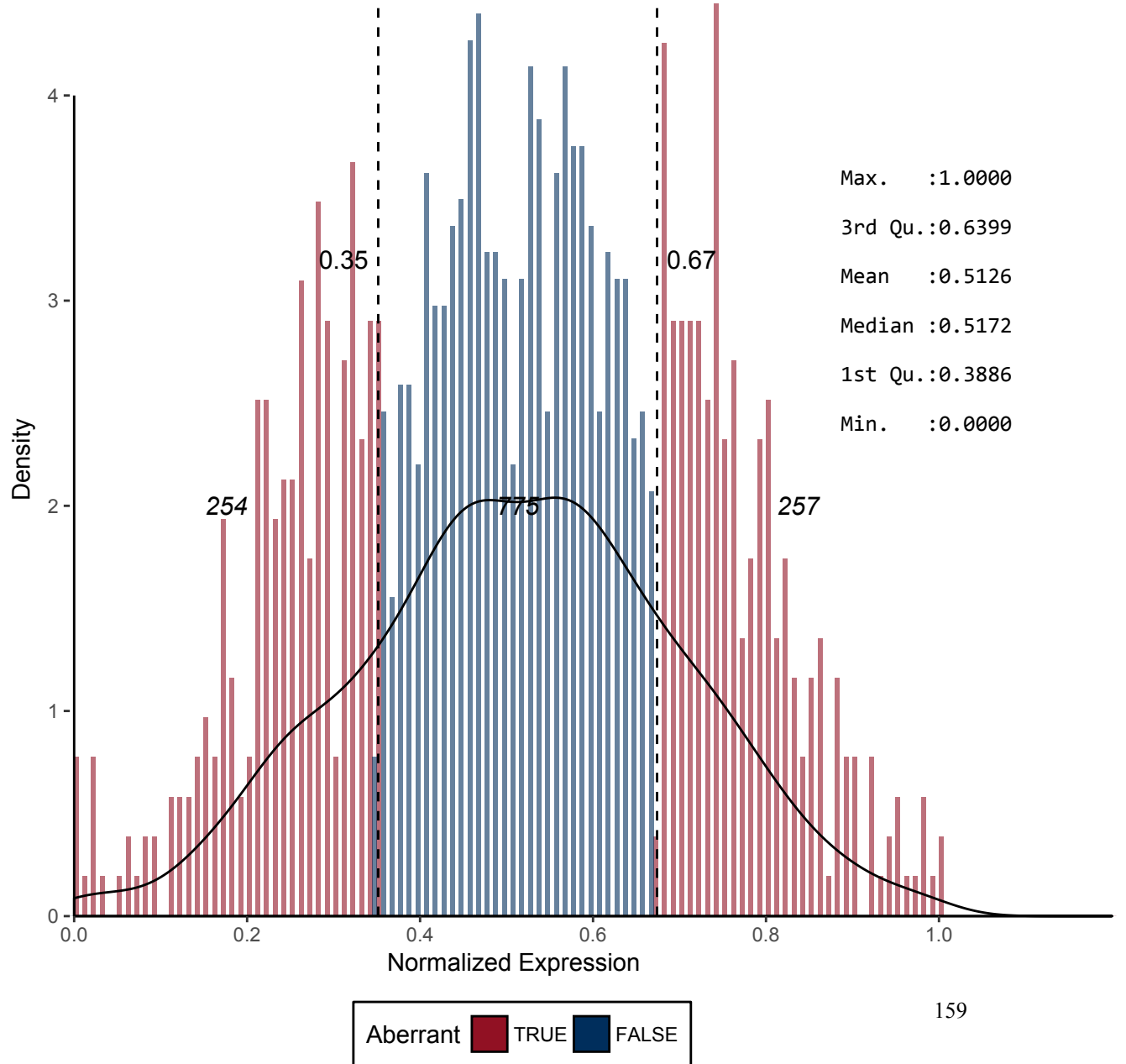
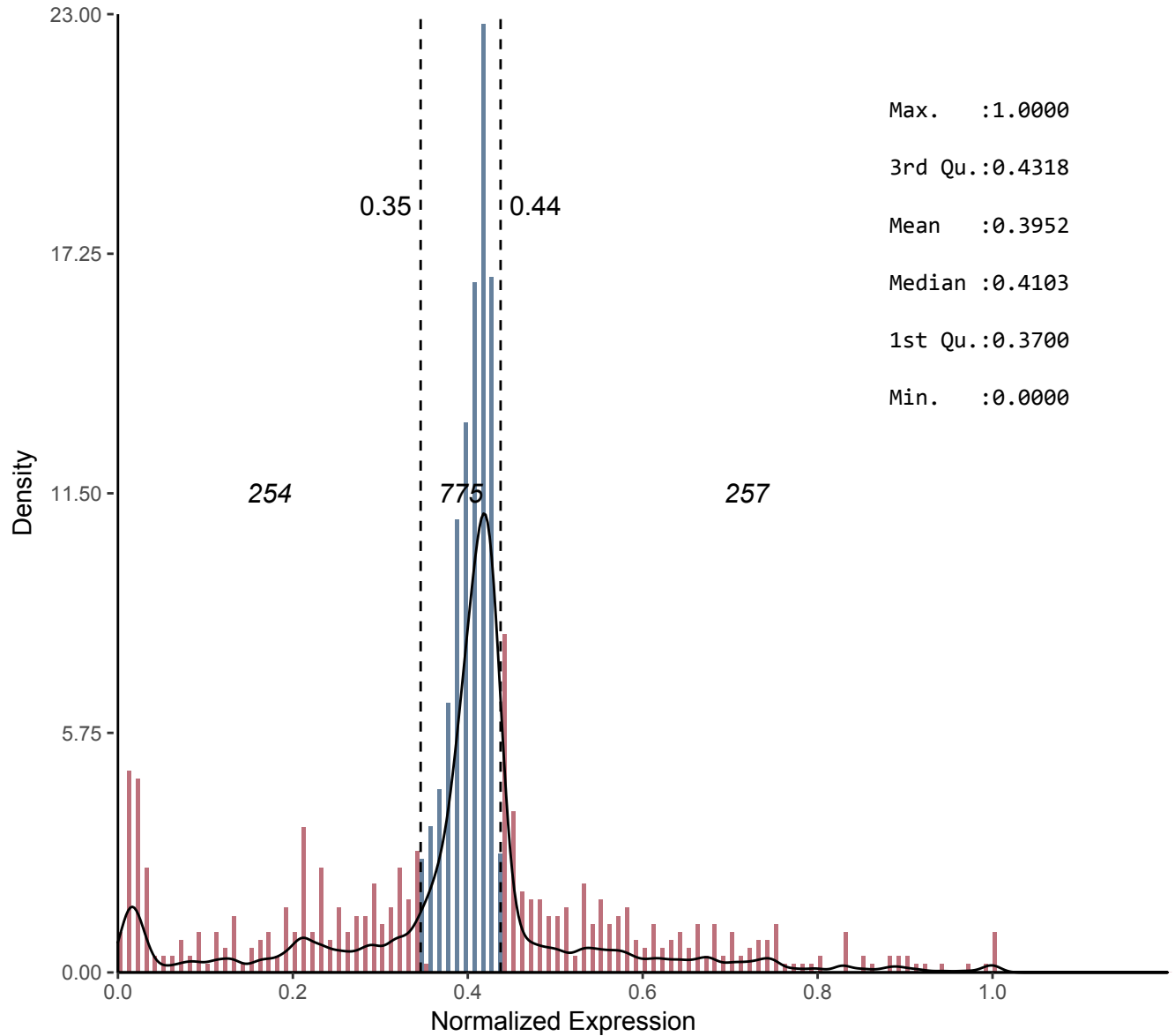


Figure 143 - CD123



Aberrant ■ TRUE ■ FALSE

Figure 144 - CD124

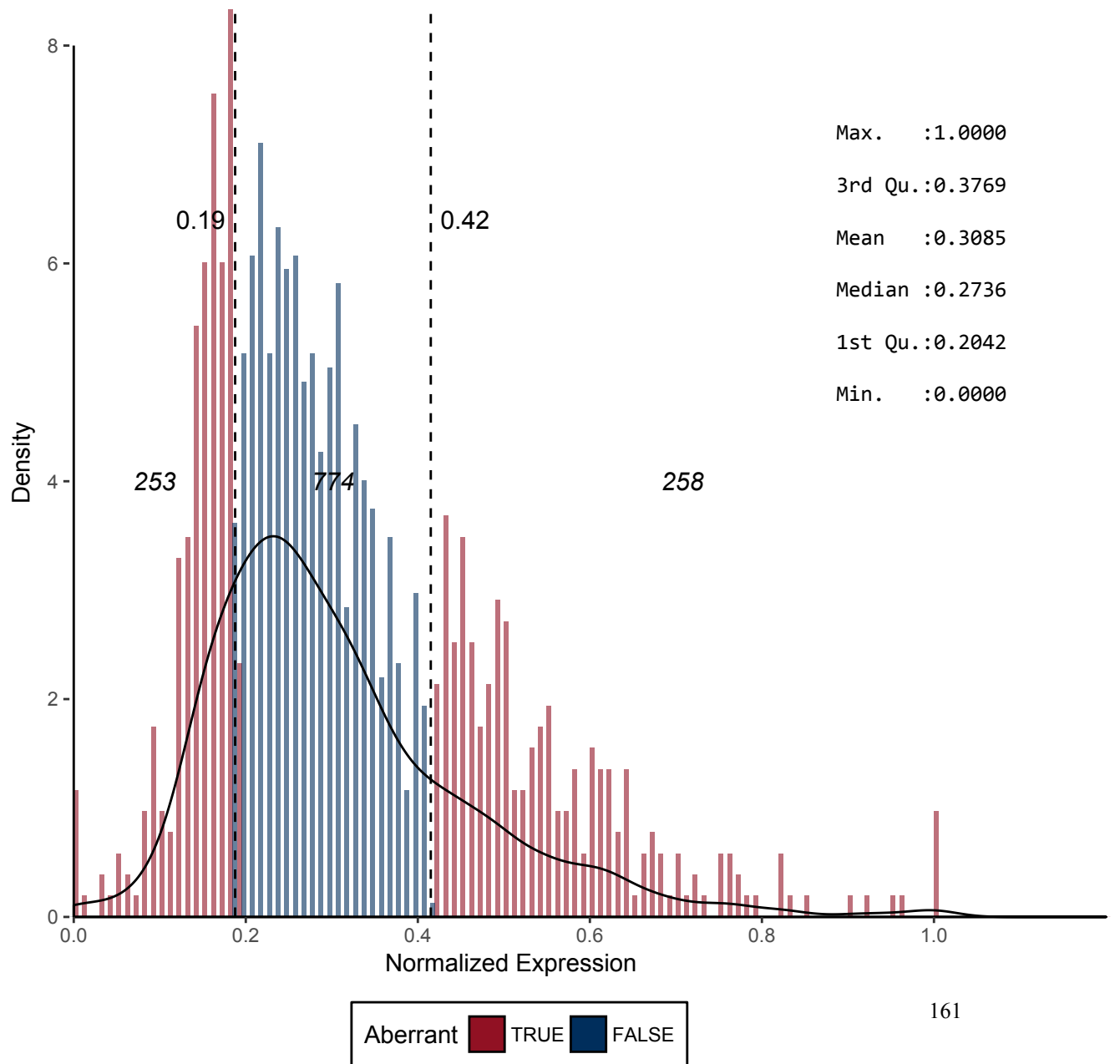


Figure 145 - CD125

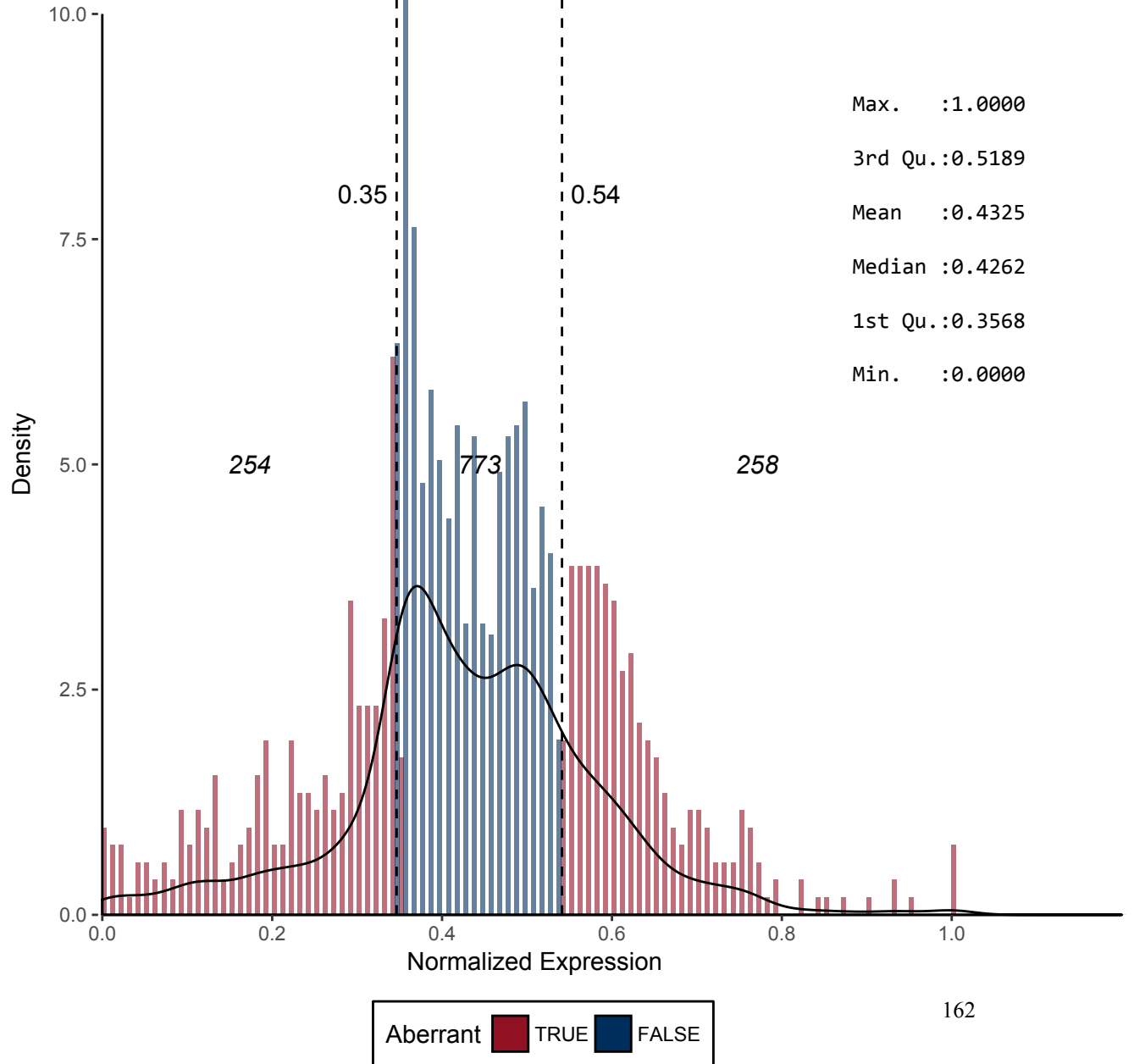


Figure 146 - CD126

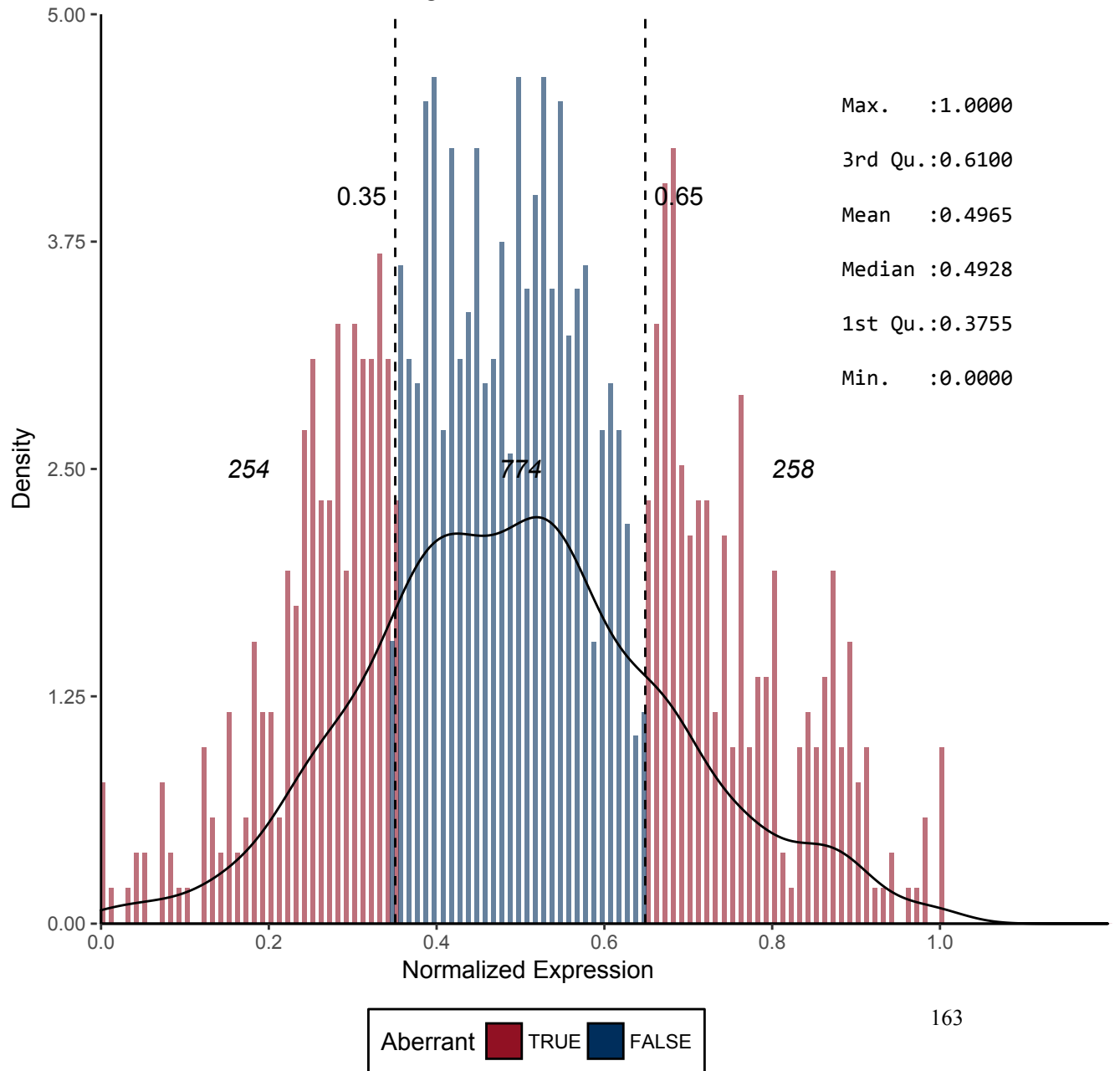
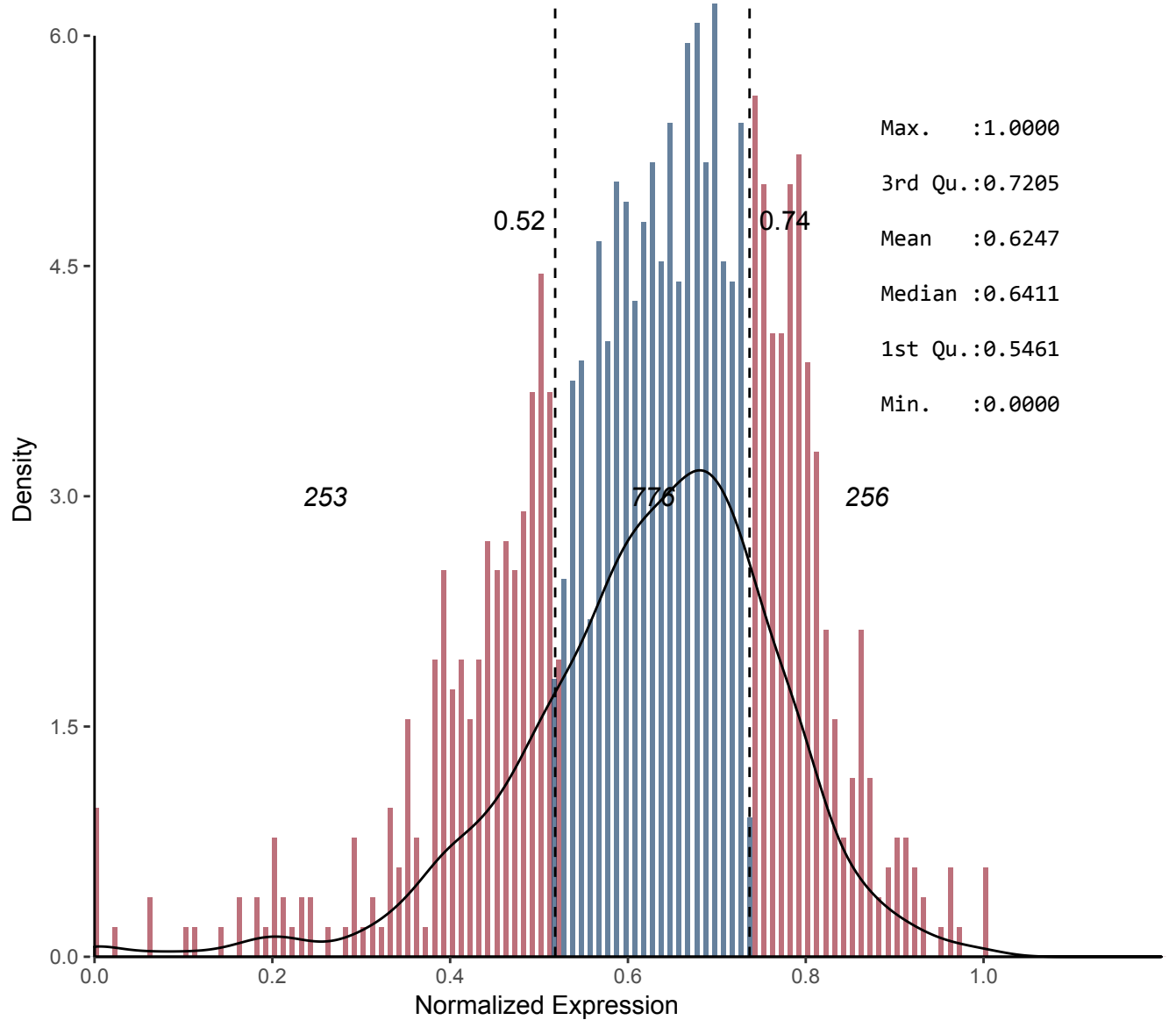


Figure 147 - CD127



Aberrant ■ TRUE ■ FALSE

Figure 148 - CD130

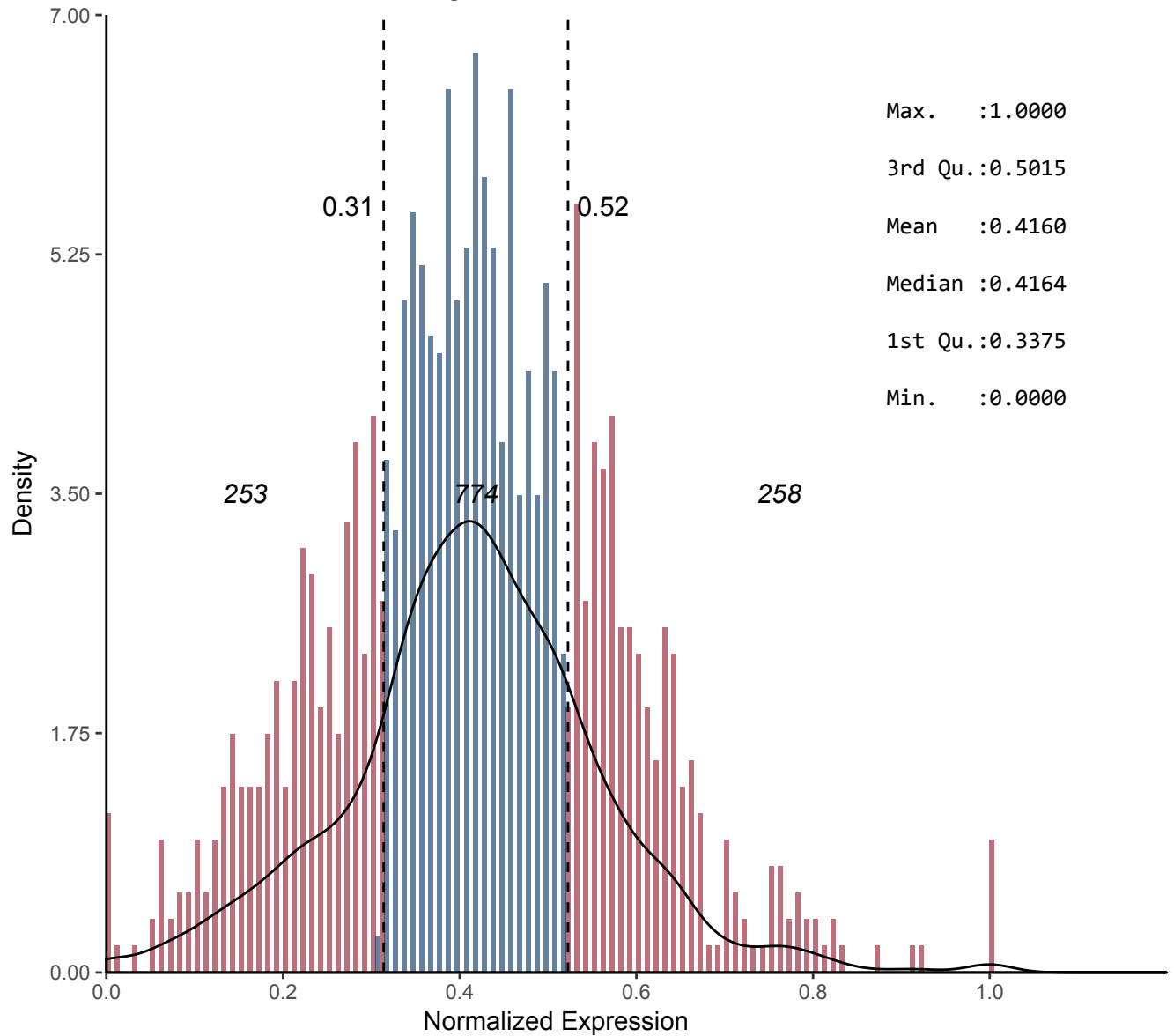


Figure 149 - CD131

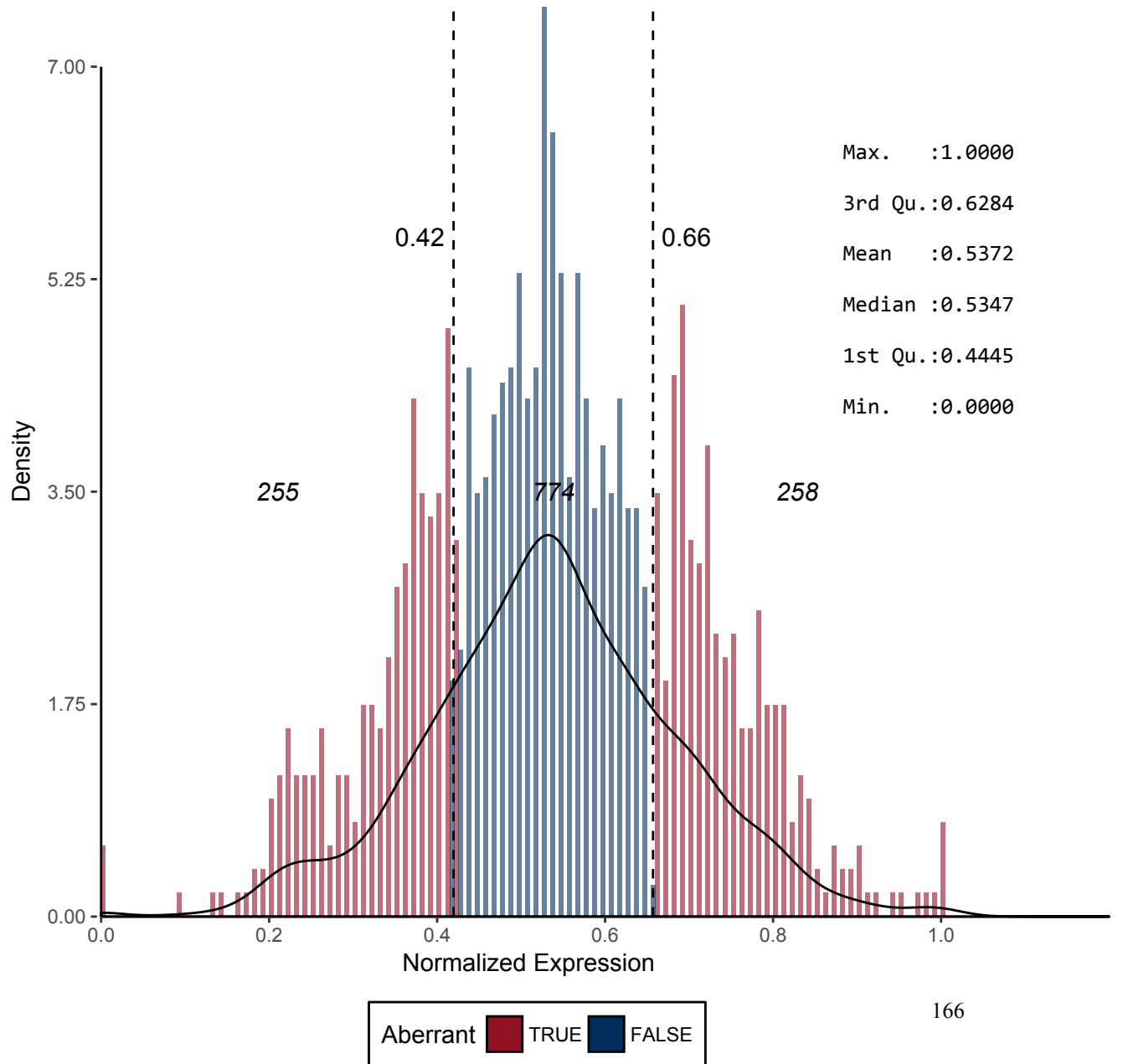


Figure 150 - CD132

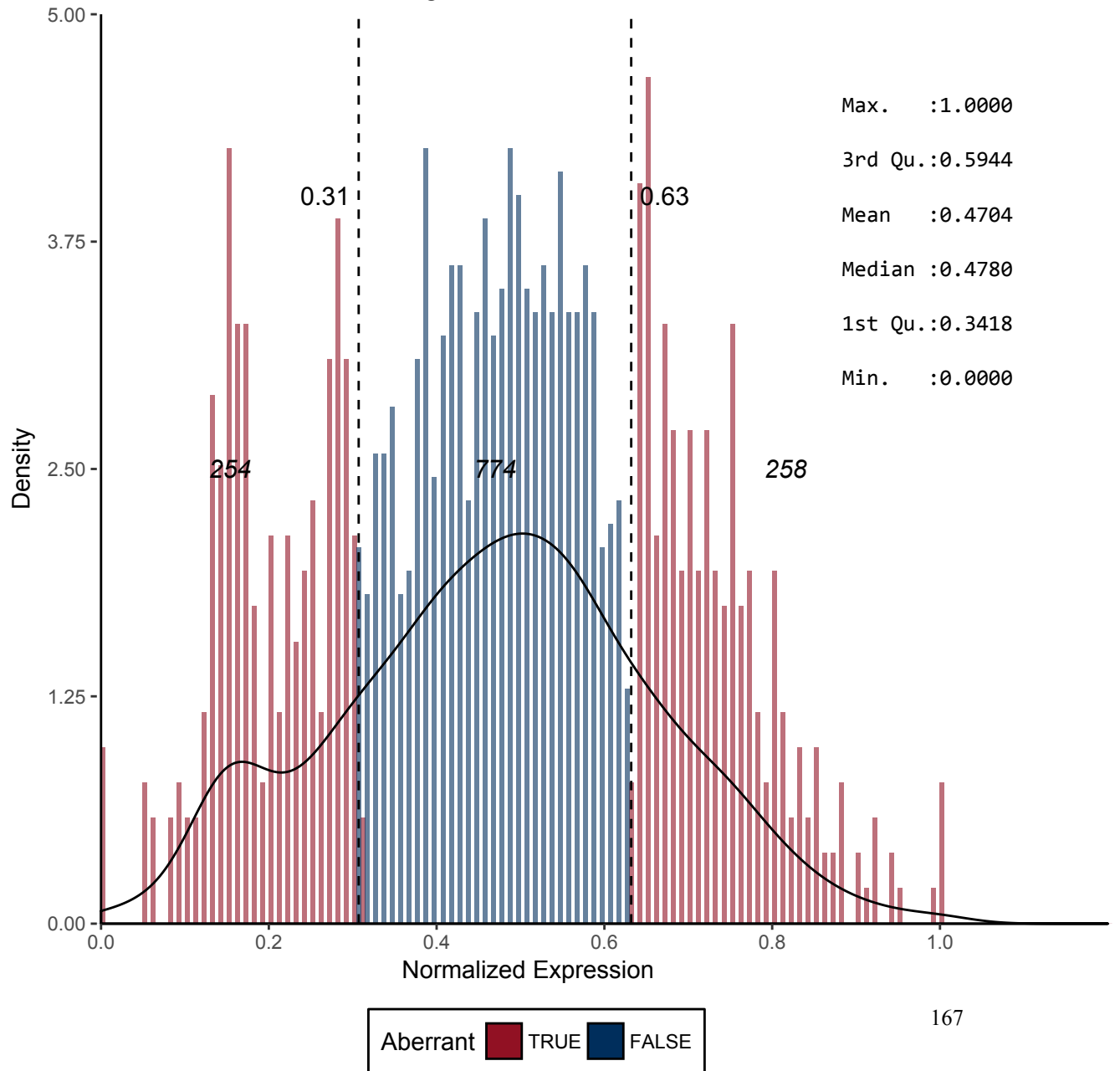


Figure 151 - CD133*

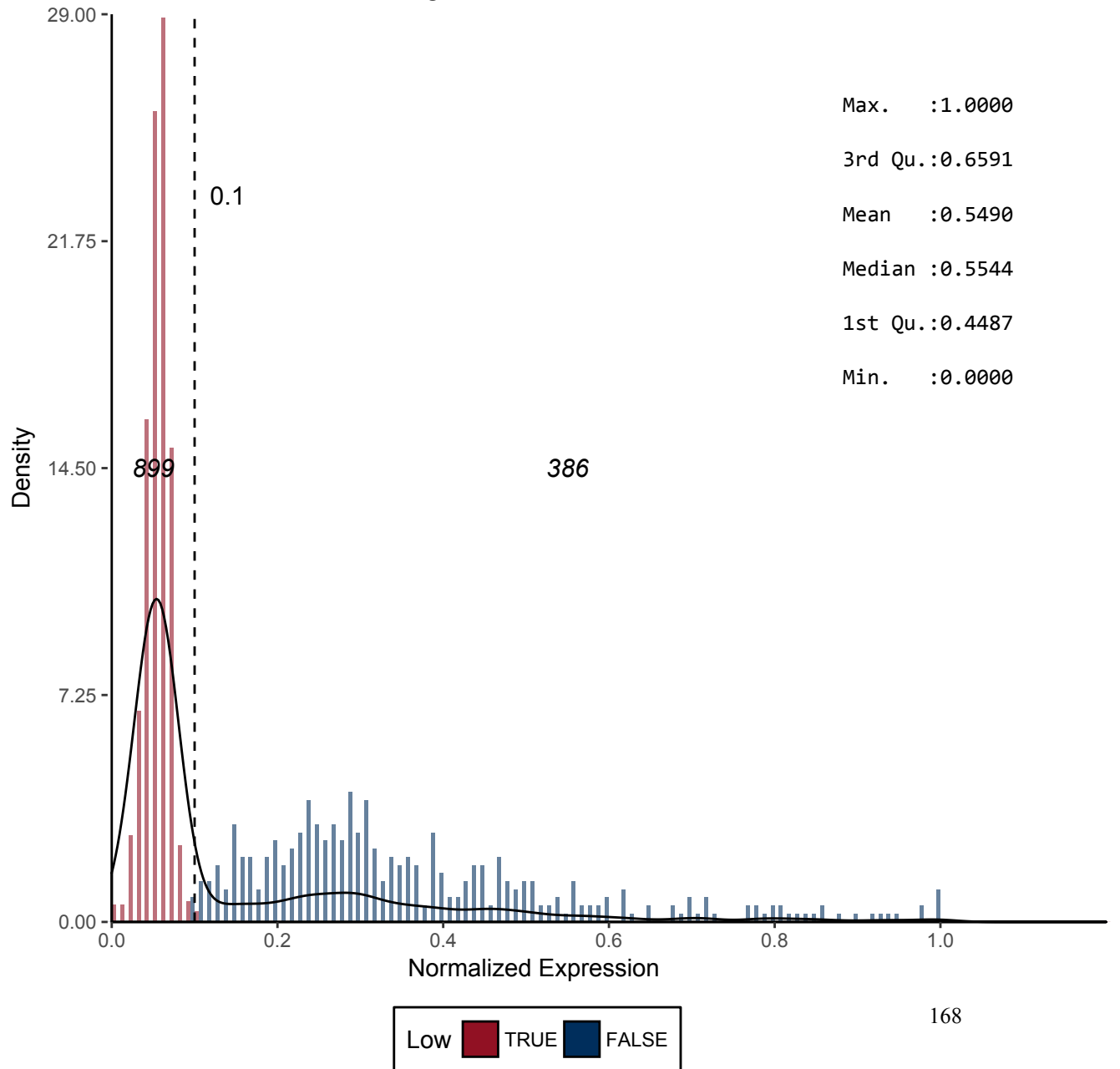


Figure 152 - CD134

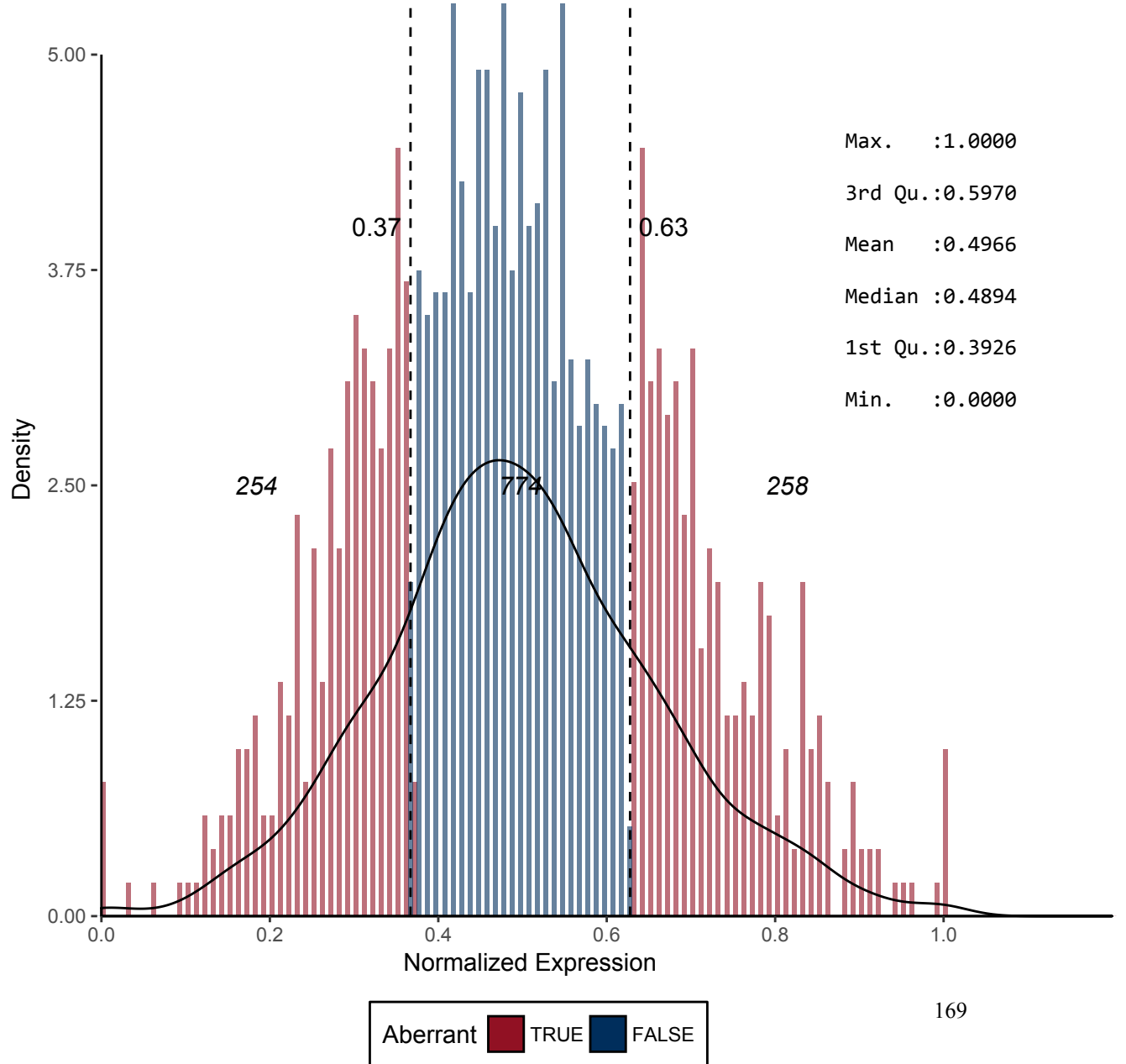


Figure 153 - CD135*

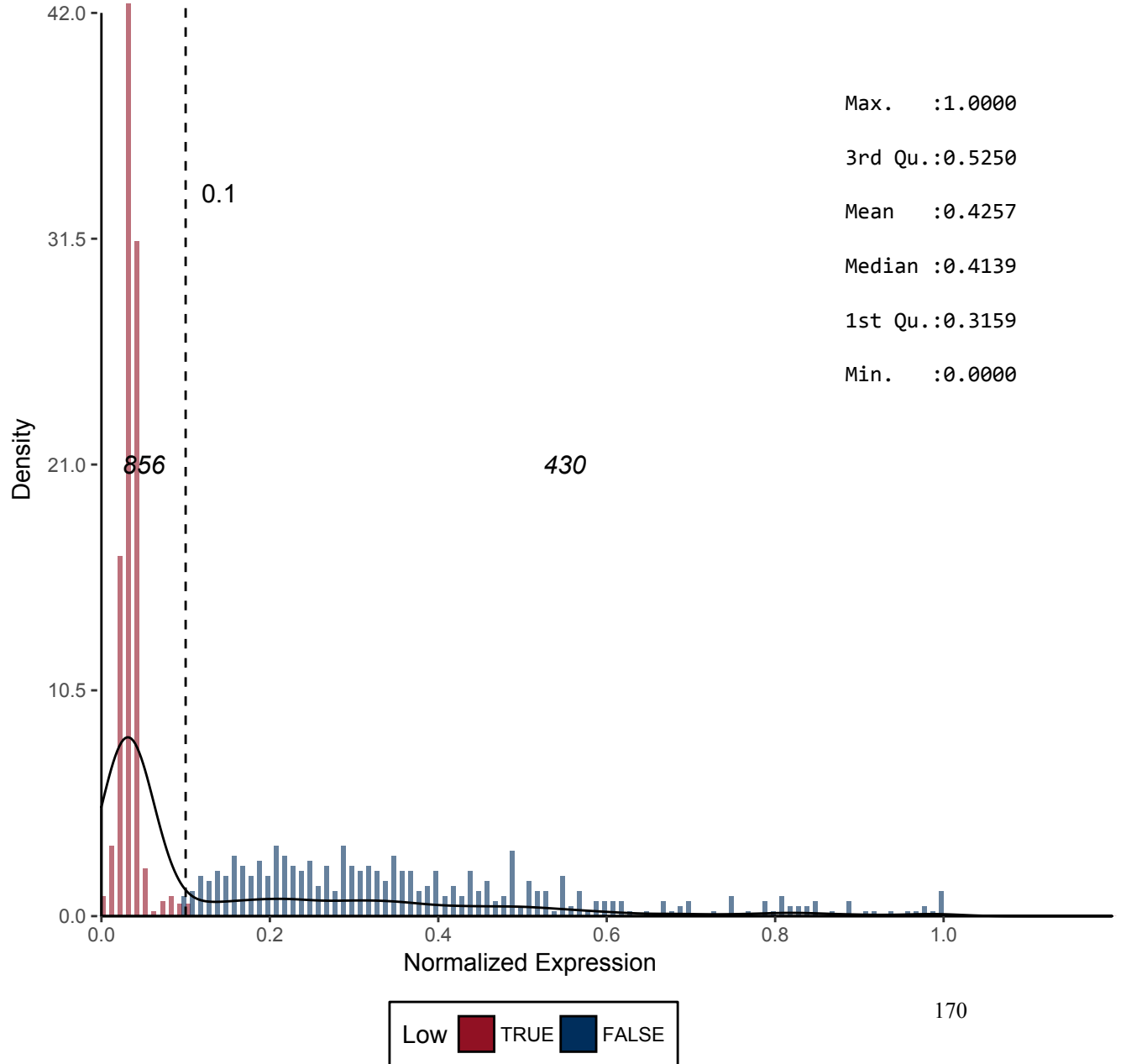
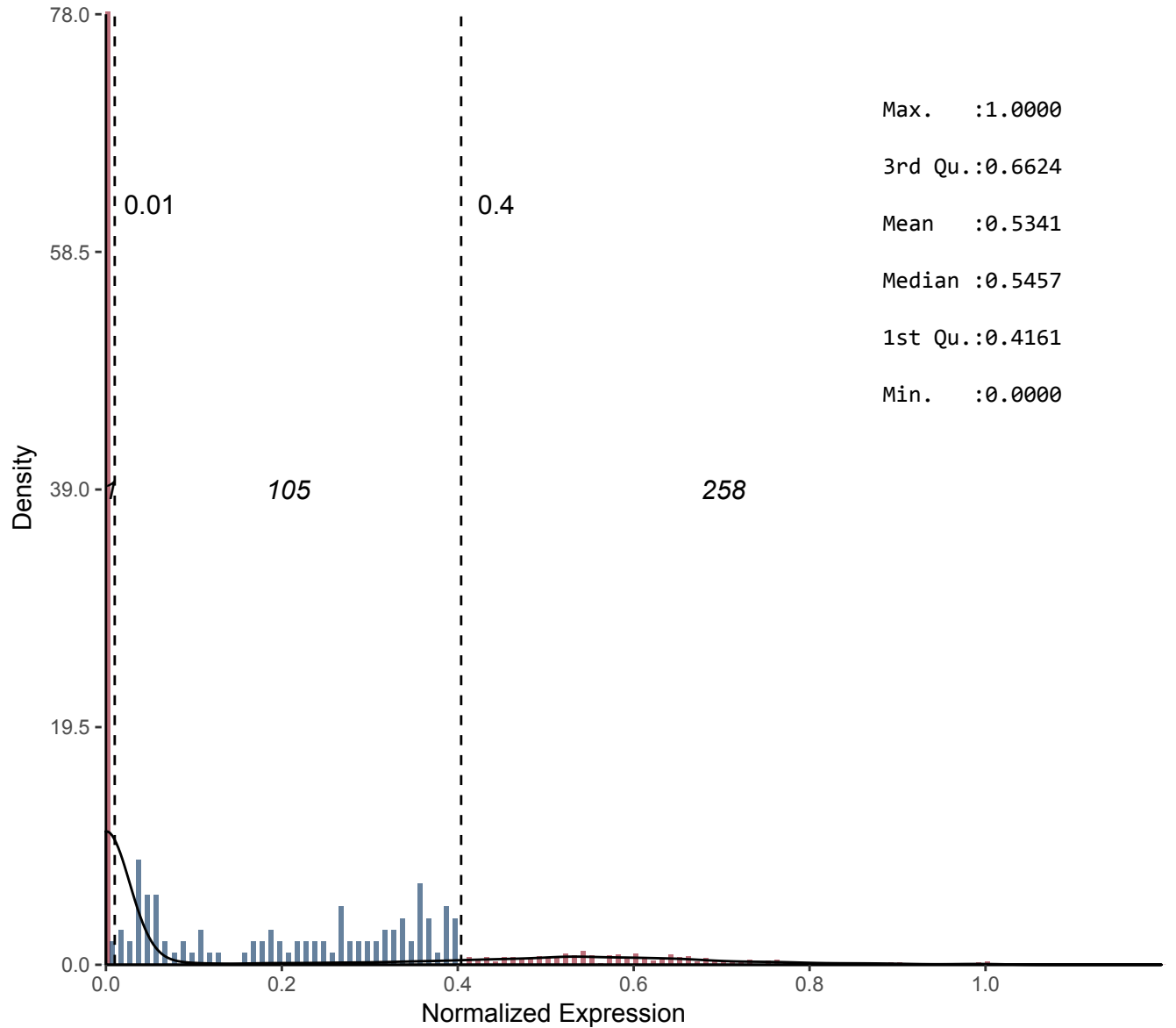
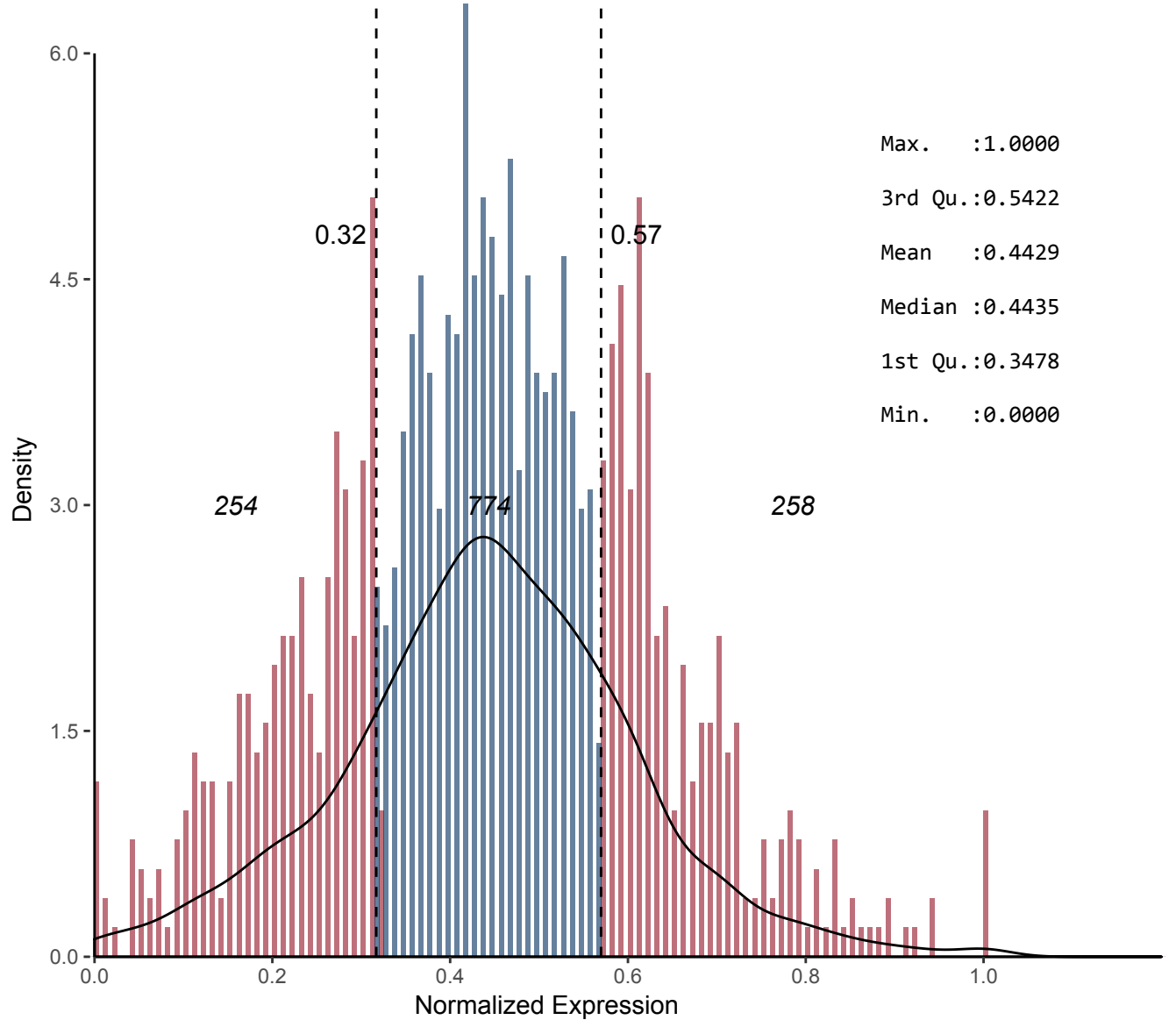


Figure 154 - CD136*



Aberrant TRUE FALSE

Figure 155 - CD137



Aberrant TRUE FALSE

Figure 156 - CD138

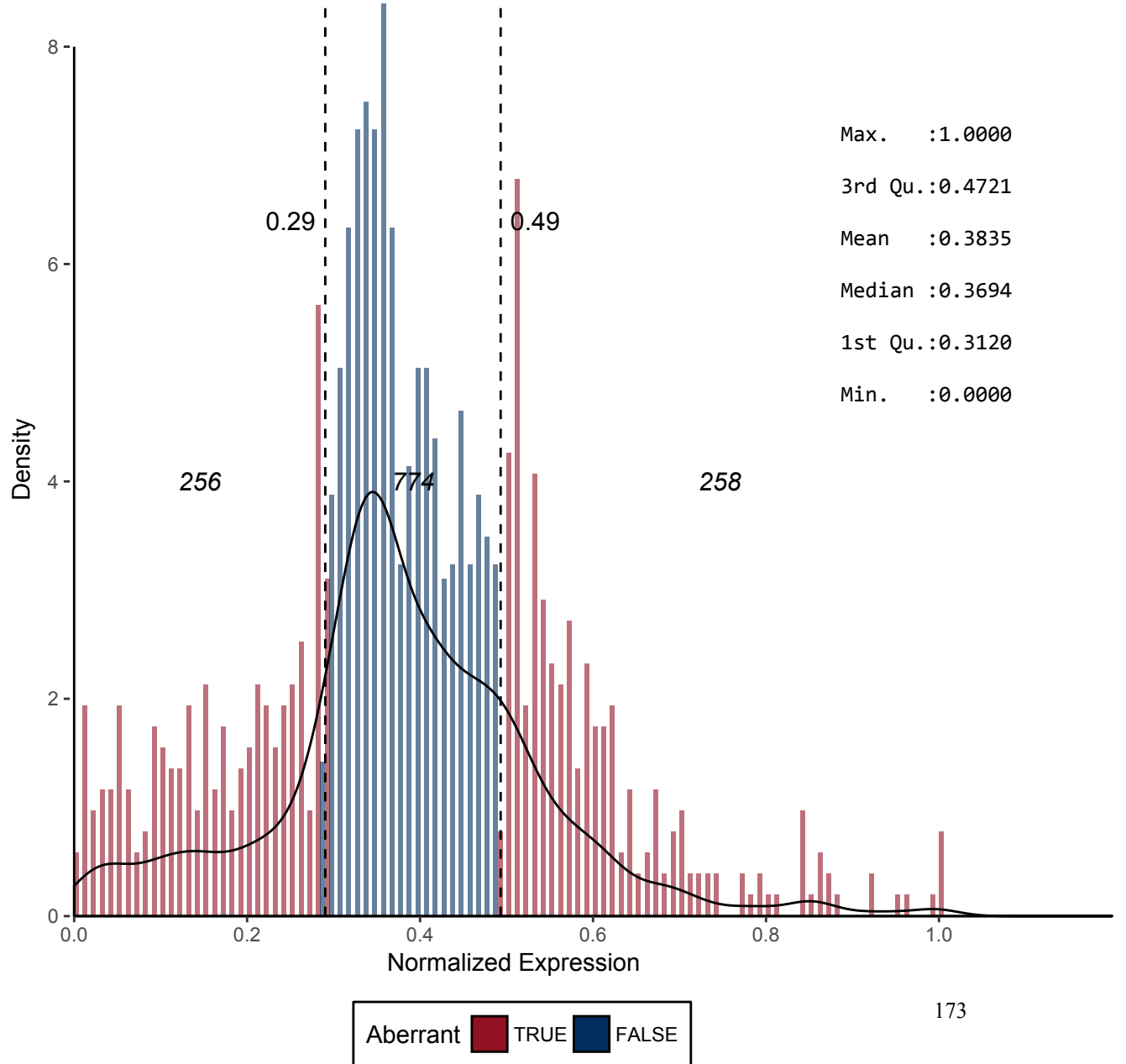


Figure 157 - CD140A*

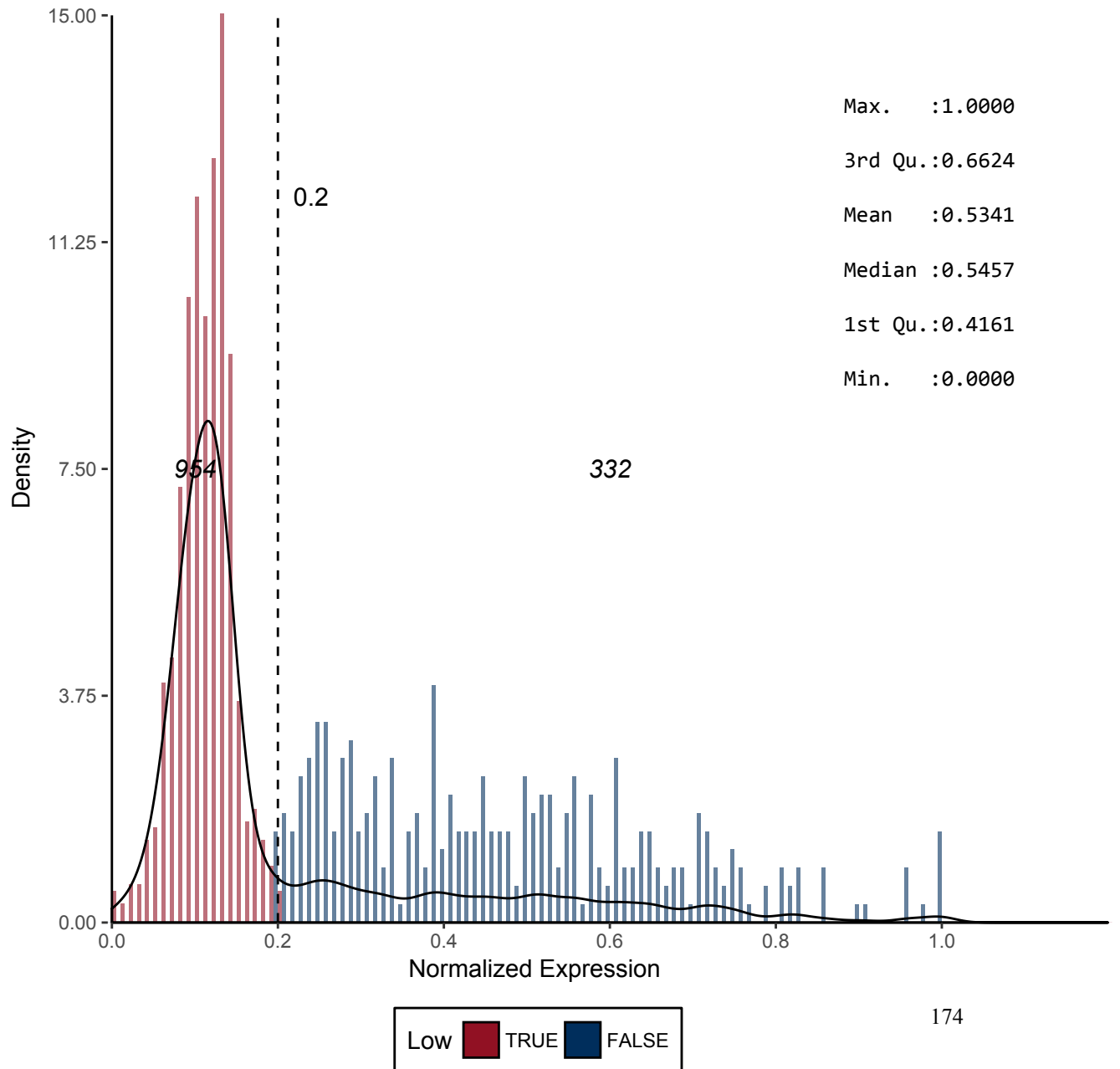


Figure 158 - CD140B

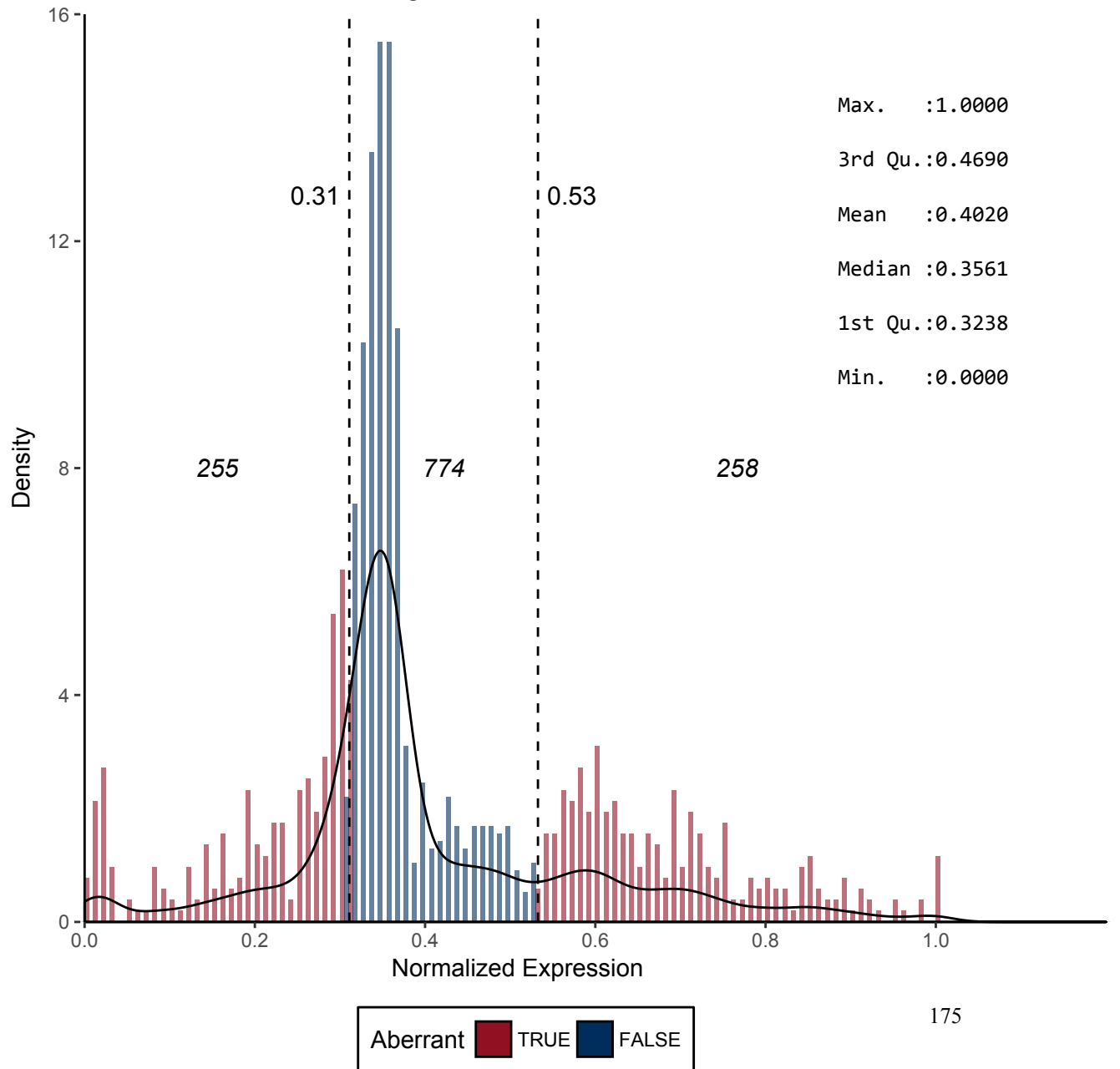


Figure 159 - CD141

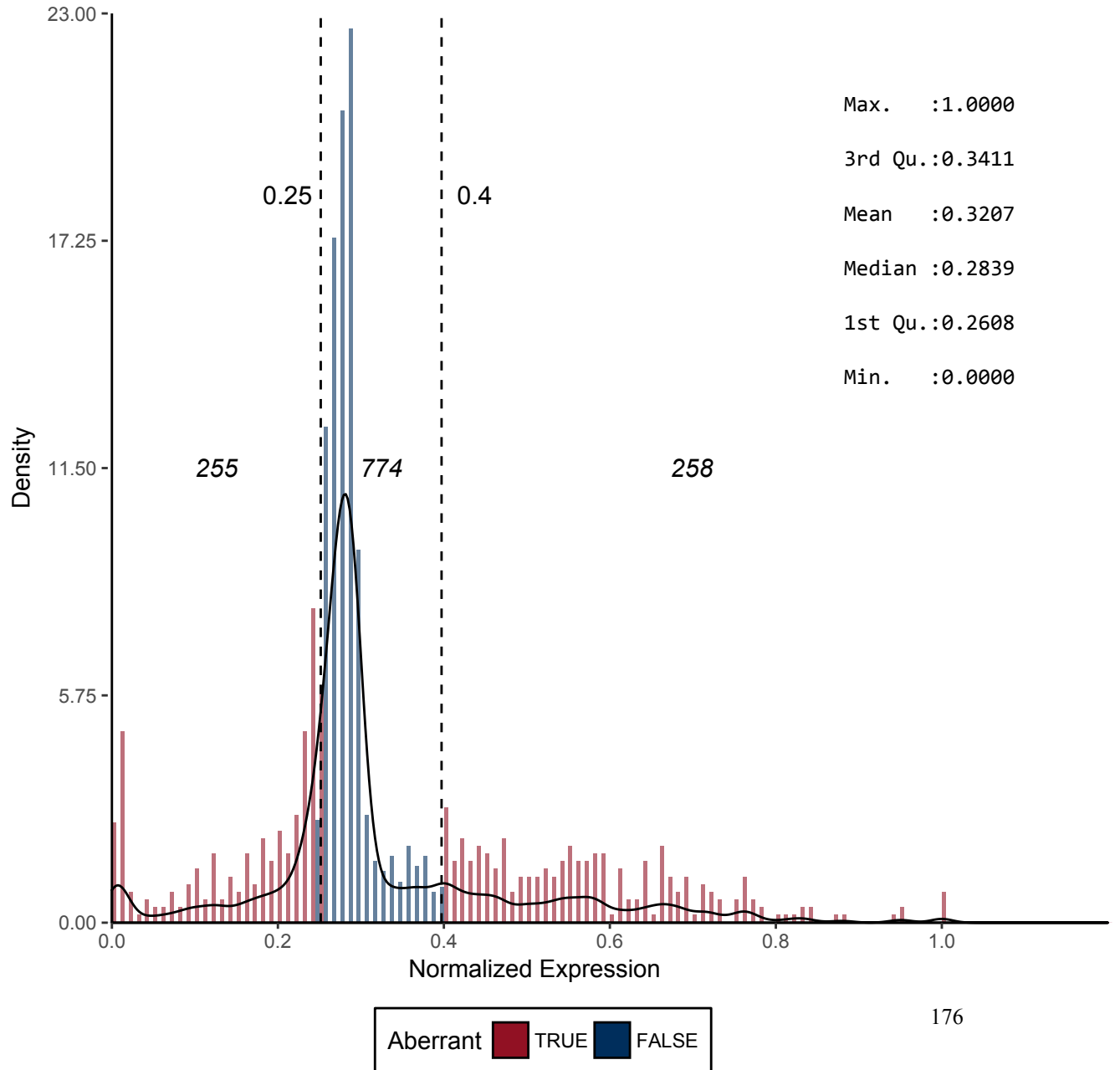


Figure 160 - CD142*

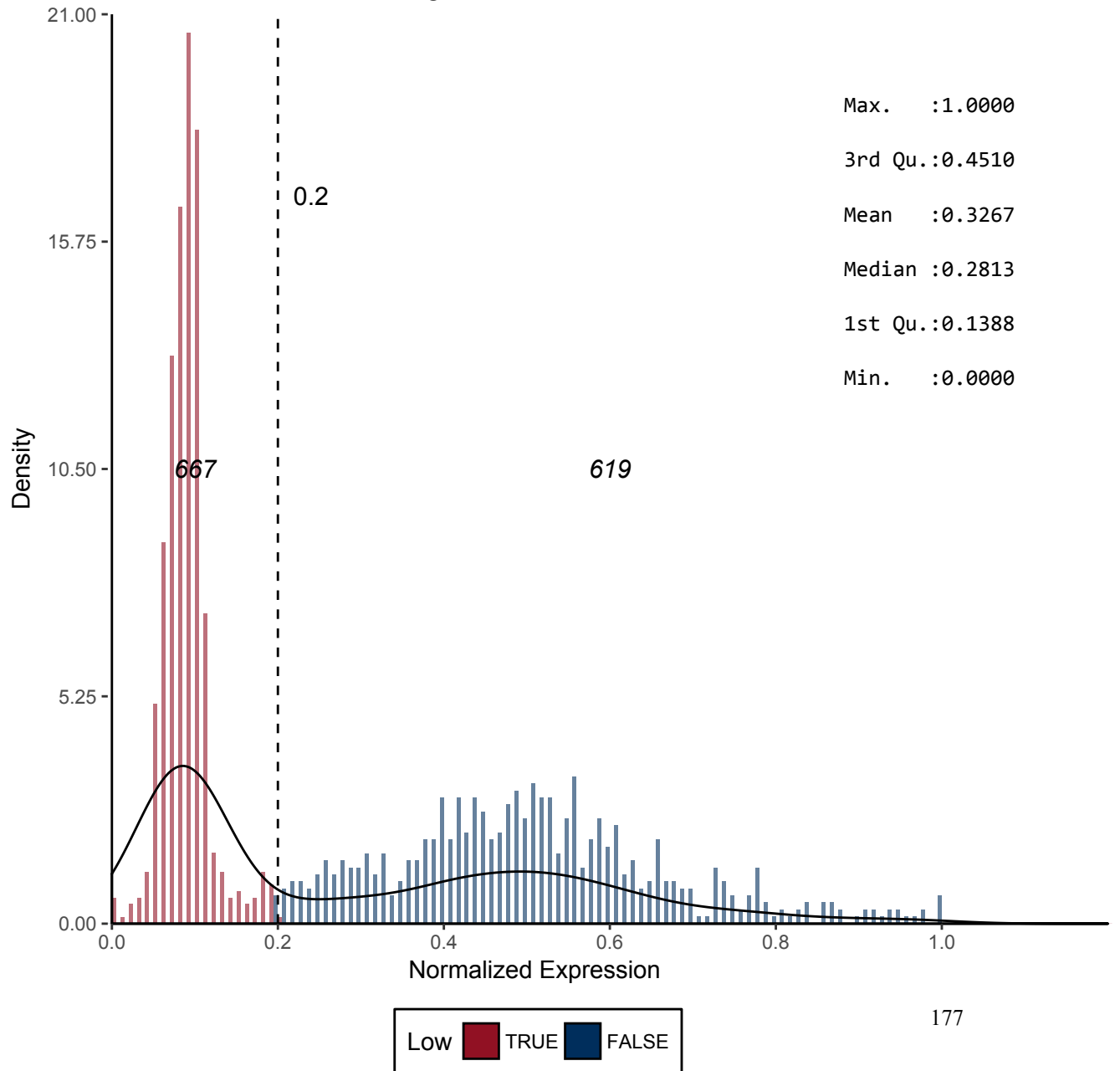


Figure 161 - CD143*

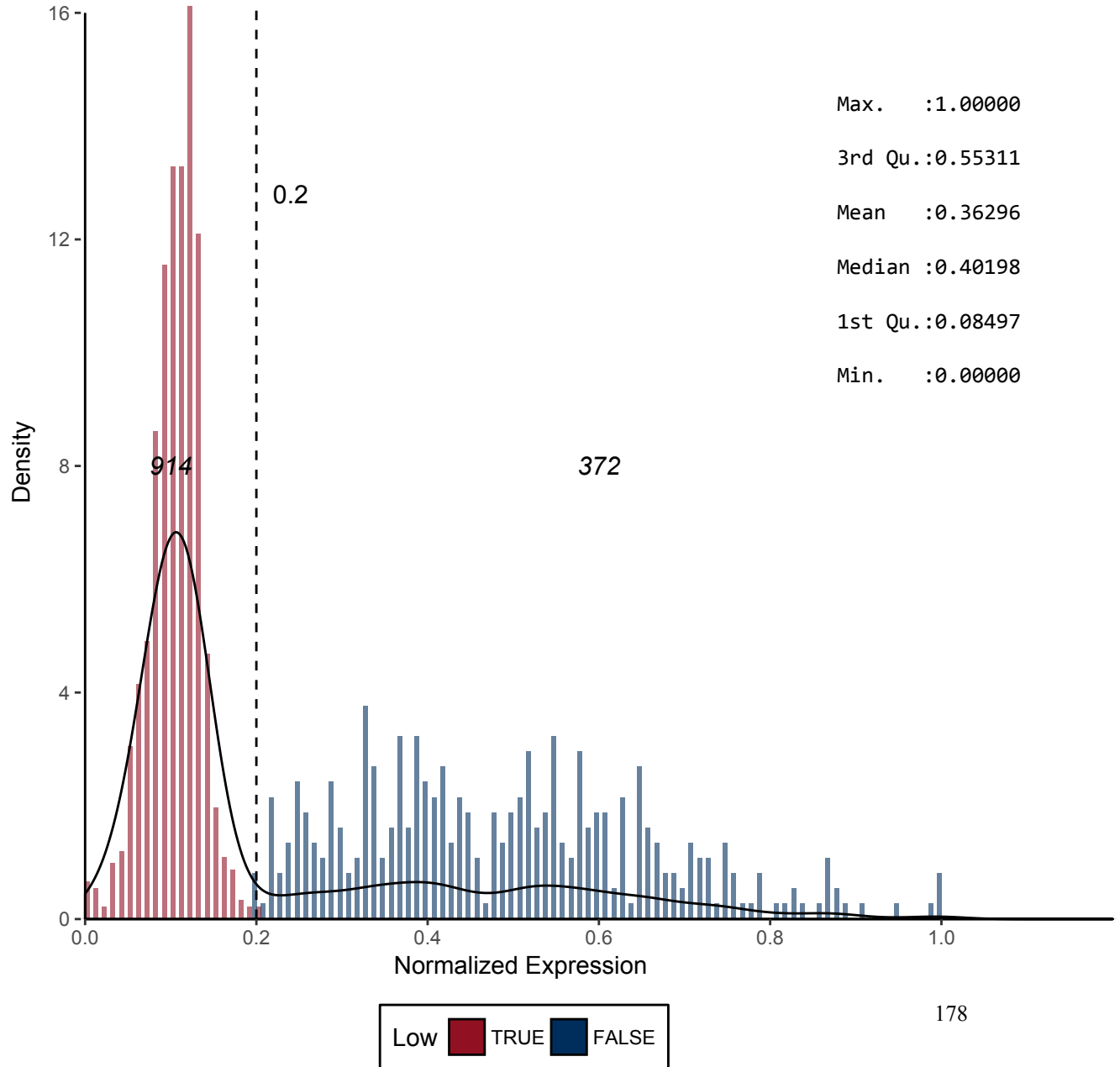


Figure 162 - CD144*

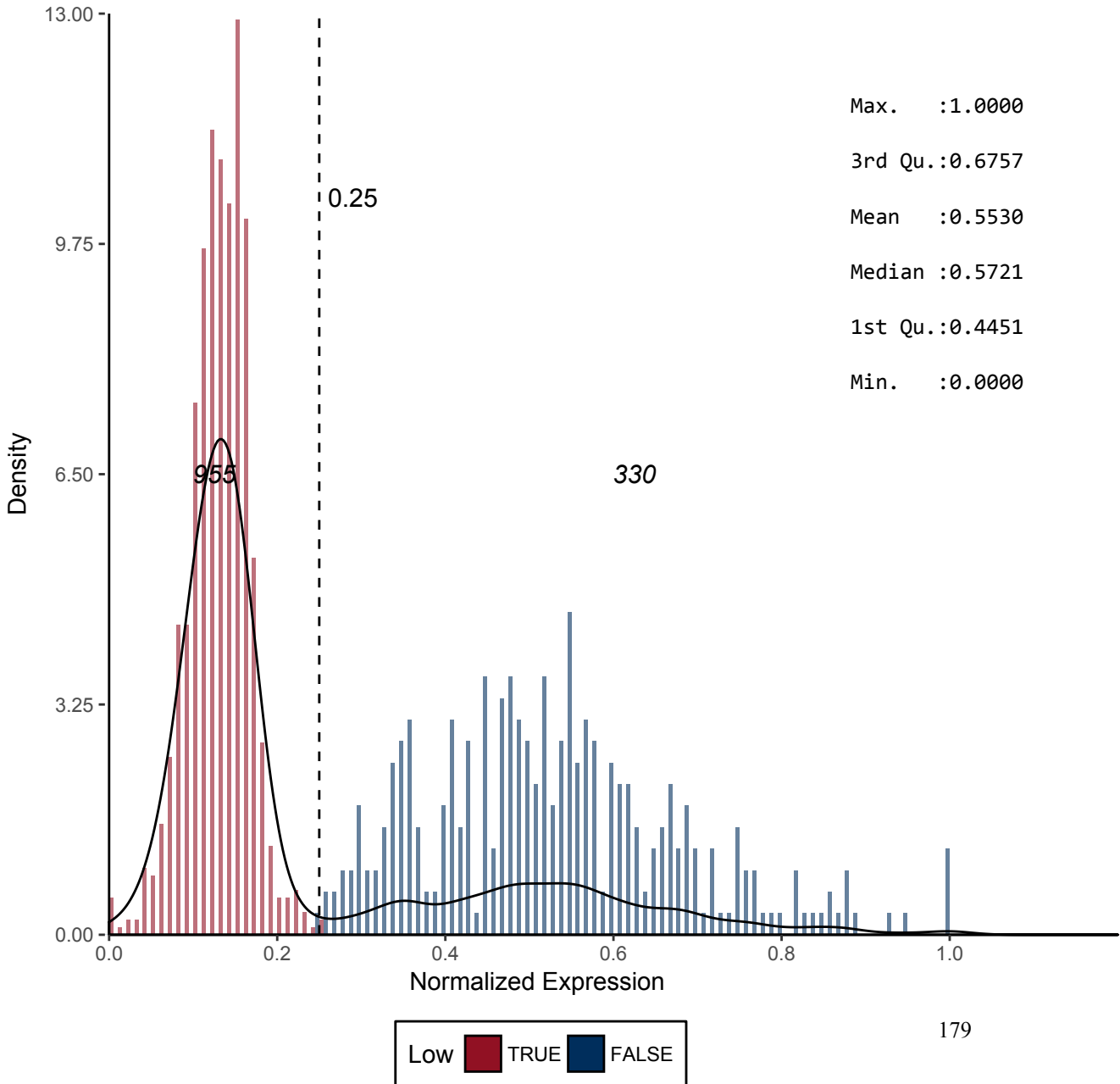


Figure 163 - CD146*

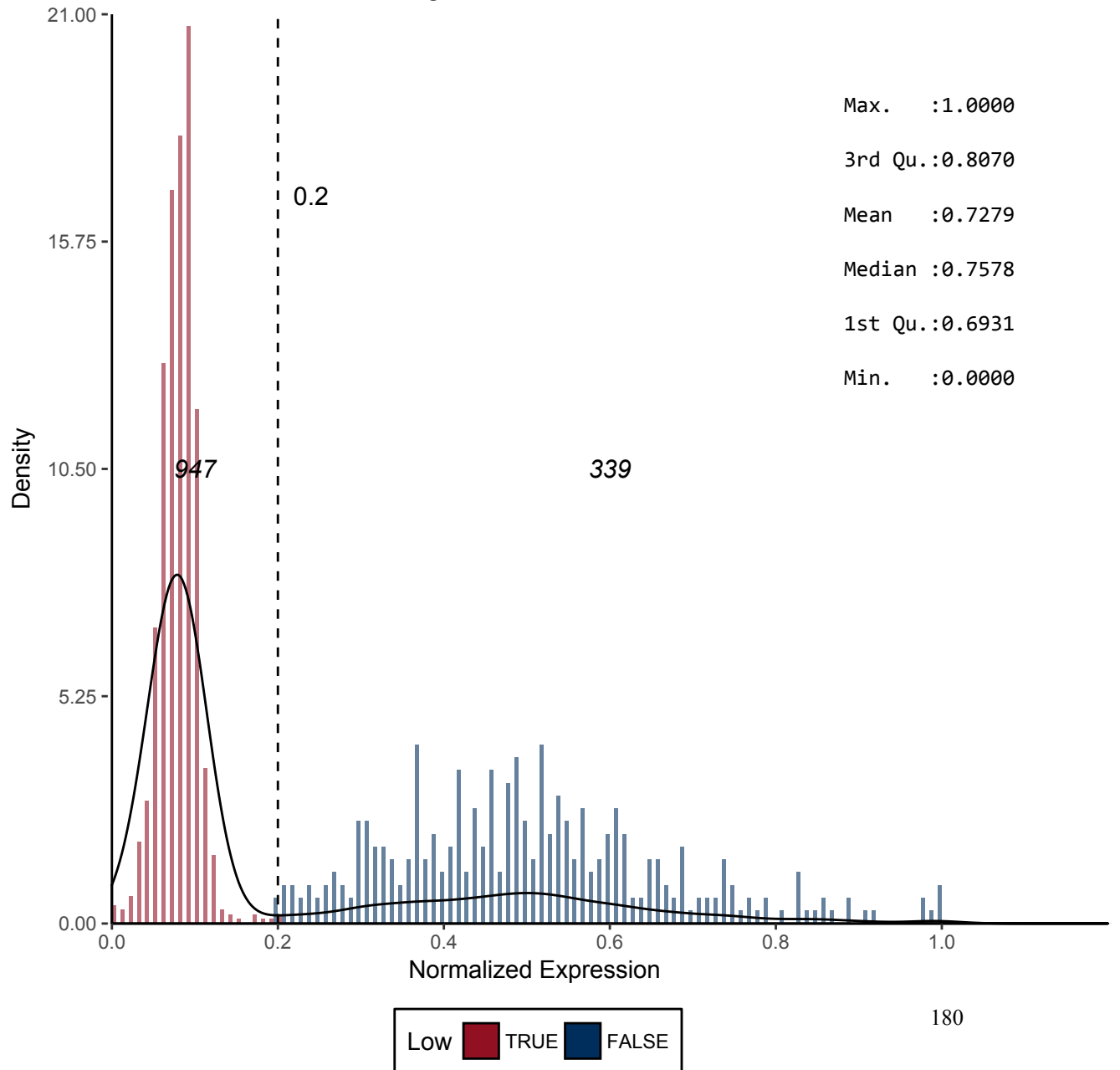


Figure 164 - CD147

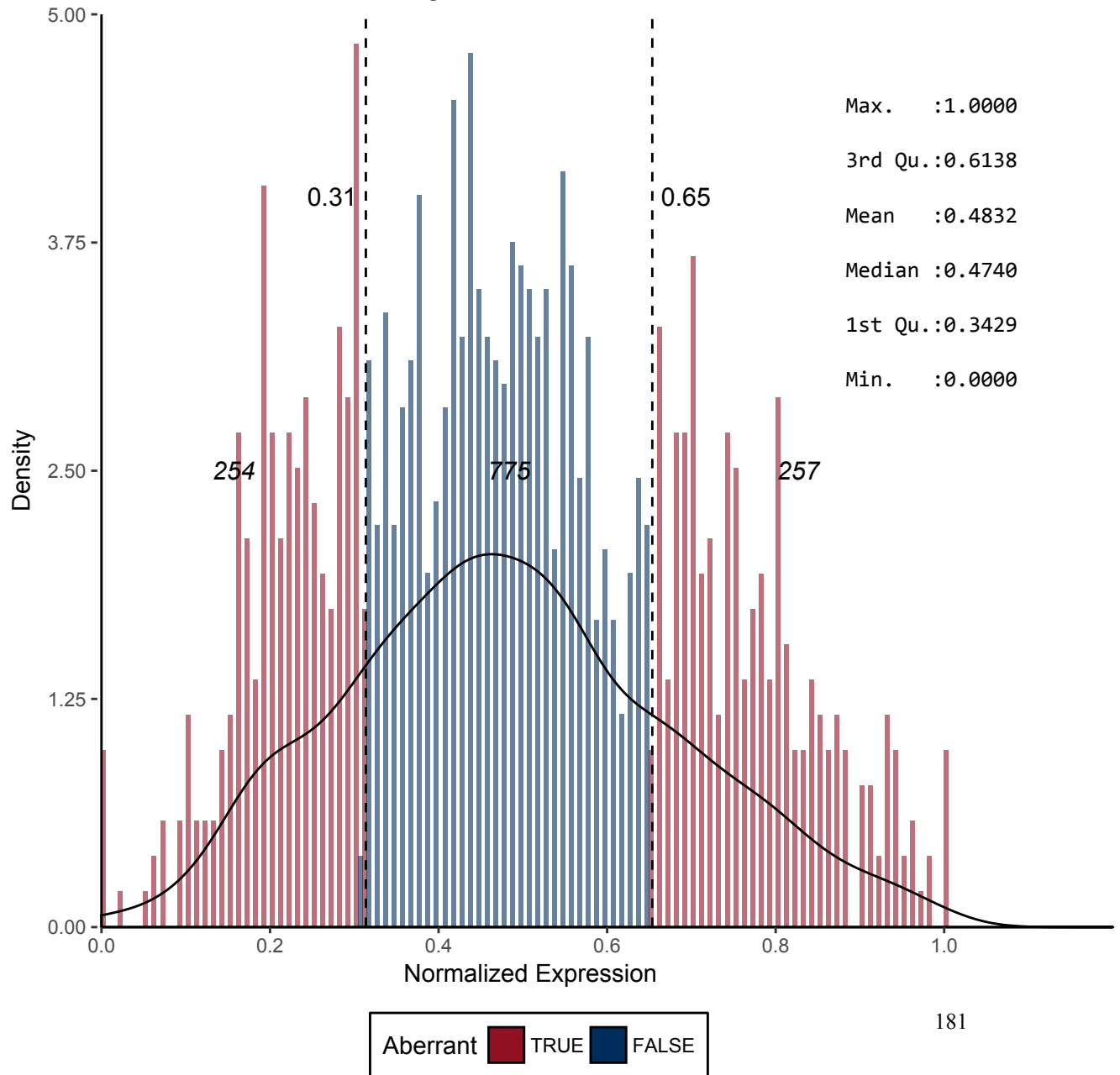


Figure 165 - CD148

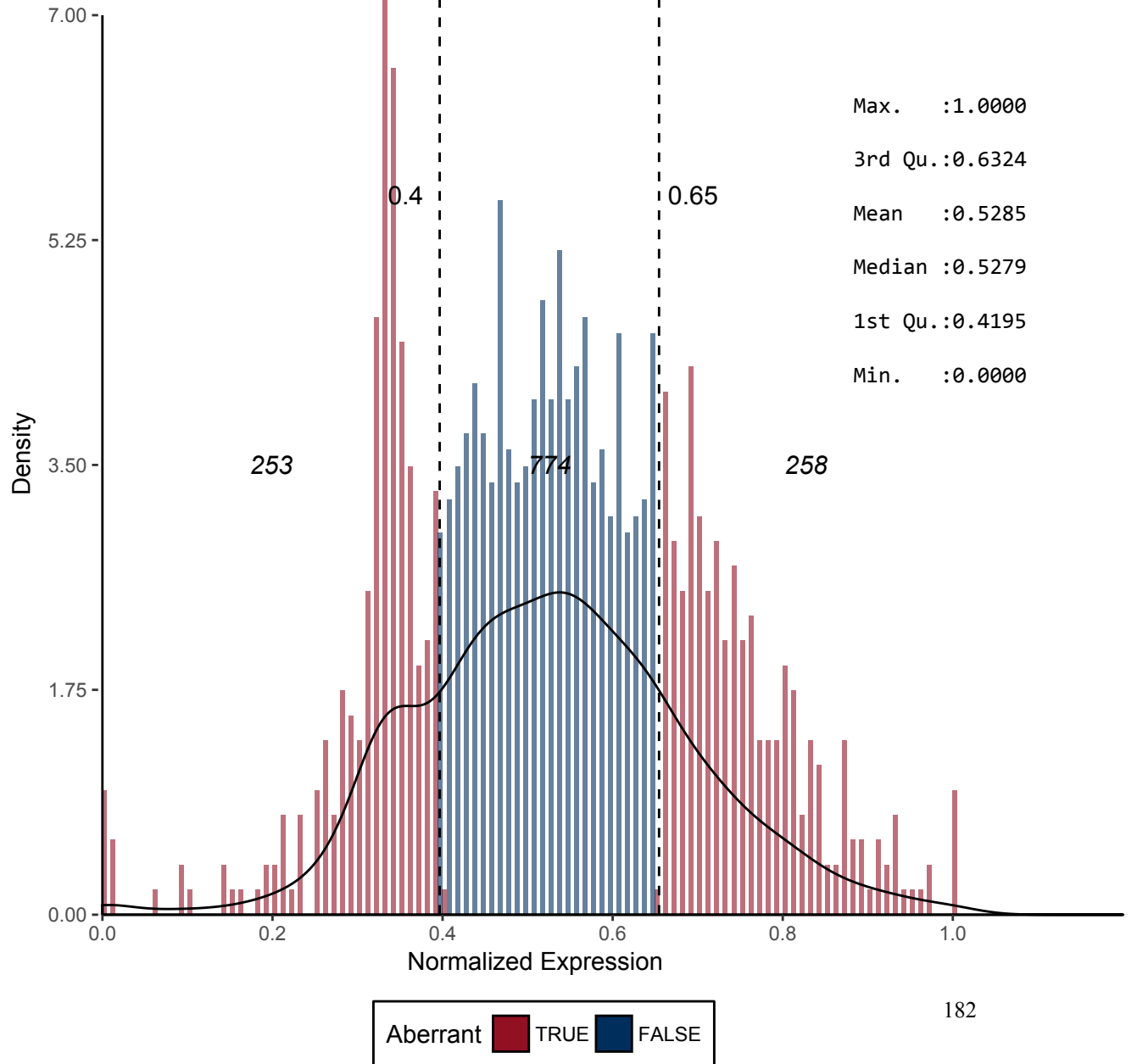


Figure 166 - CD150

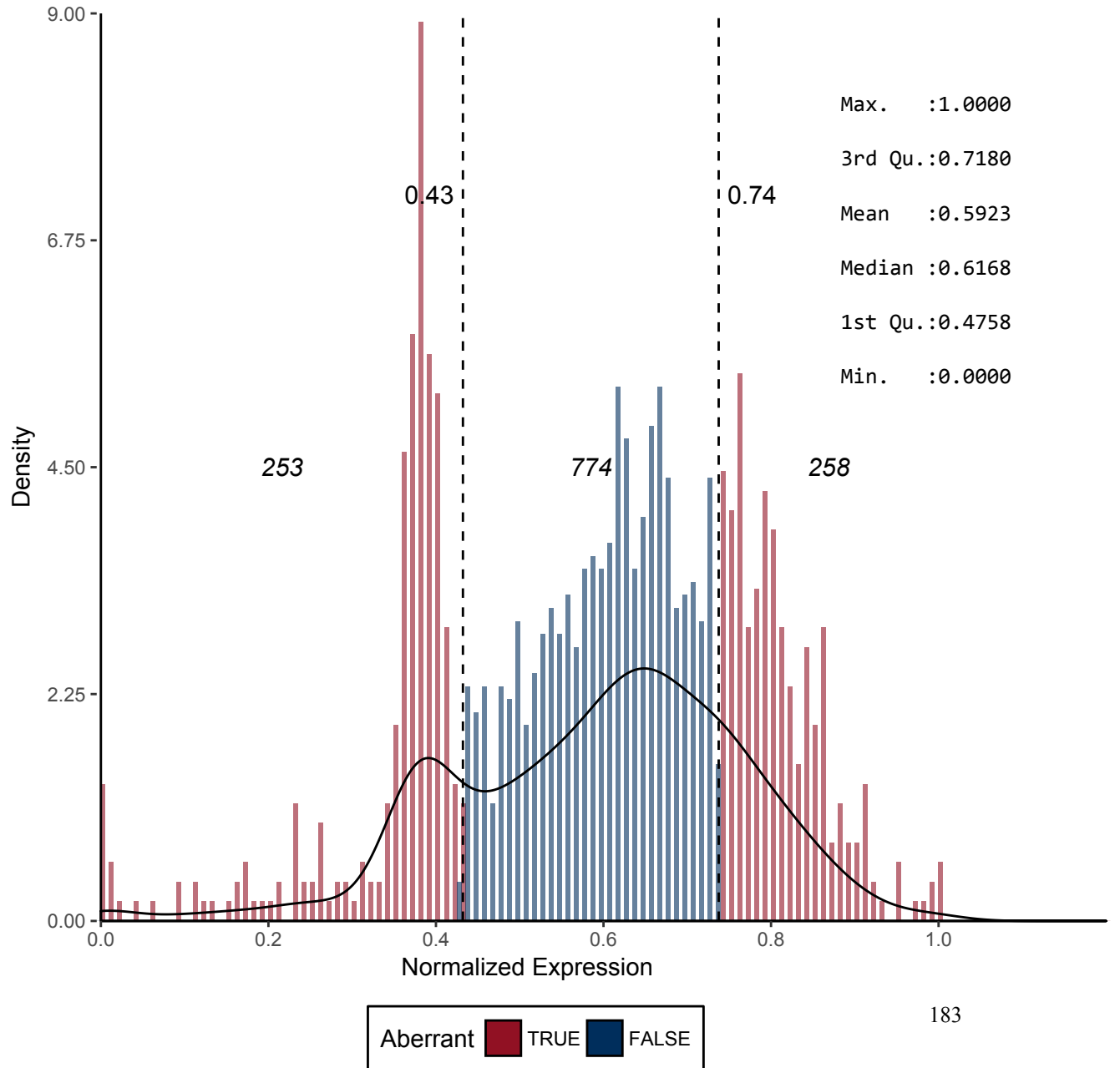
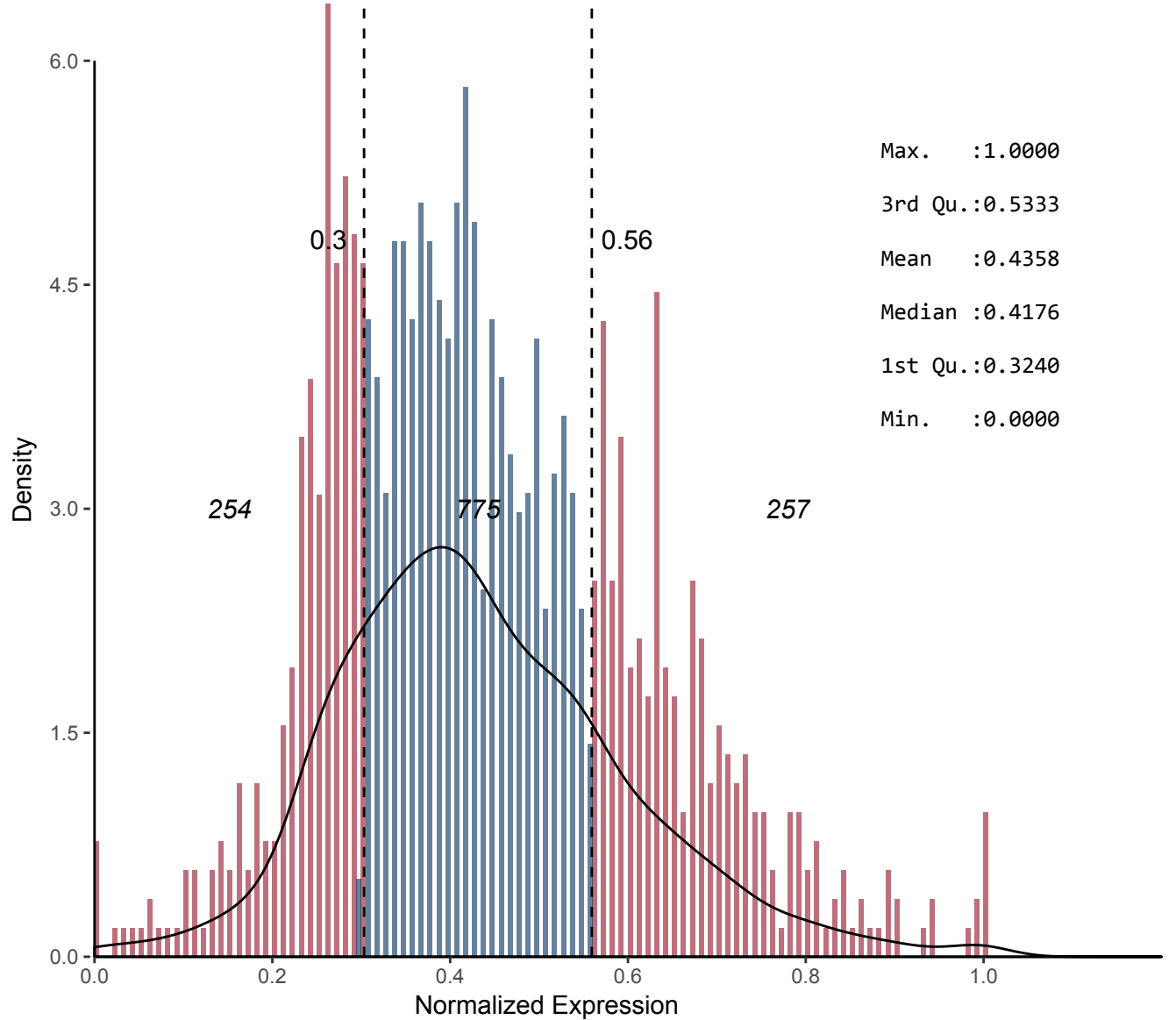


Figure 167 - CD151



Aberrant TRUE FALSE

Figure 168 - CD152

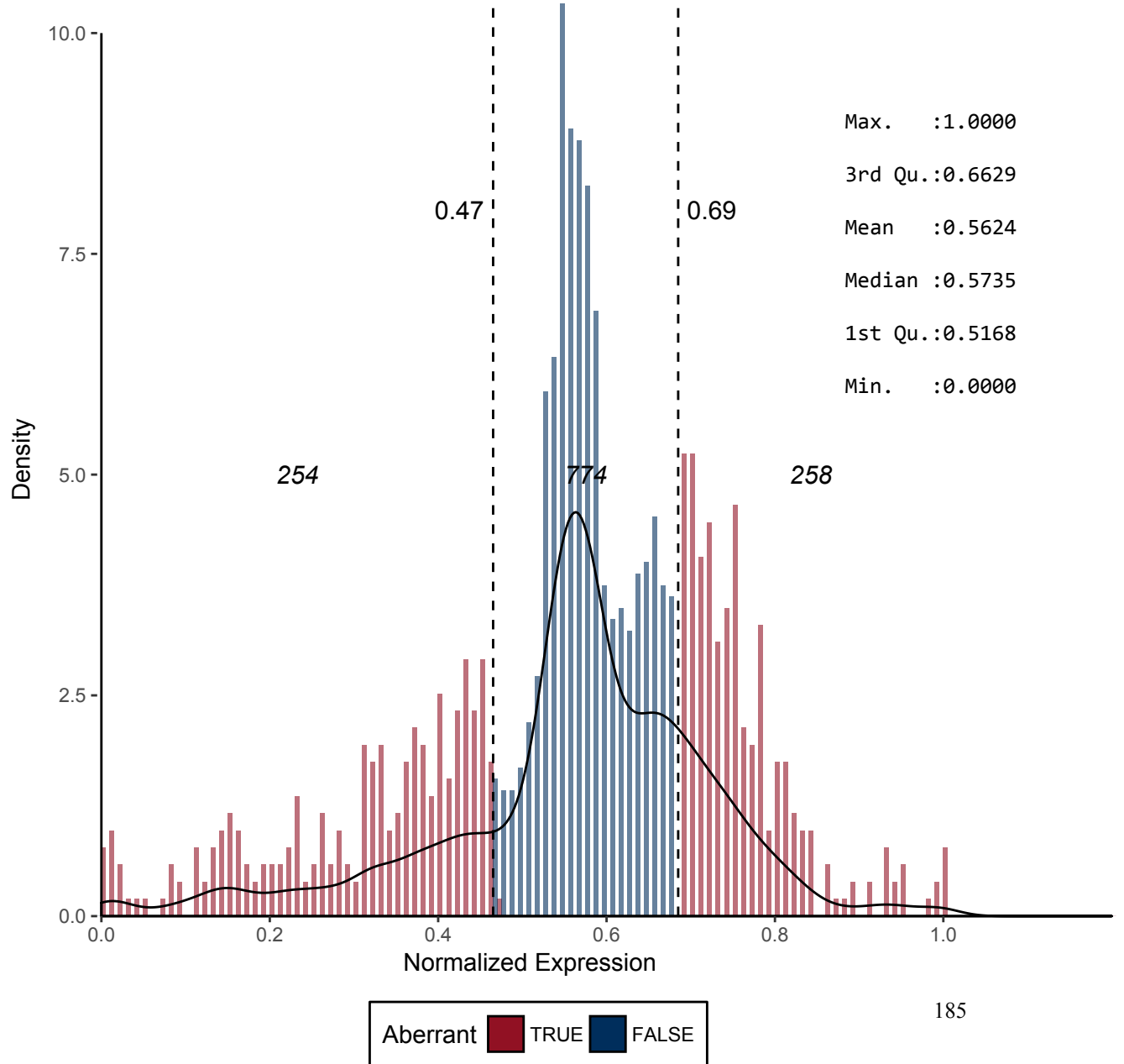
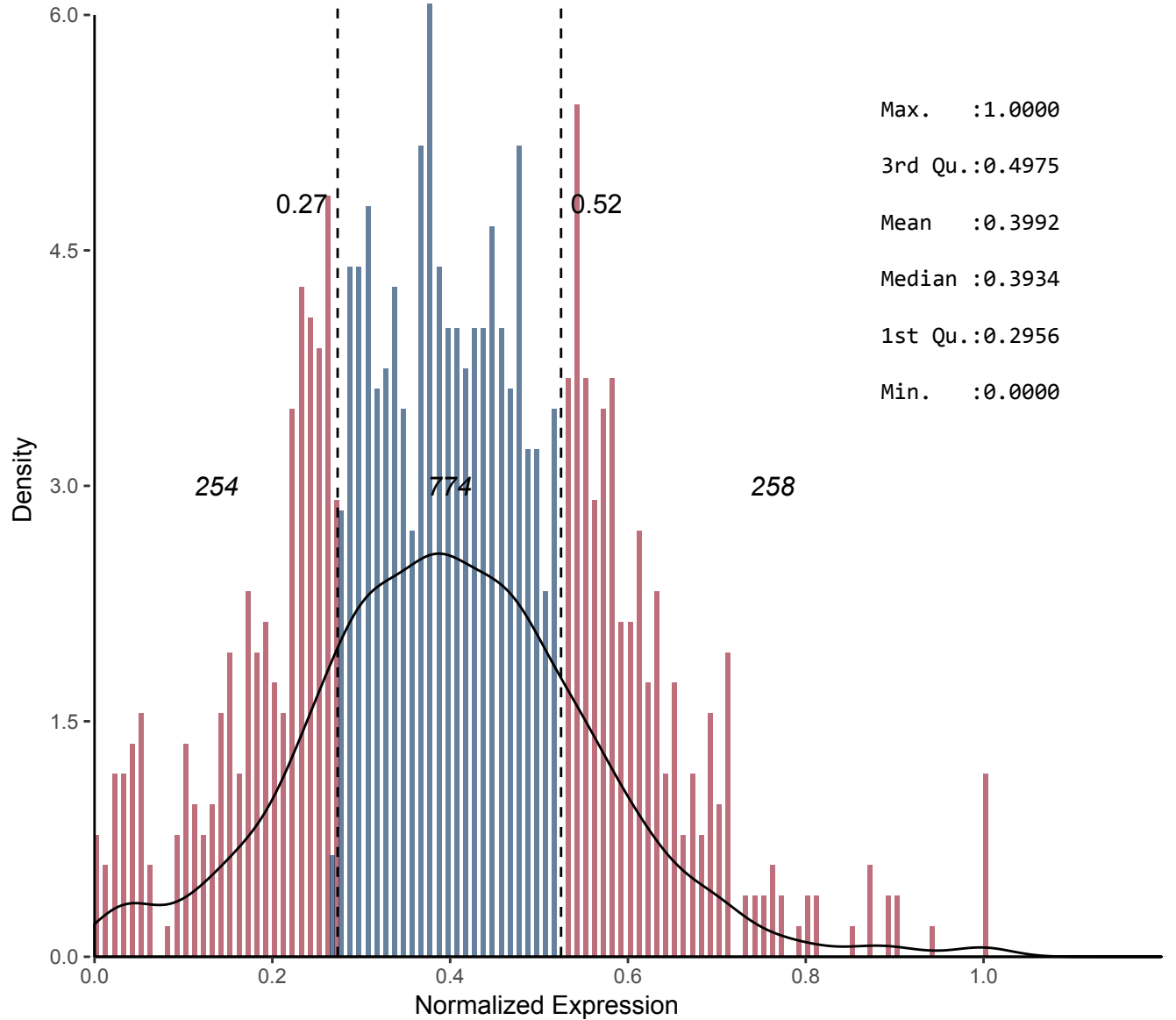


Figure 169 - CD153



Aberrant TRUE FALSE

Figure 170 - CD154*

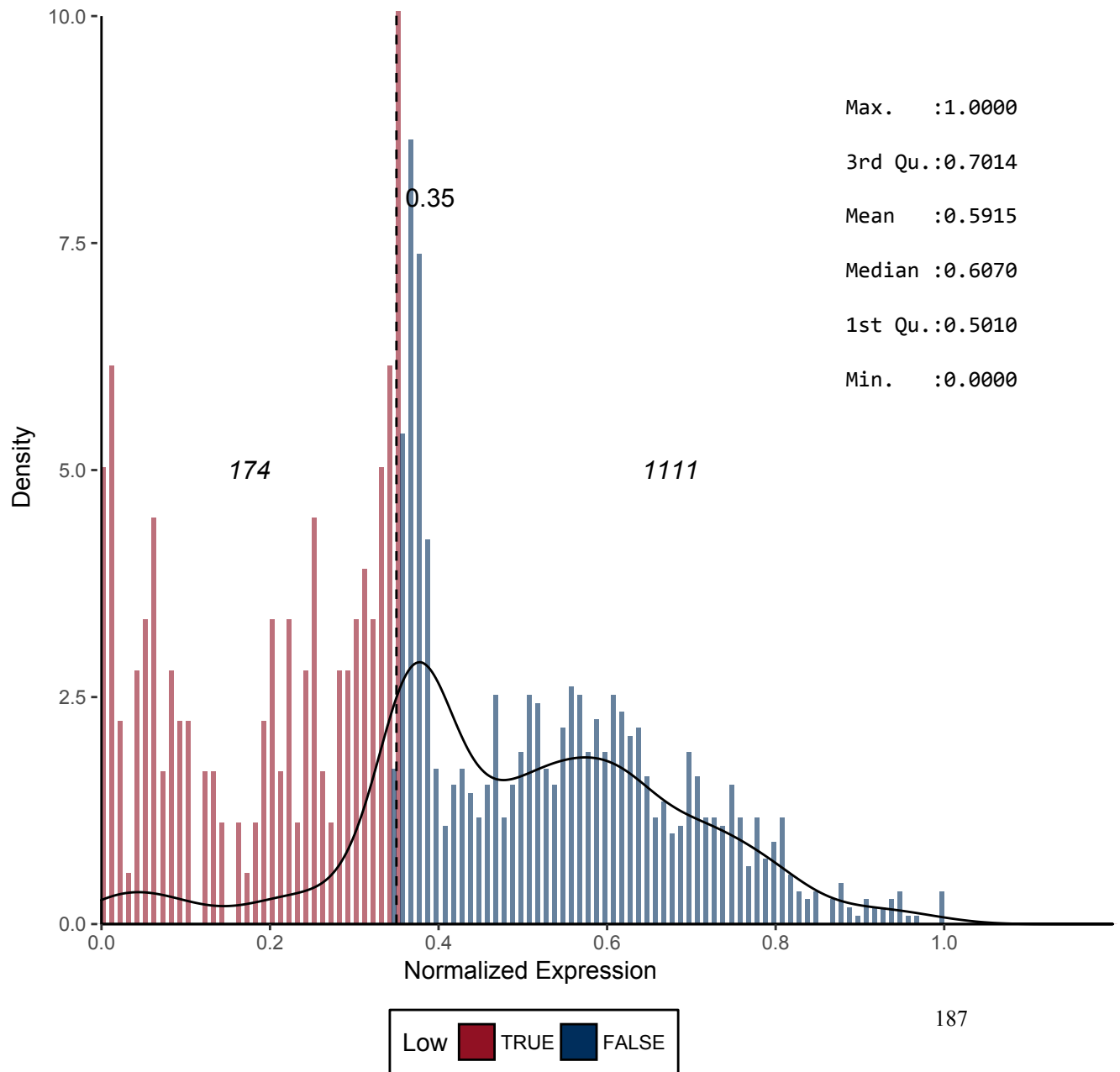


Figure 171 - CD155

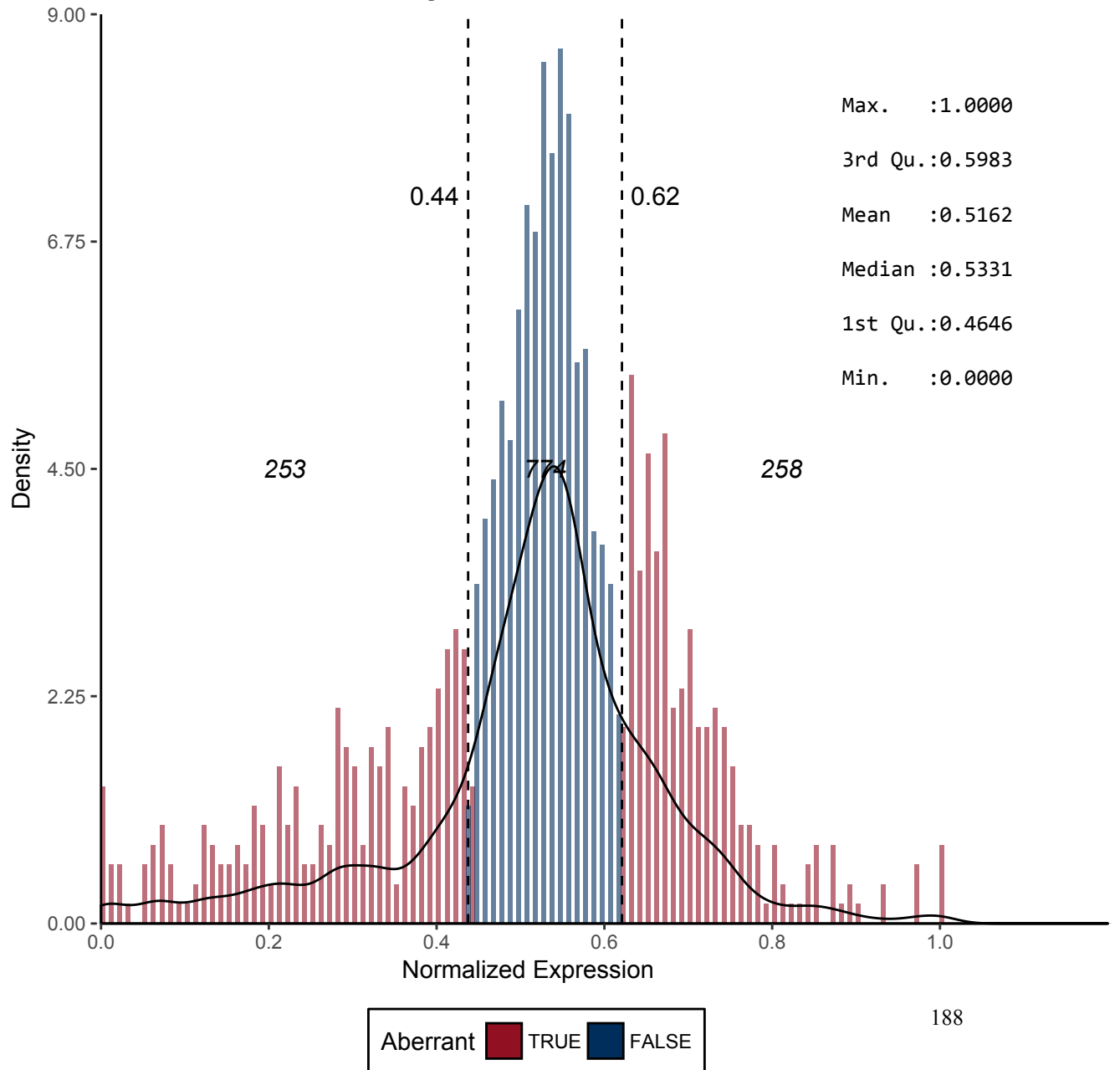


Figure 172 - CD156A

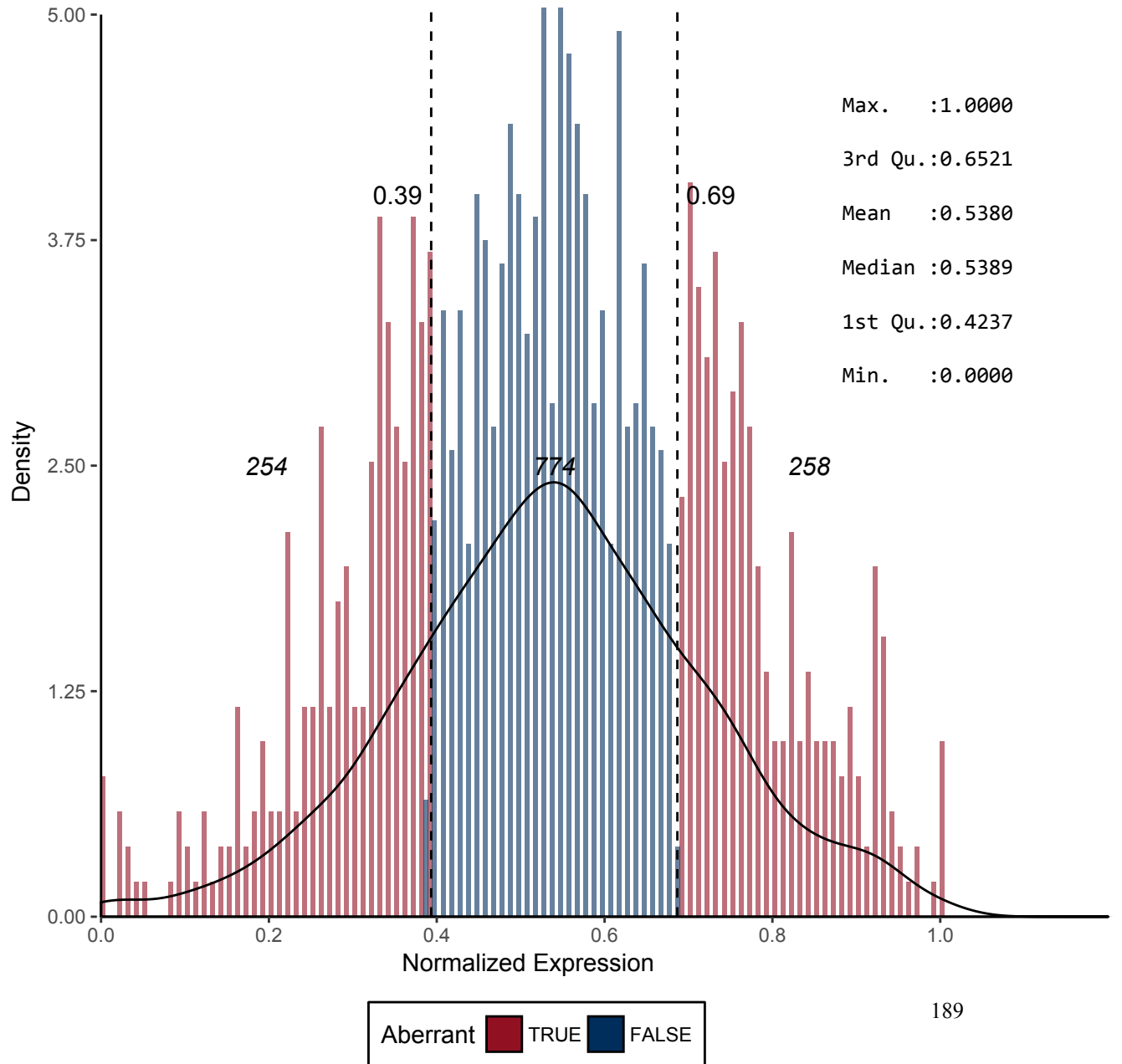
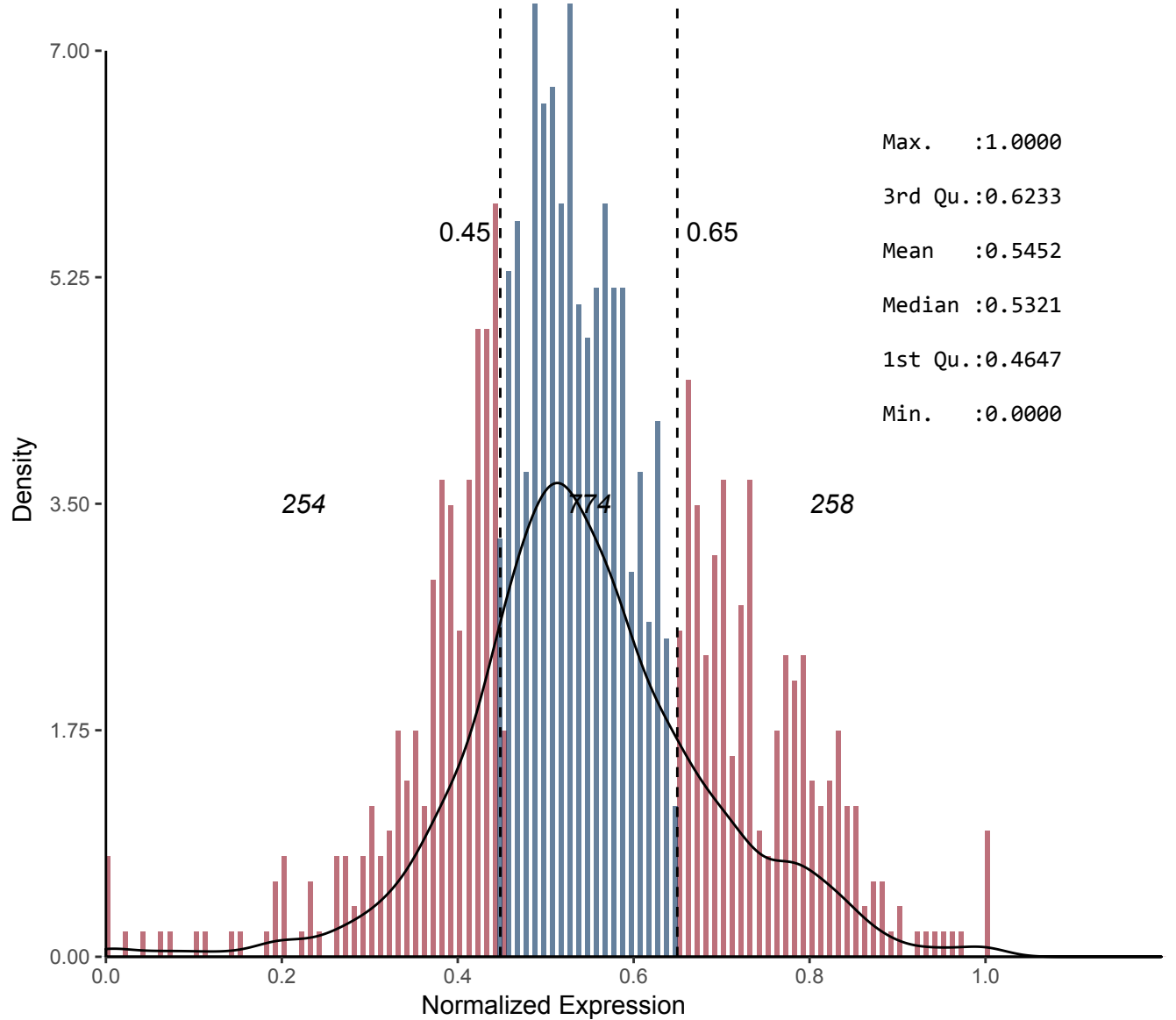
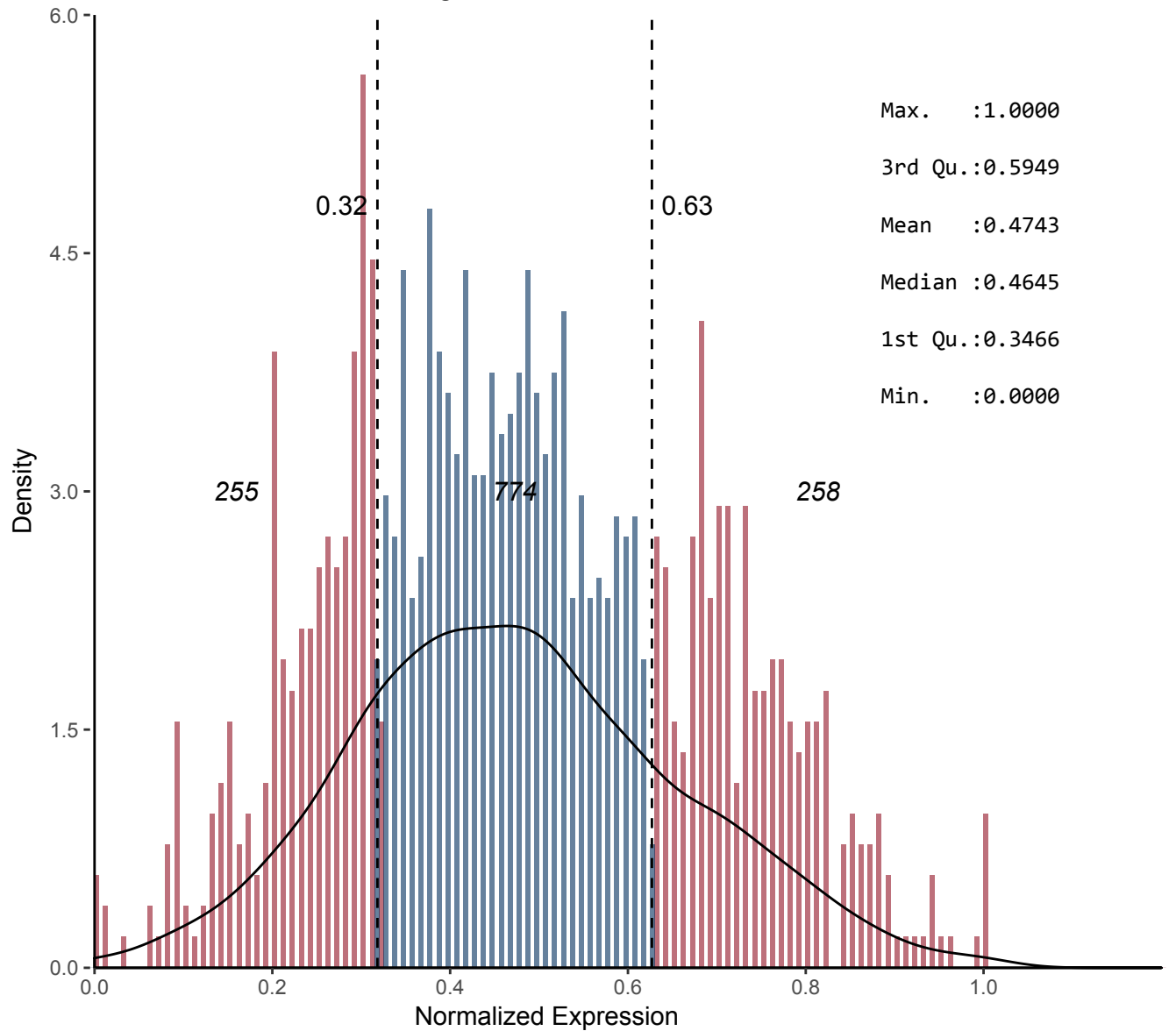


Figure 173 - CD156C



Aberrant TRUE FALSE

Figure 174 - CD157



Aberrant TRUE FALSE

Figure 175 - CD158E

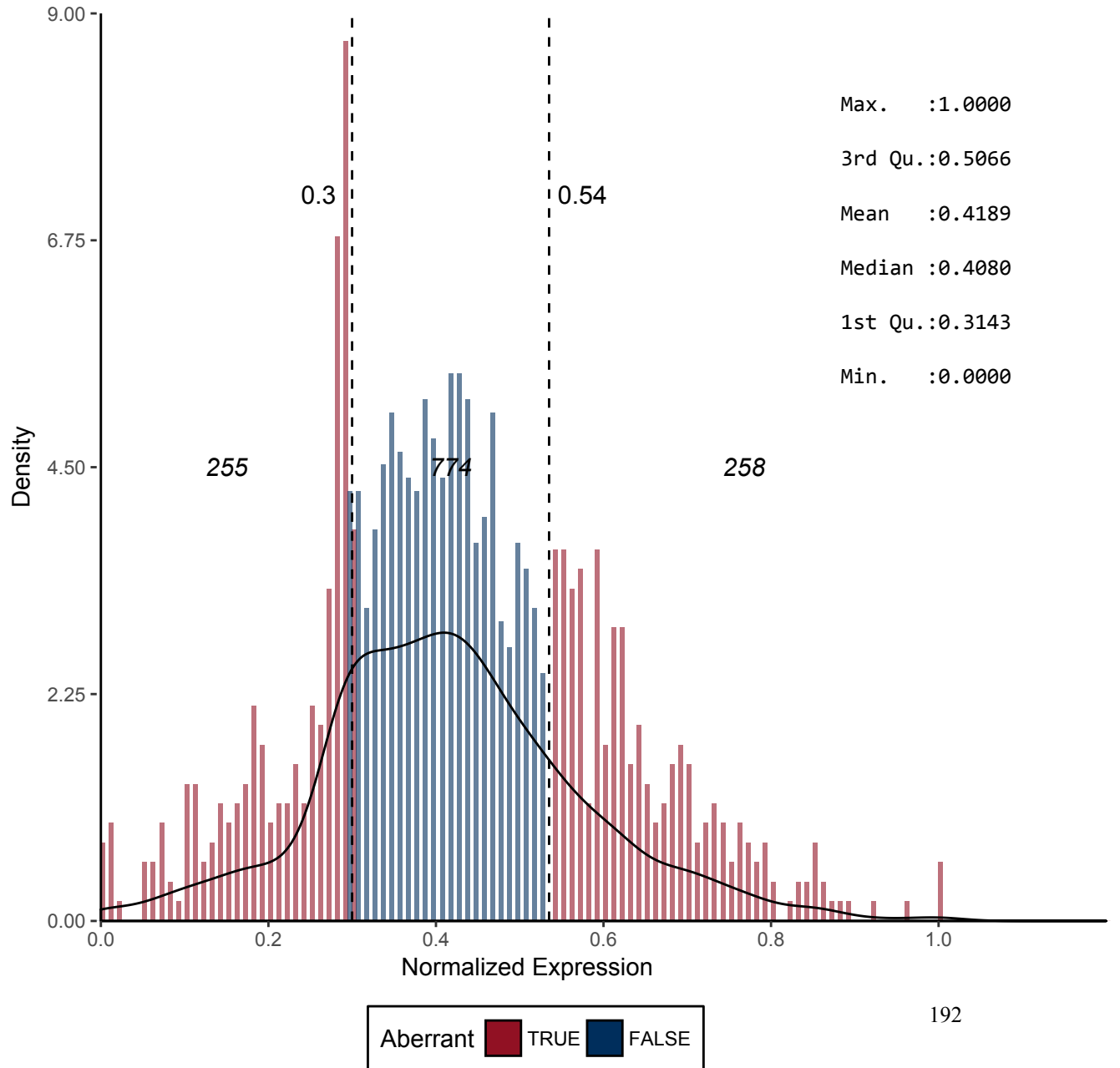


Figure 176 - CD158I*

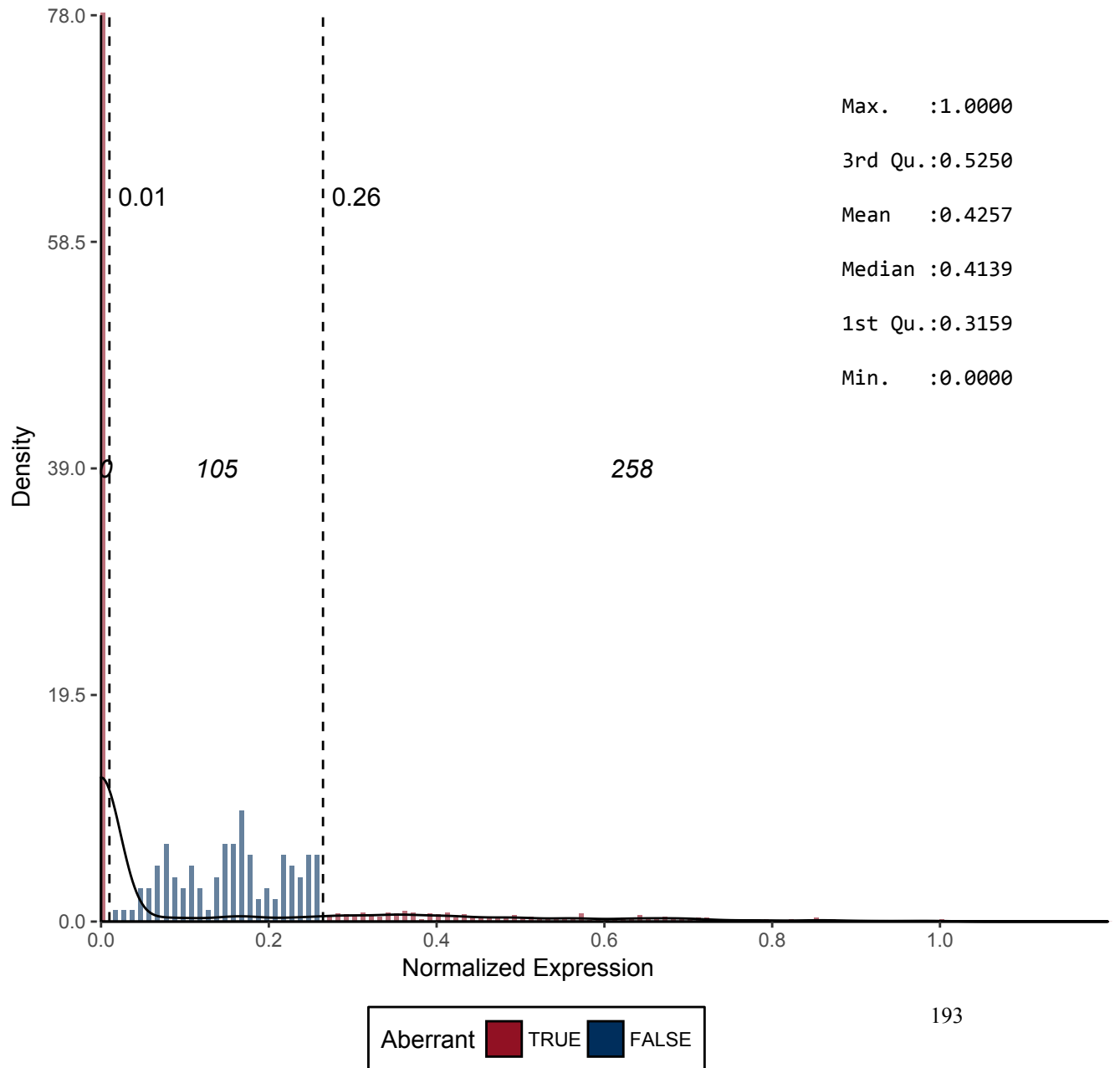


Figure 177 - CD158K

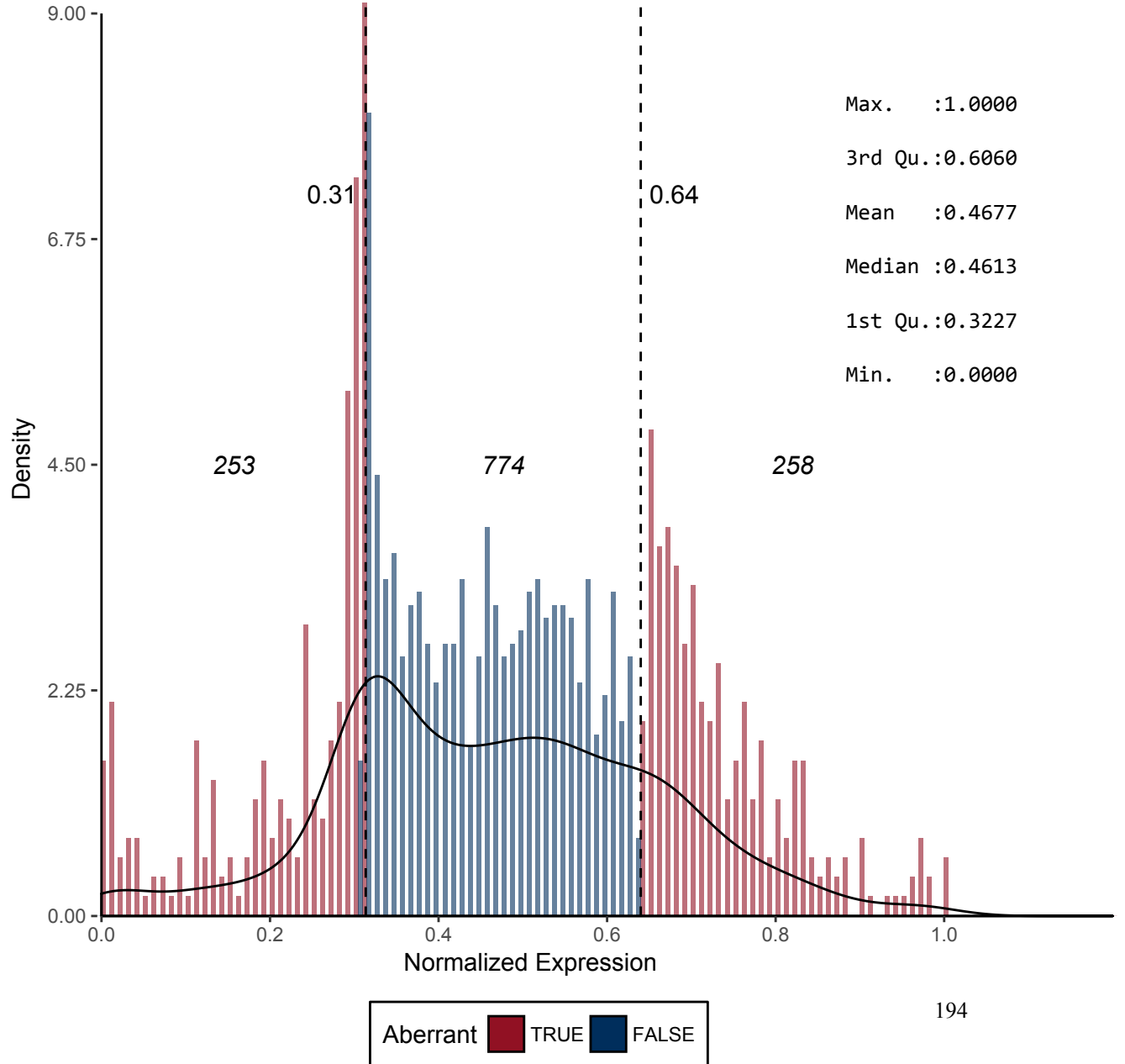


Figure 178 - CD160

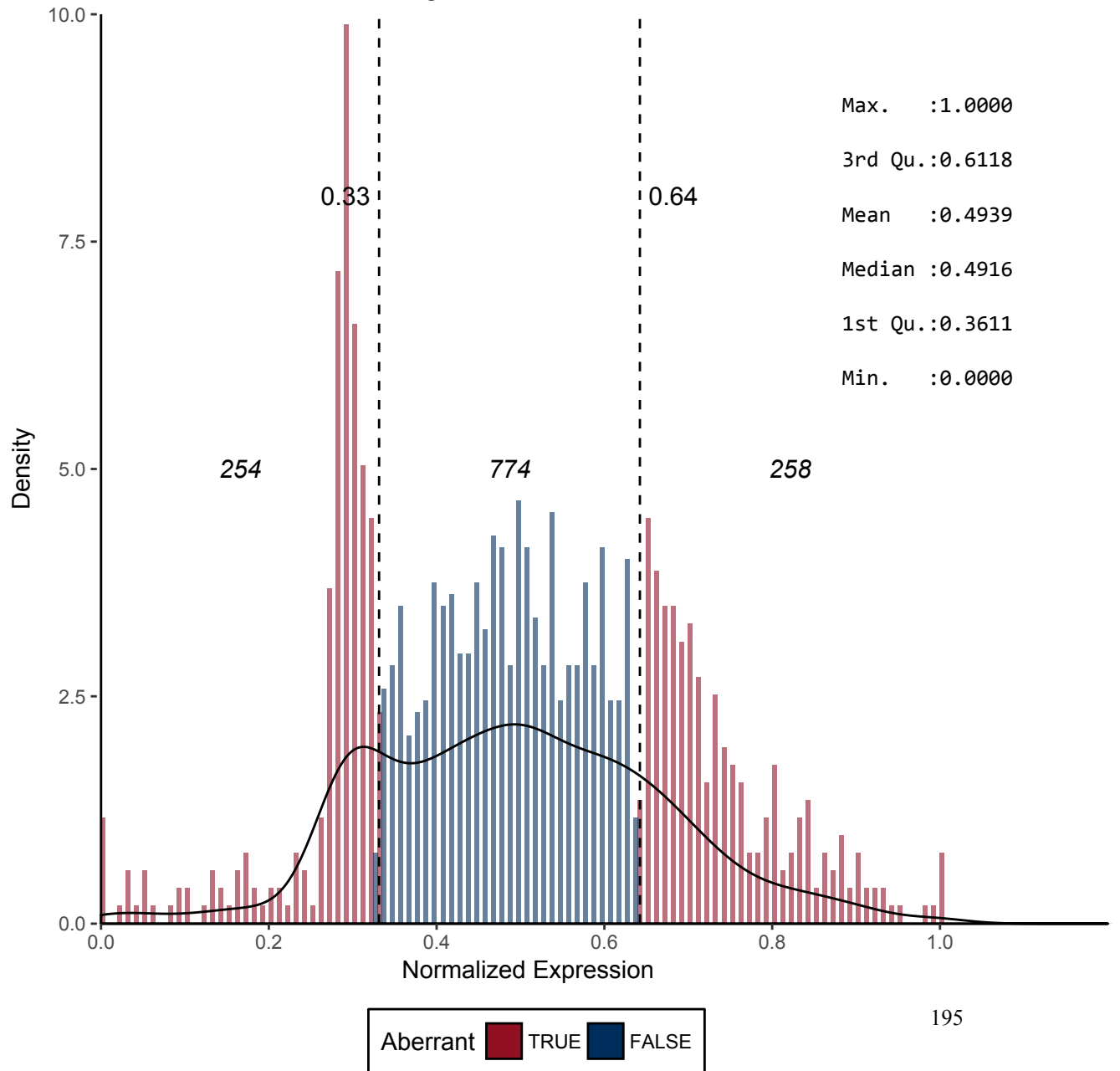


Figure 179 - CD161

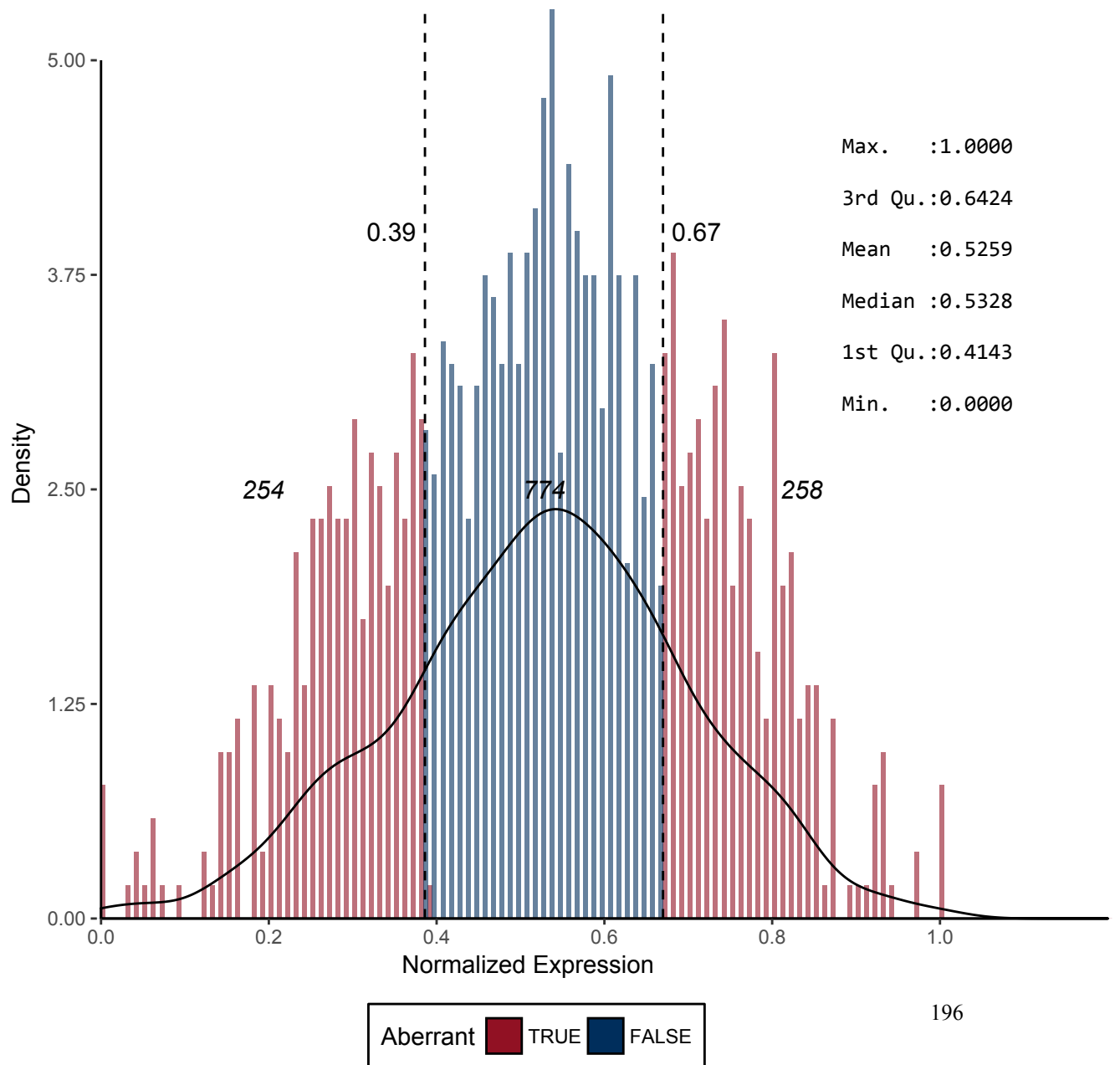
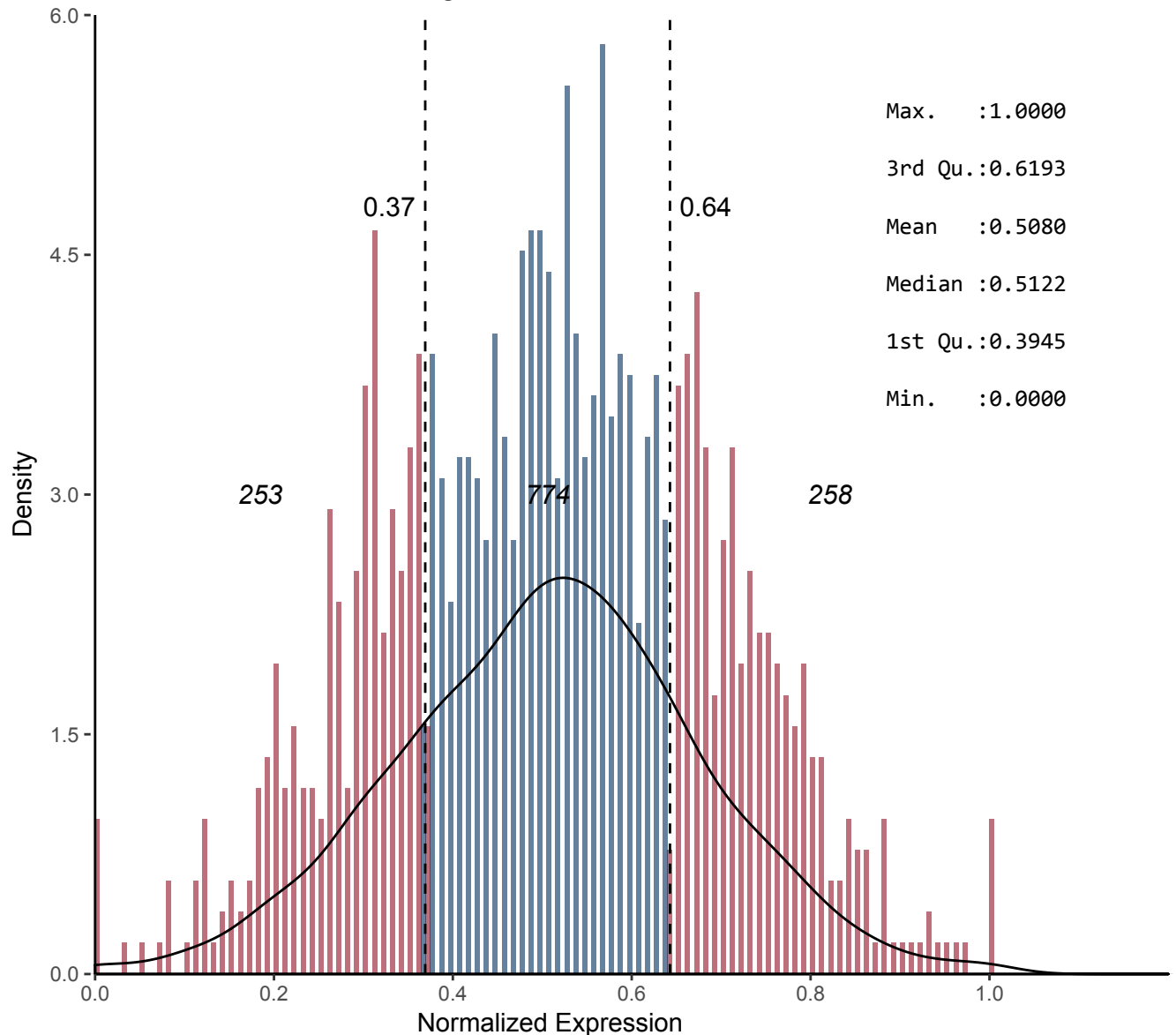


Figure 180 - CD162



Aberrant TRUE FALSE

Figure 181 - CD163

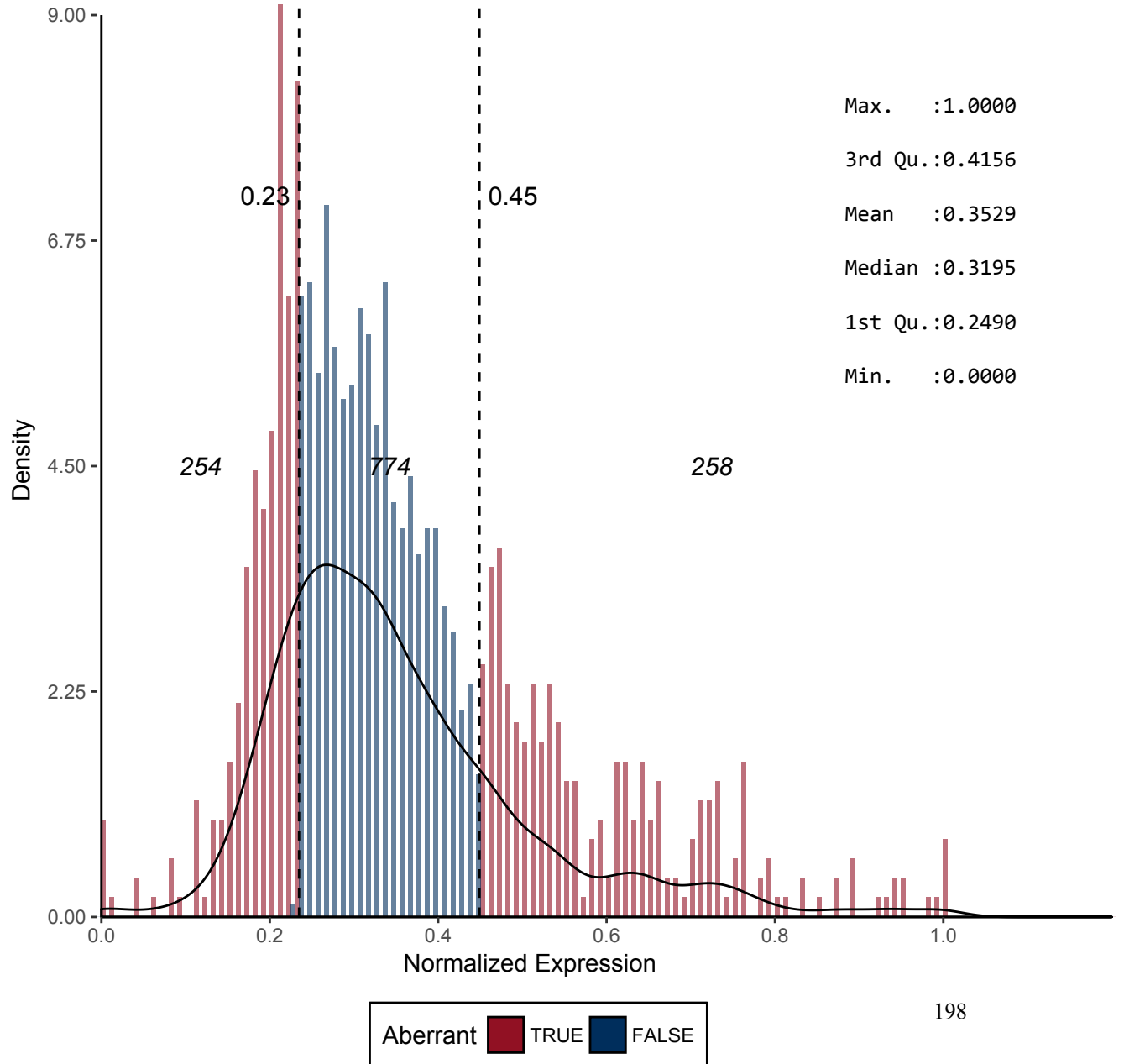


Figure 182 - CD164

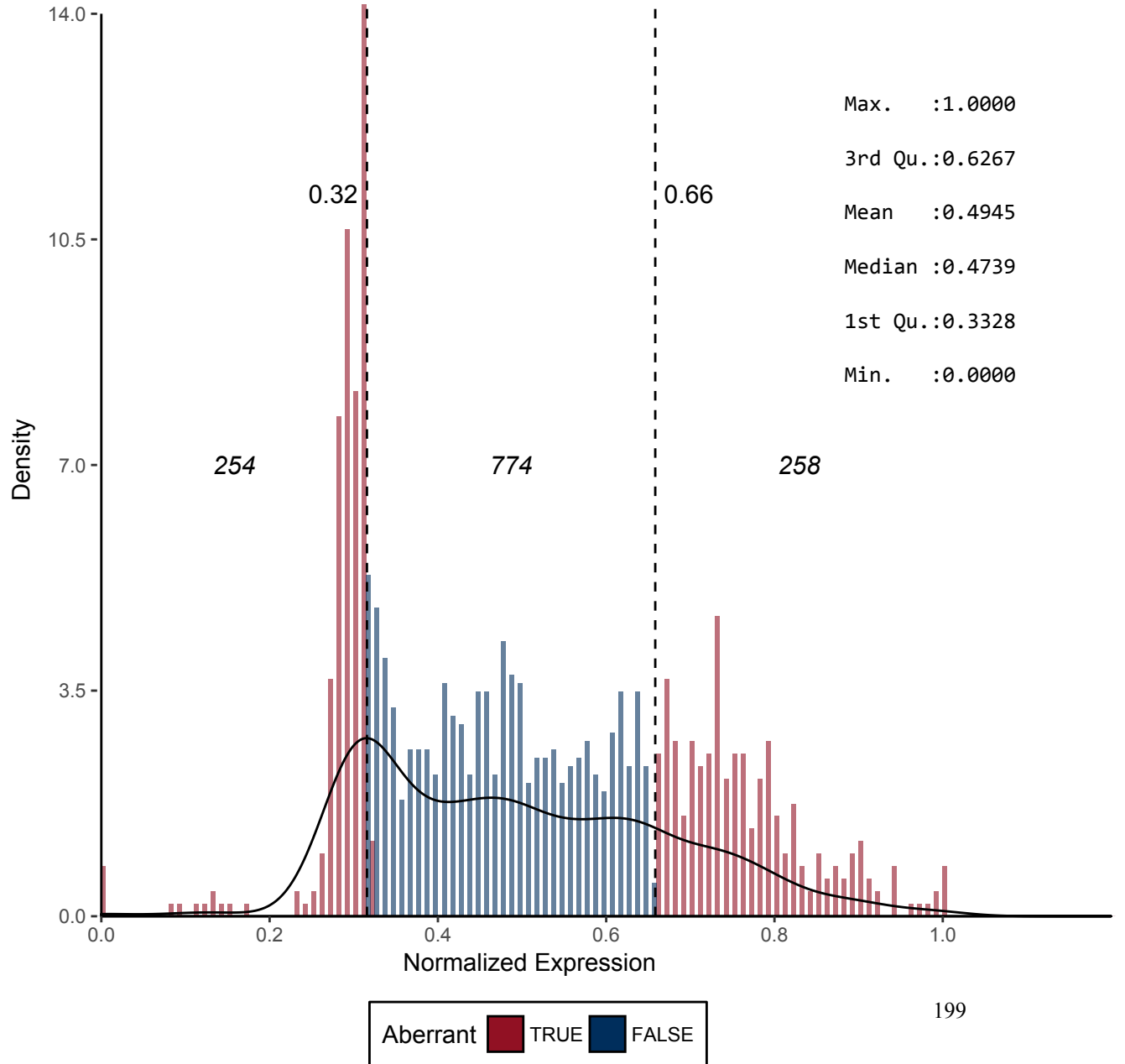


Figure 183 - CD166

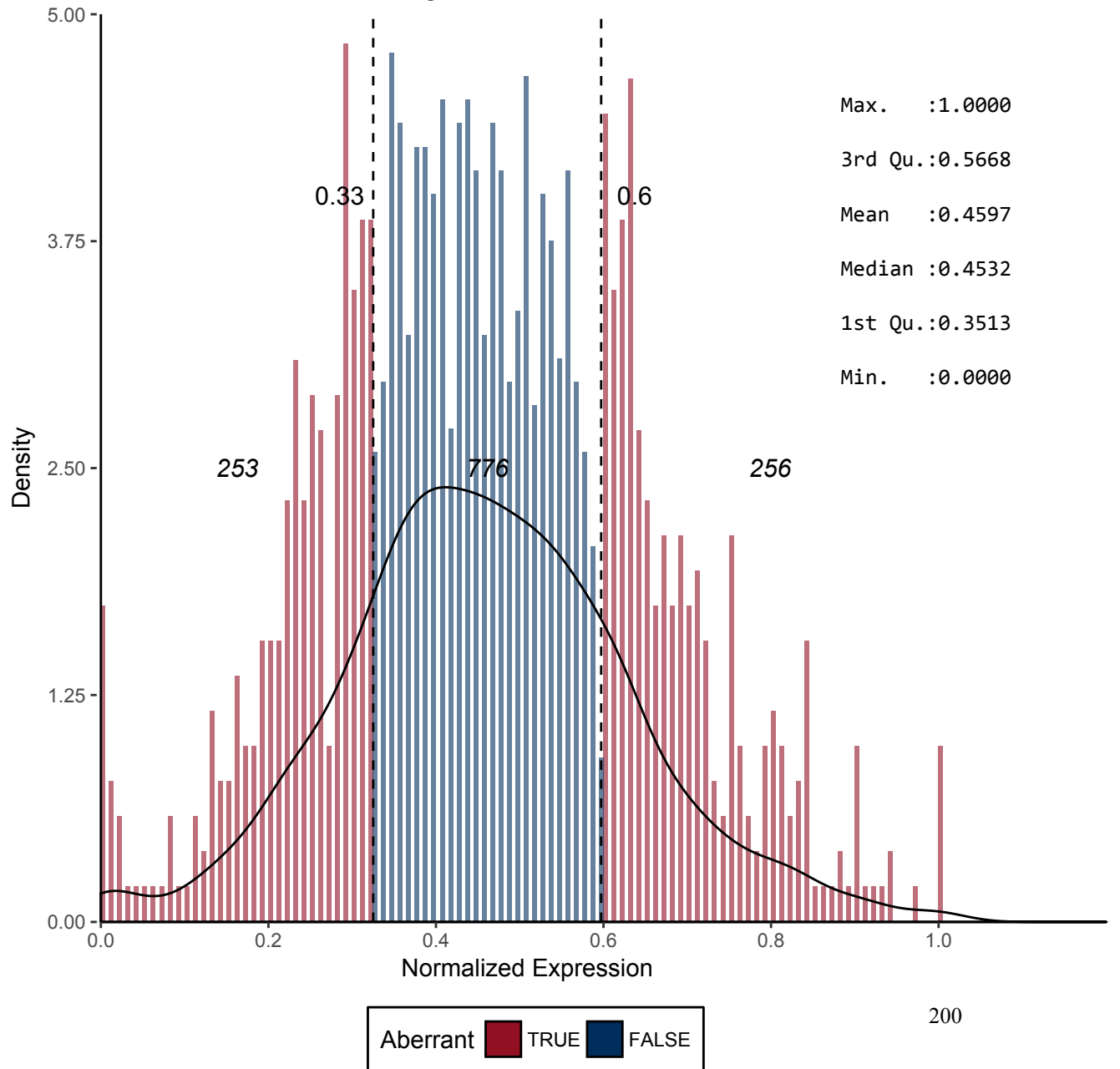


Figure 184 - CD167A

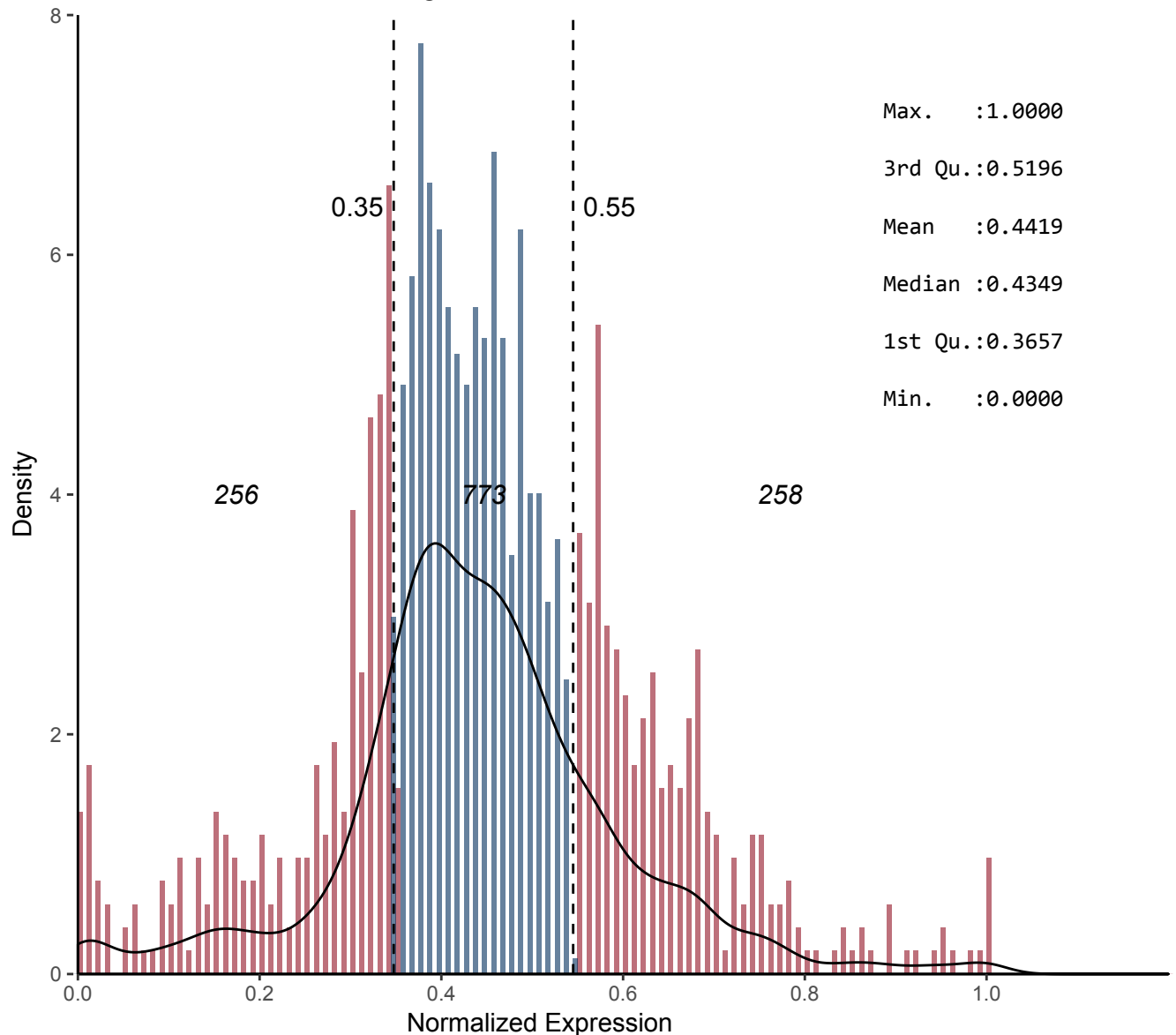


Figure 185 - CD167B*

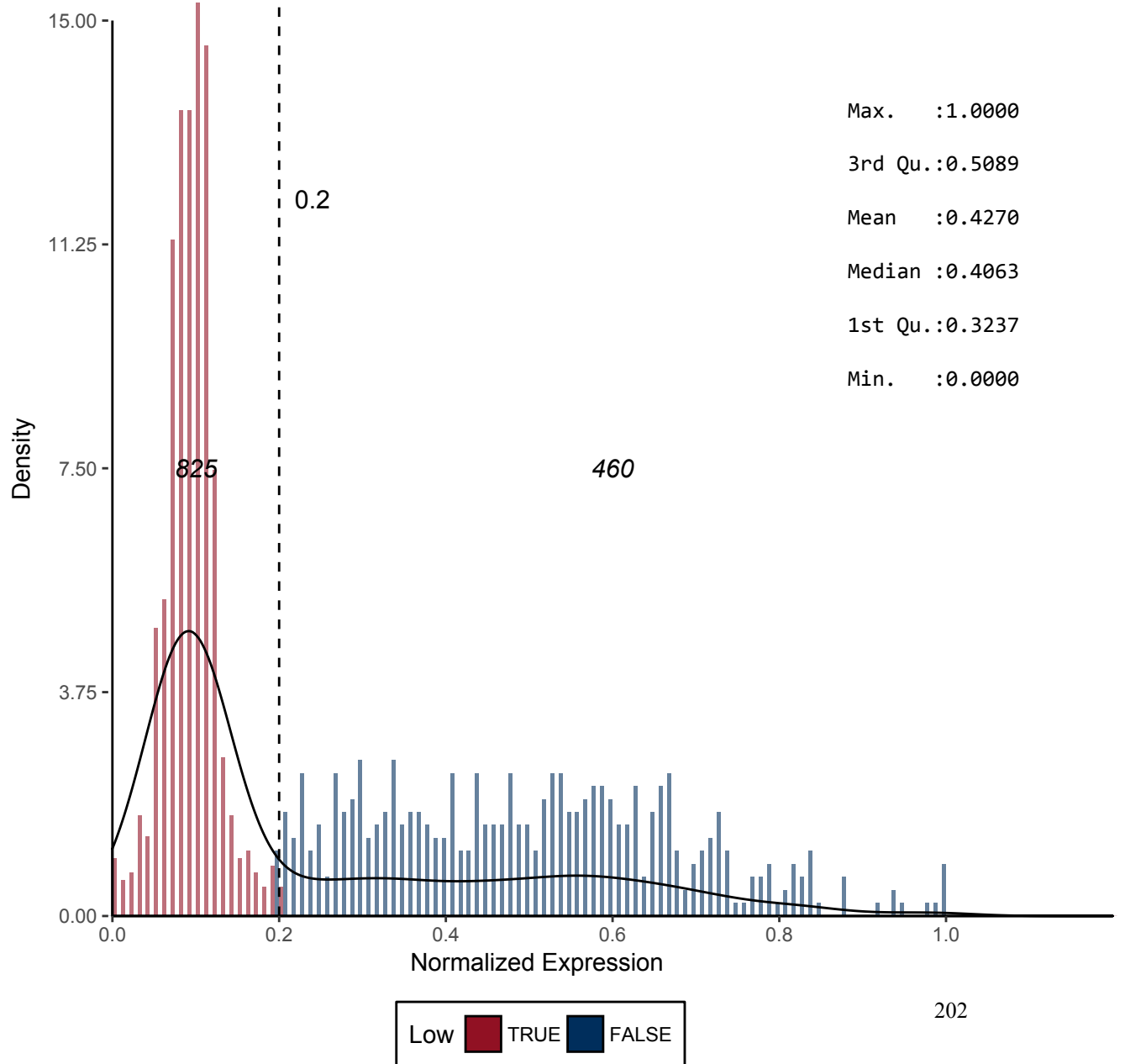


Figure 186 - CD168*

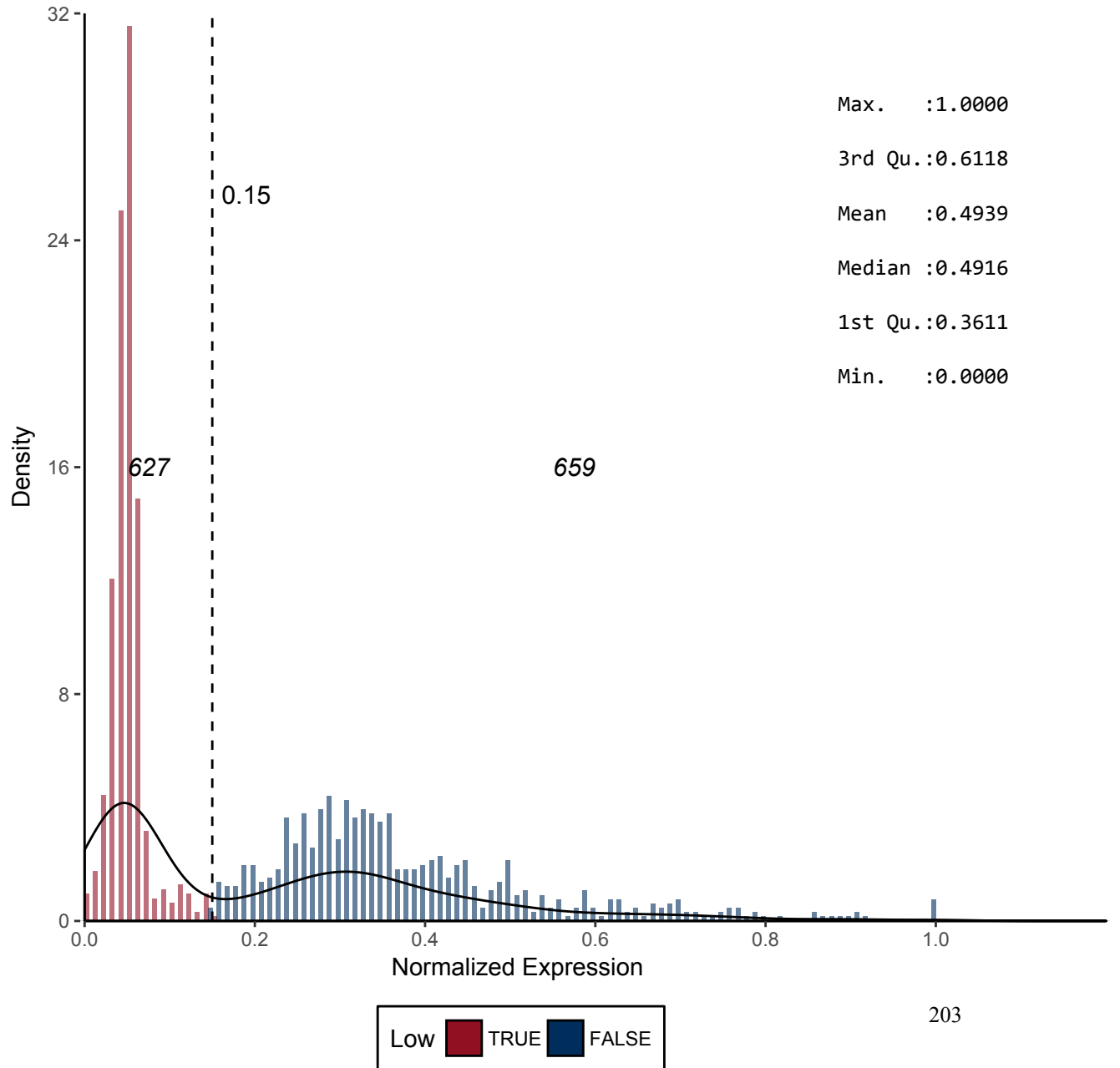


Figure 187 - CD169*

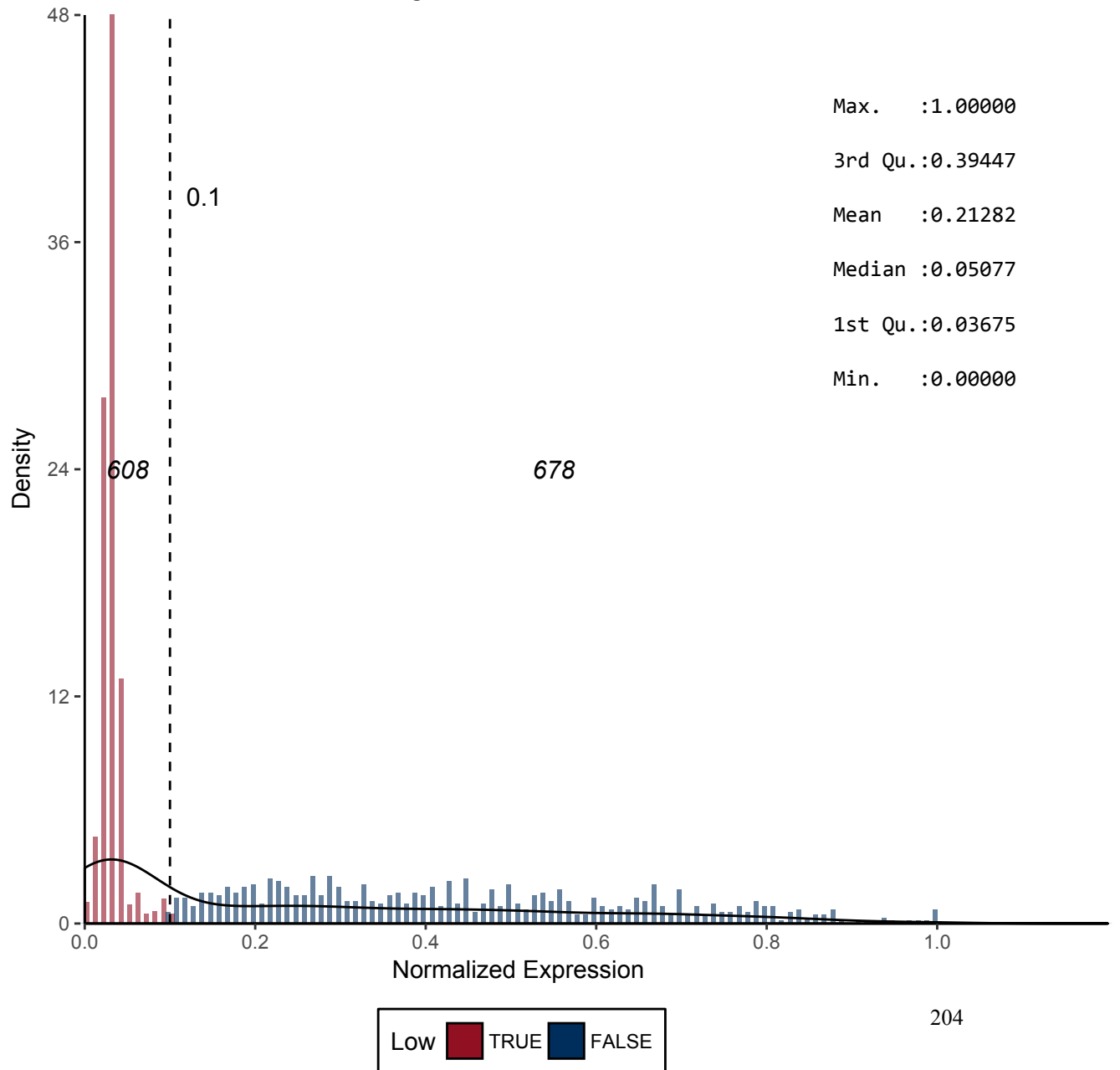


Figure 188 - CD170

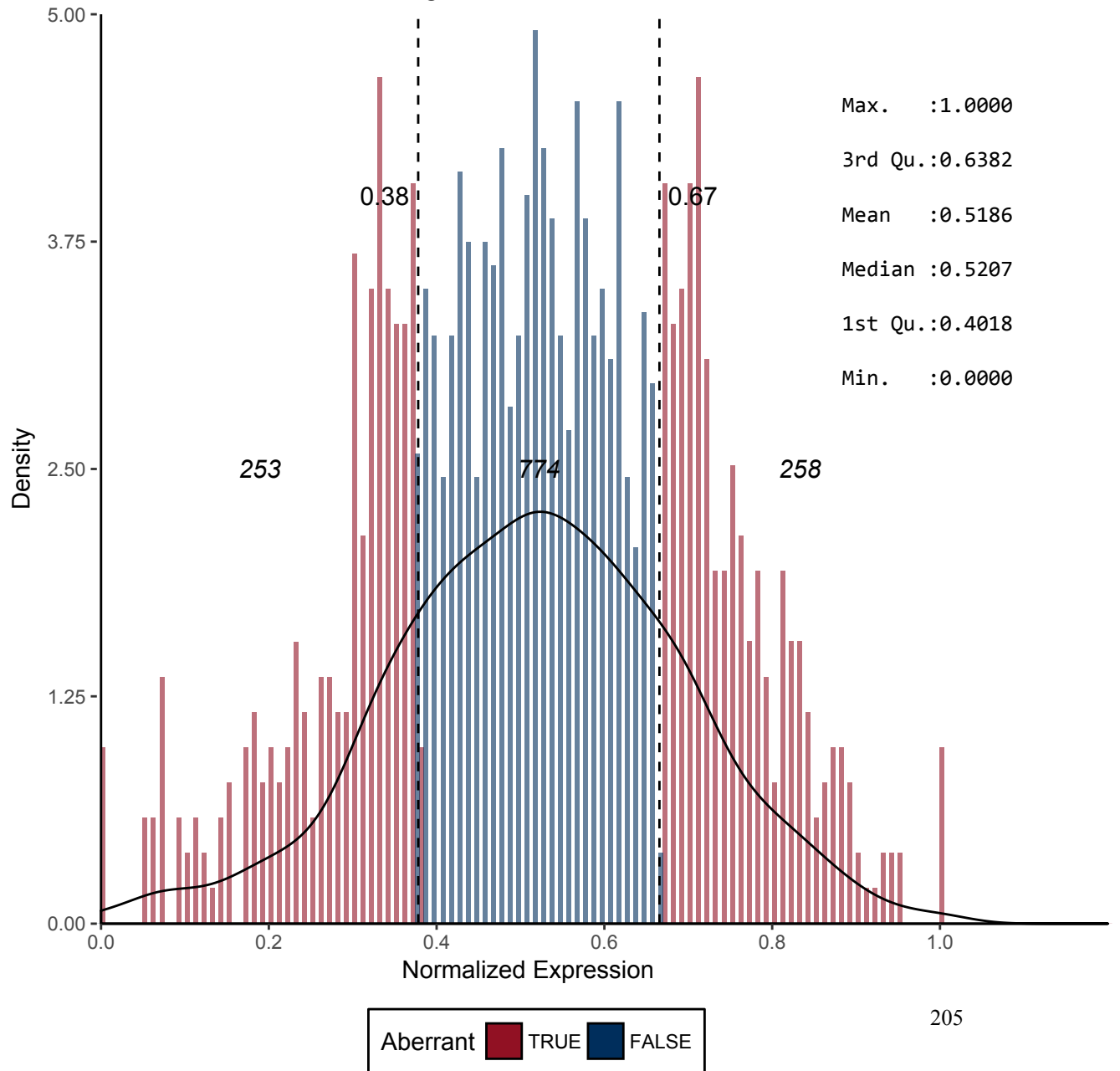


Figure 189 - CD171*

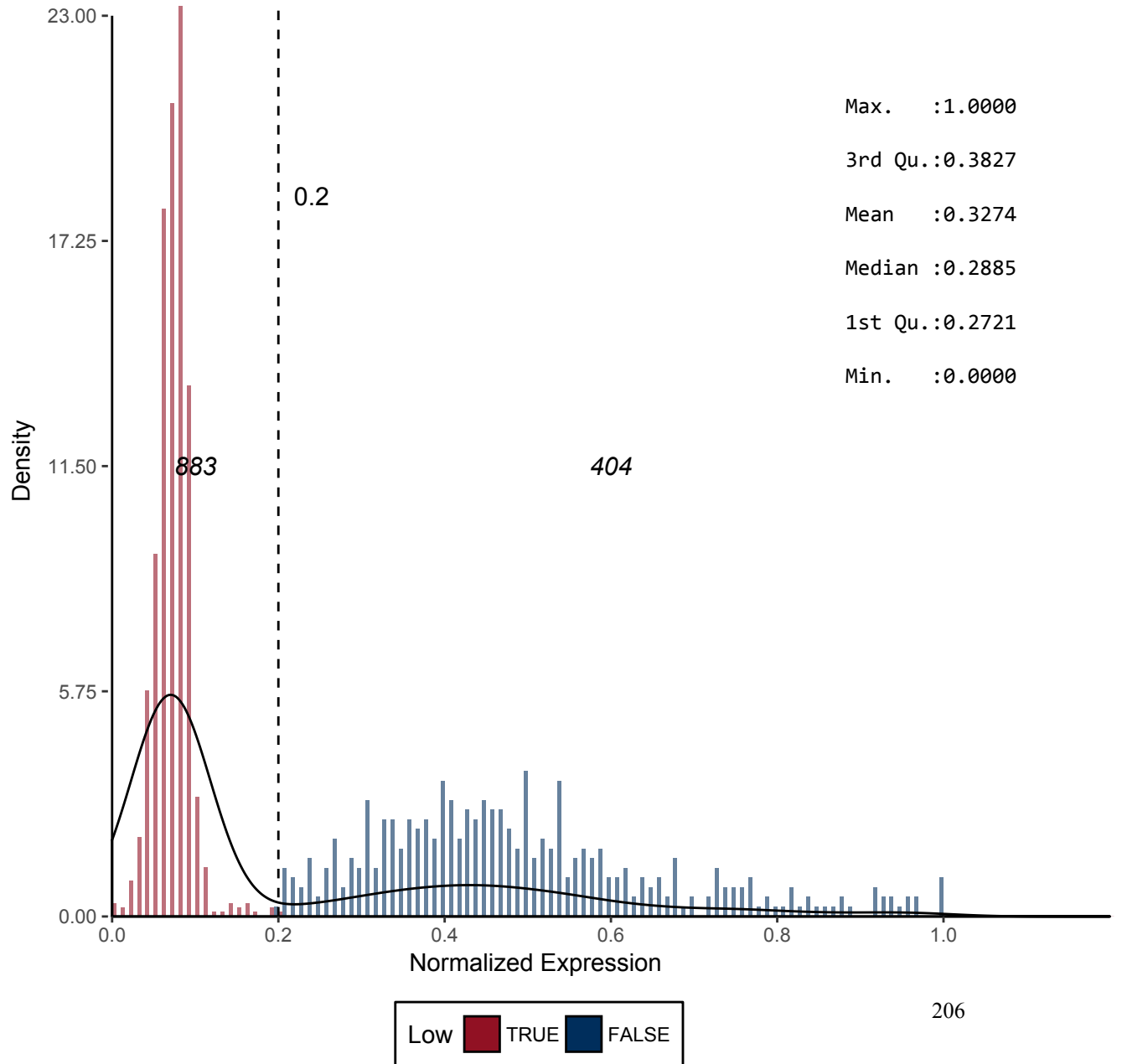
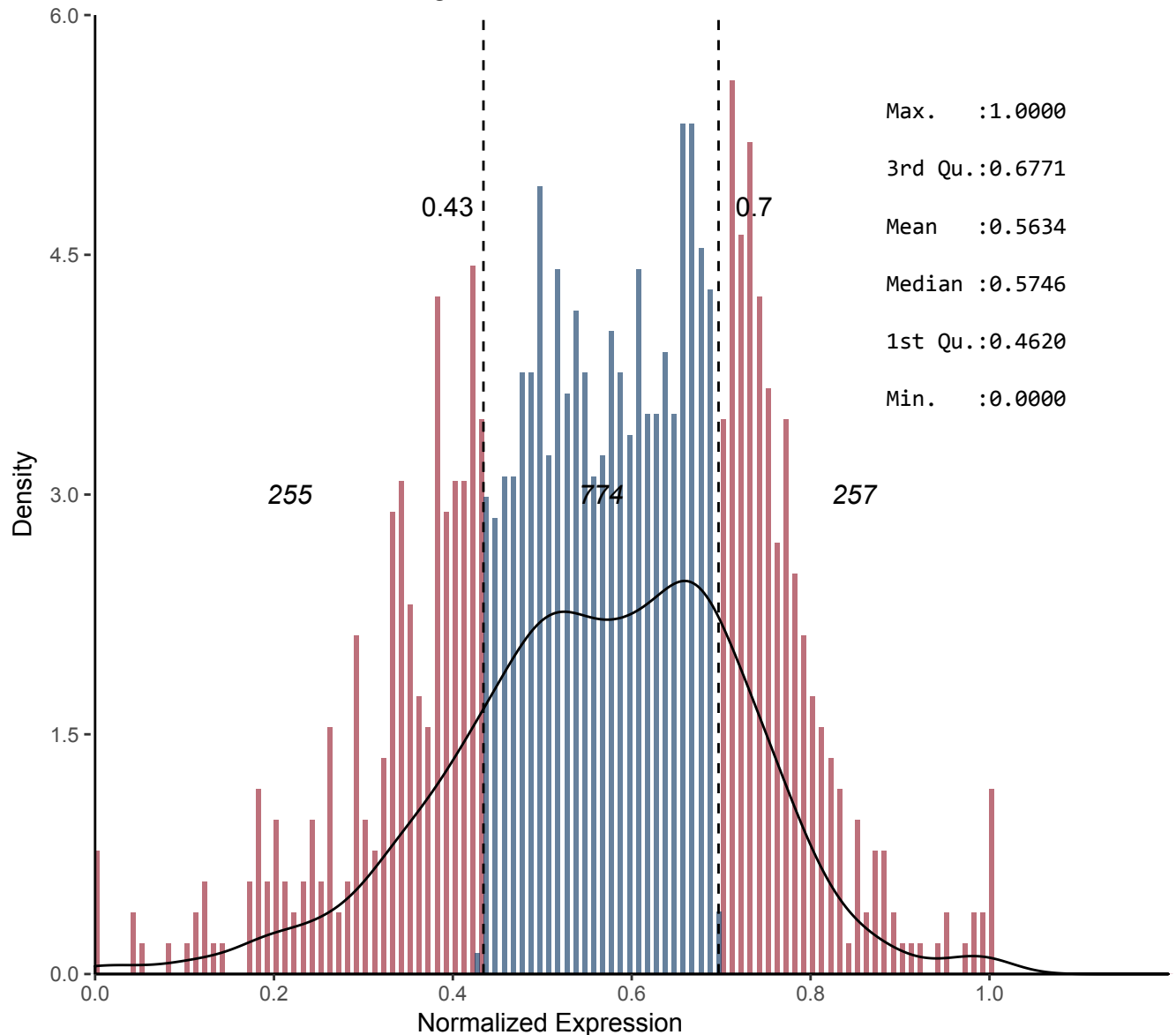


Figure 190 - CD172A



Aberrant TRUE FALSE

Figure 191 - CD172G

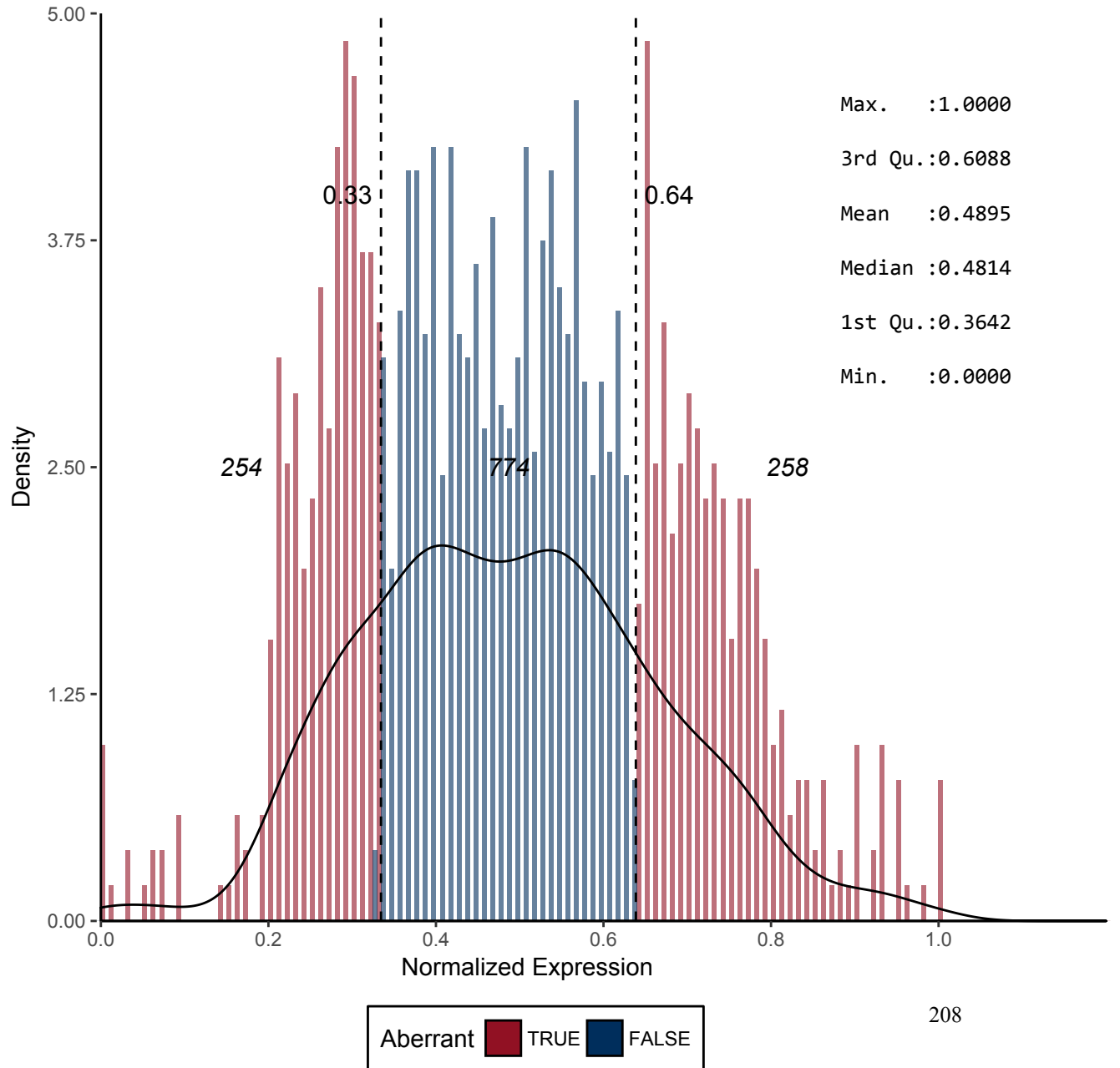
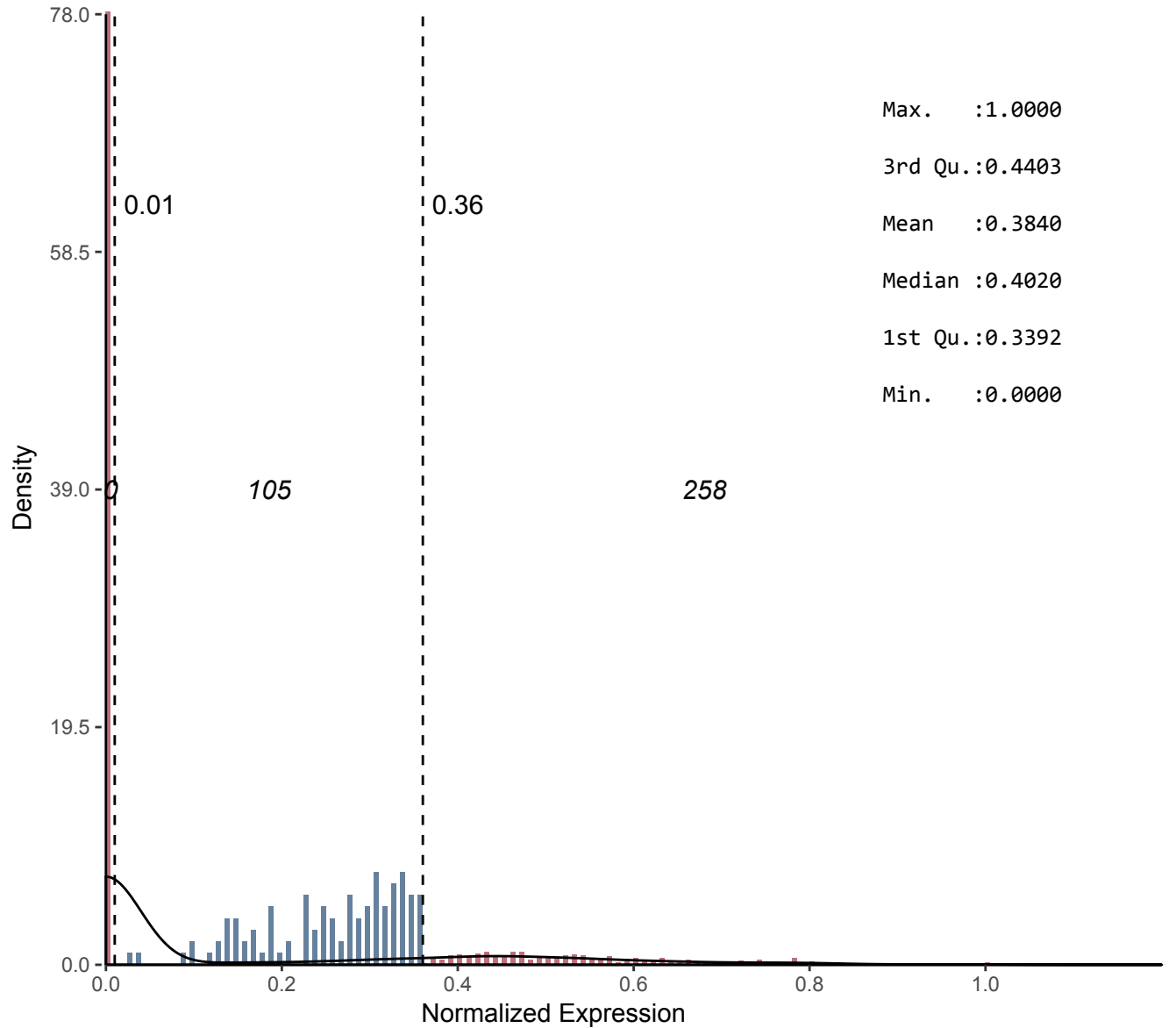


Figure 192 - CD174*



Aberrant TRUE FALSE

Figure 193 - CD177

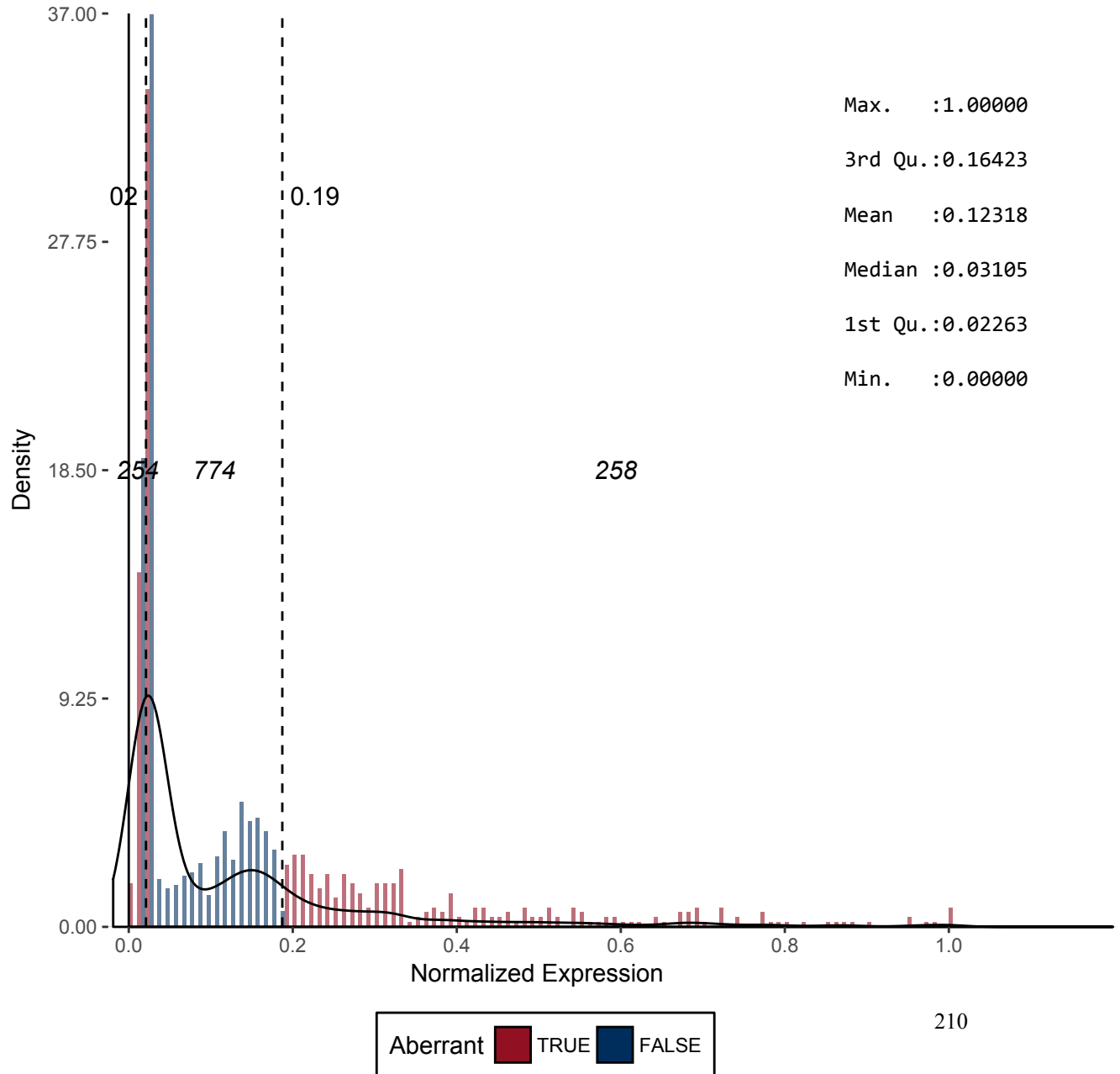


Figure 194 - CD178

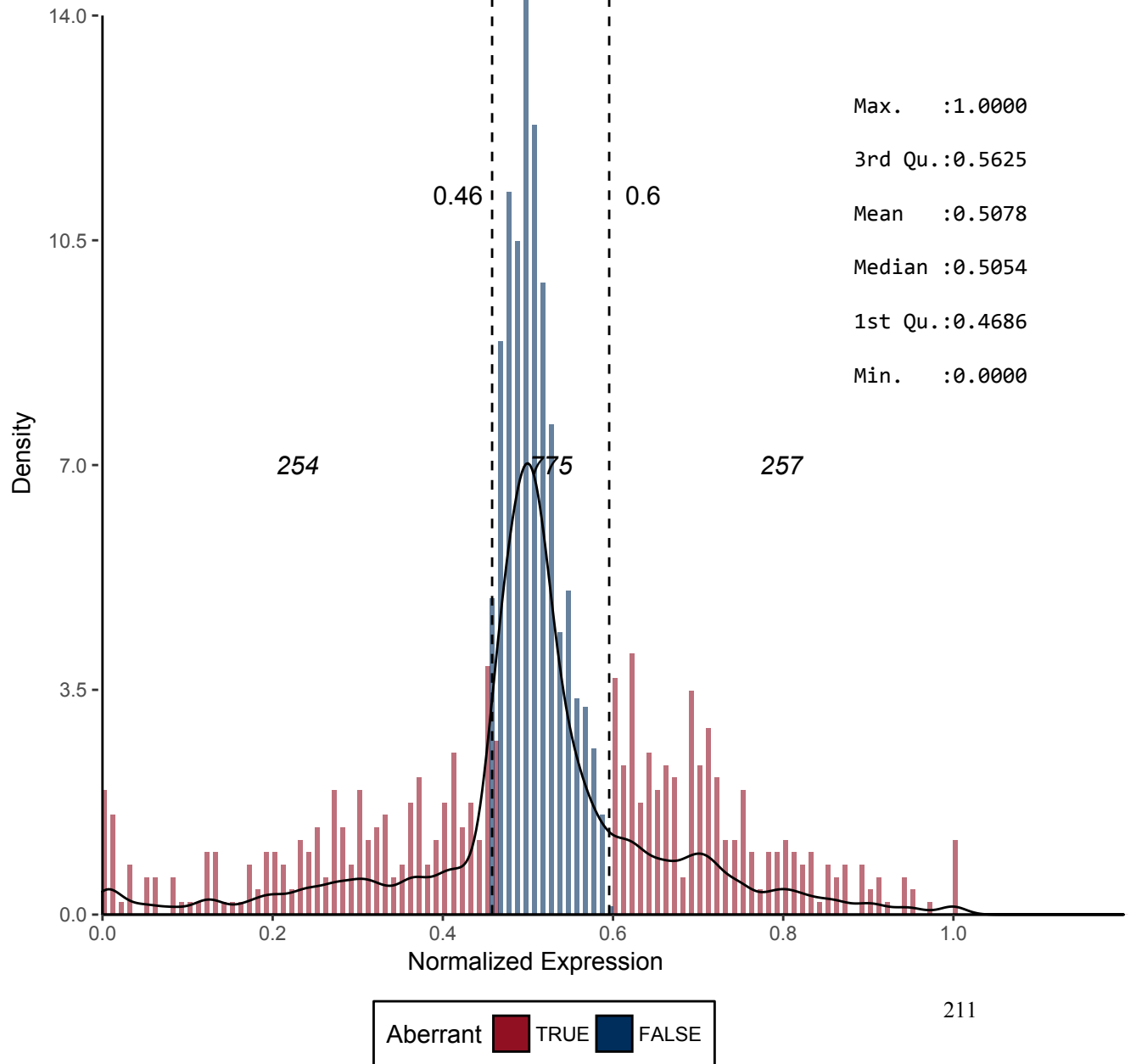


Figure 195 - CD179A*

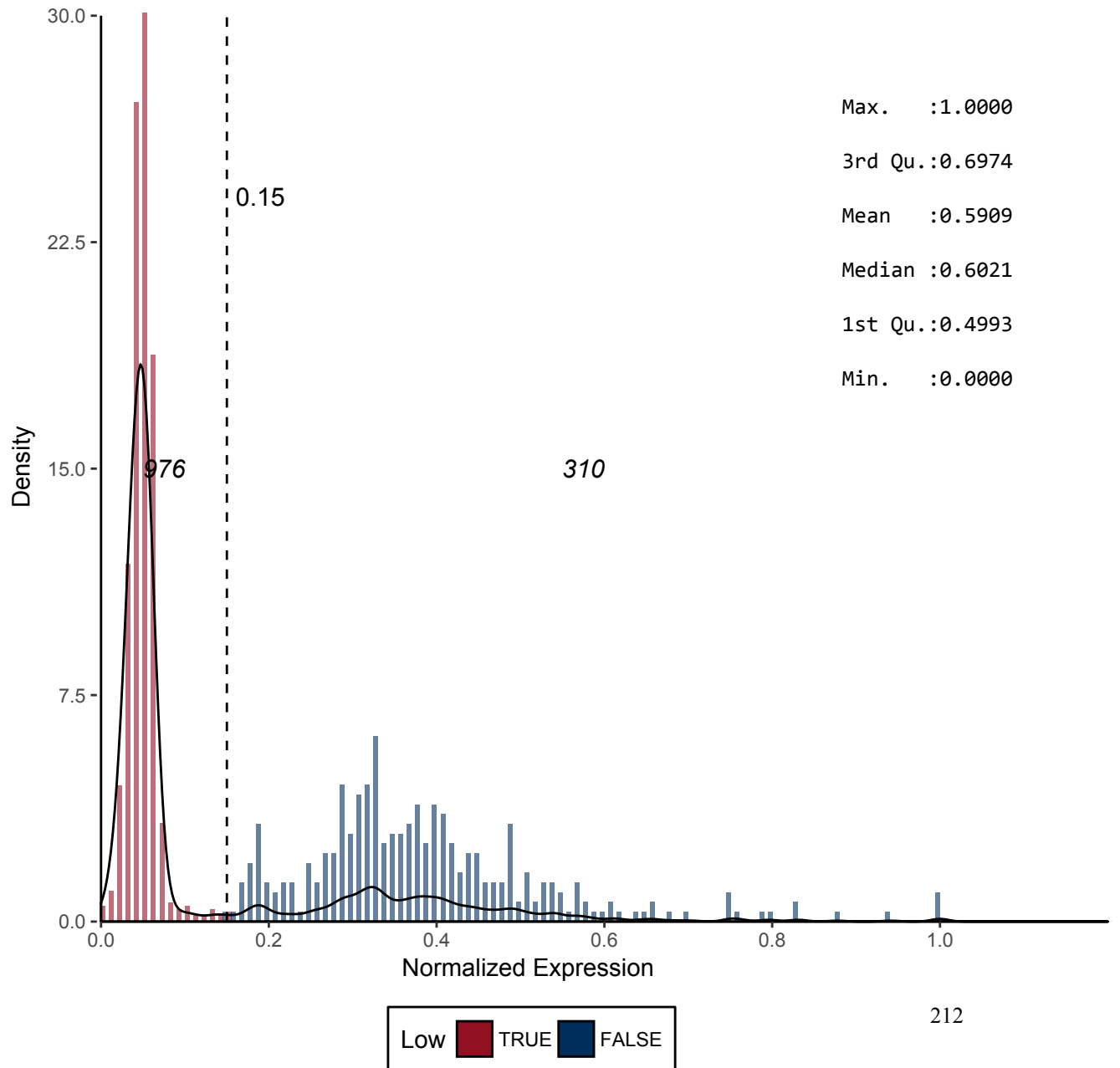


Figure 196 - CD179B

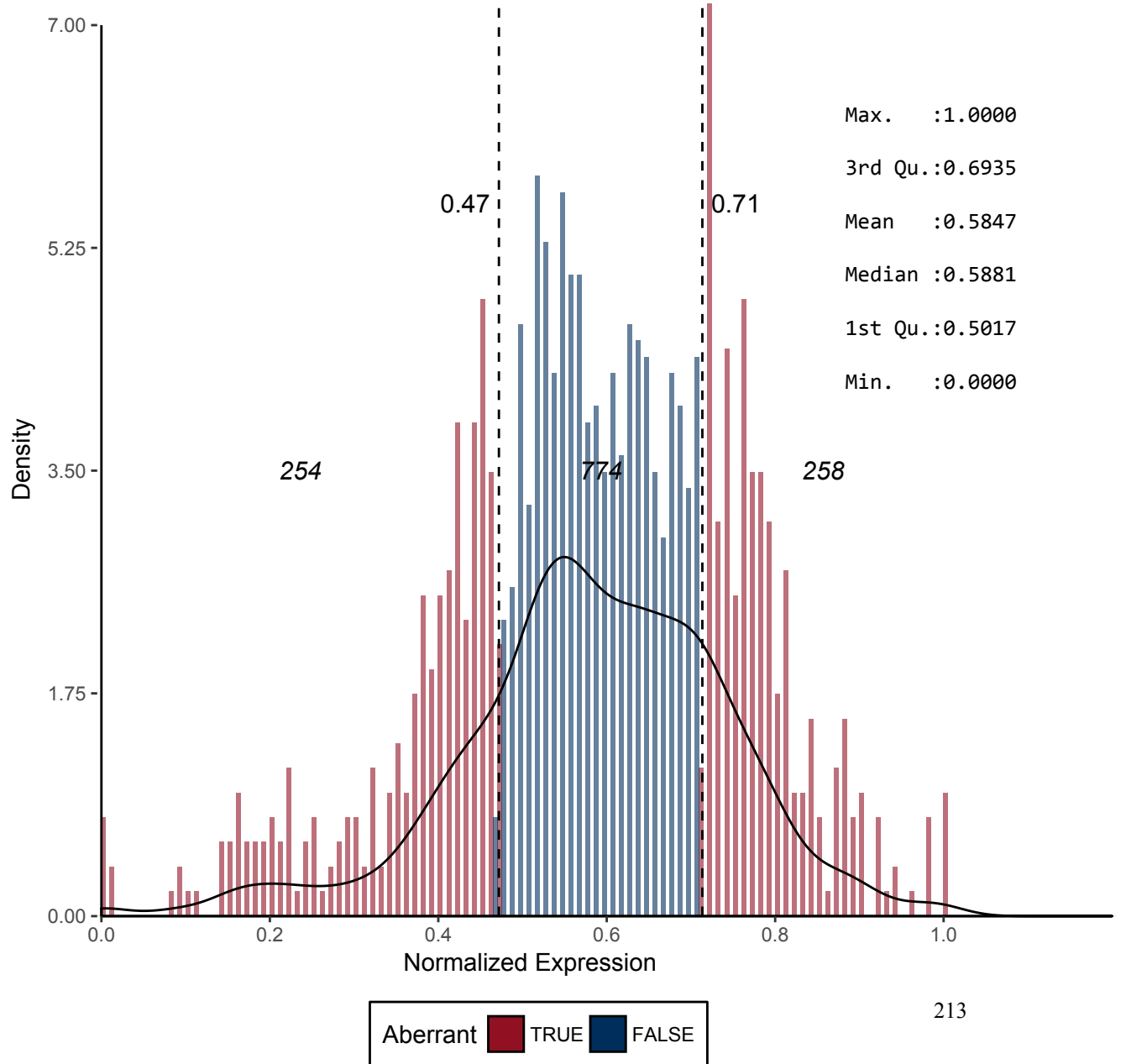


Figure 197 - CD180*

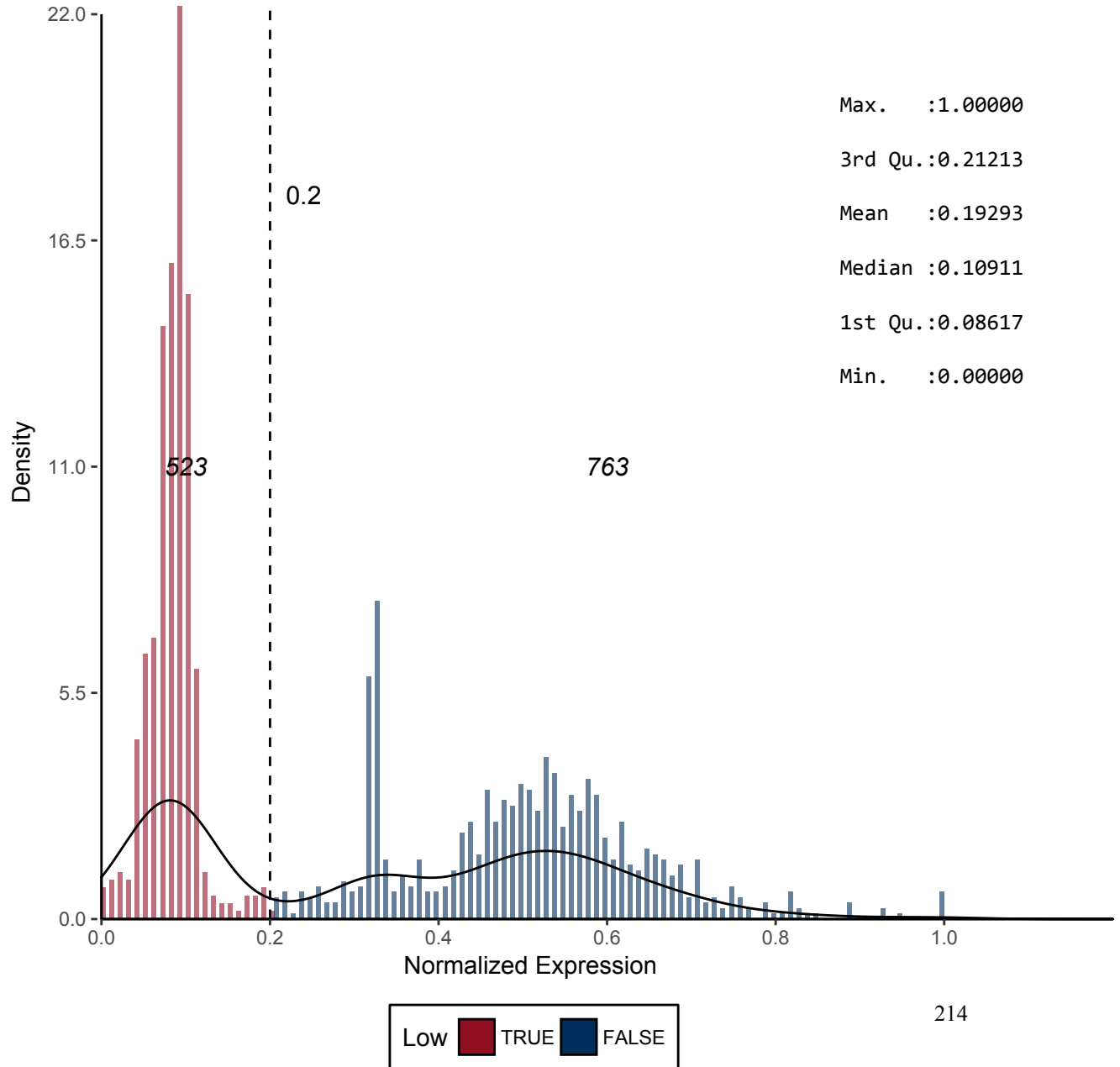
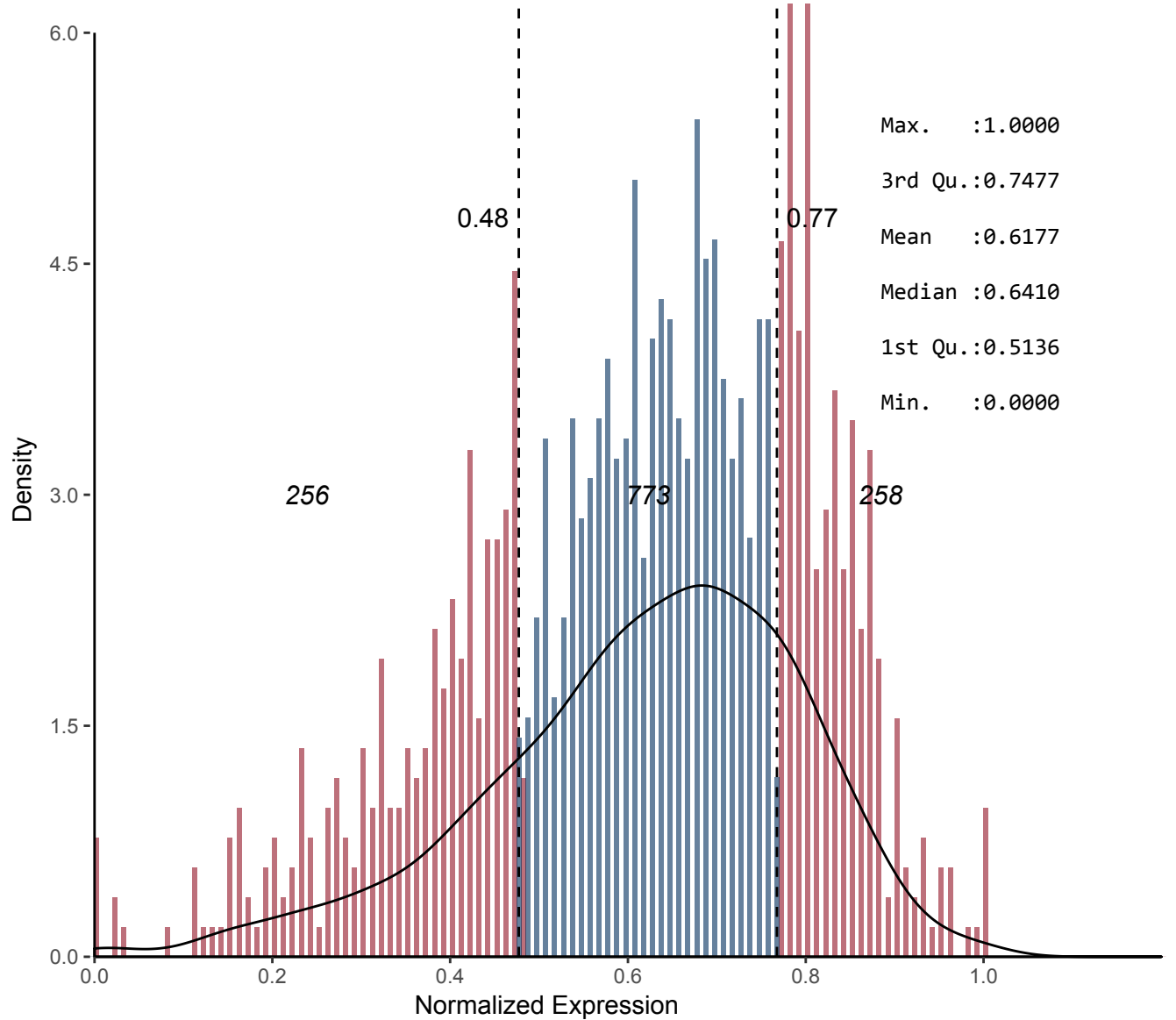


Figure 198 - CD181



Aberrant TRUE FALSE

Figure 199 - CD182

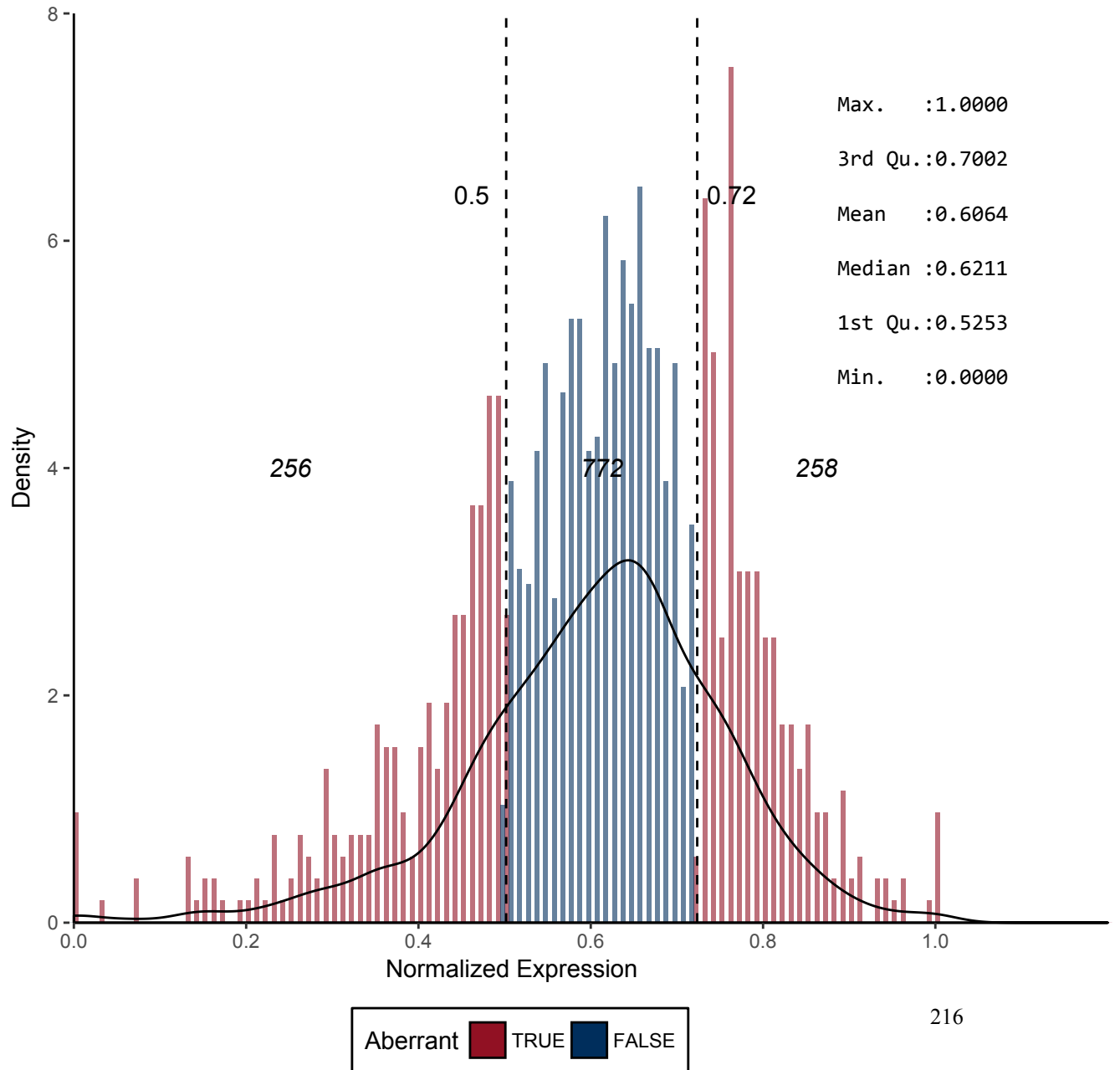


Figure 200 - CD183

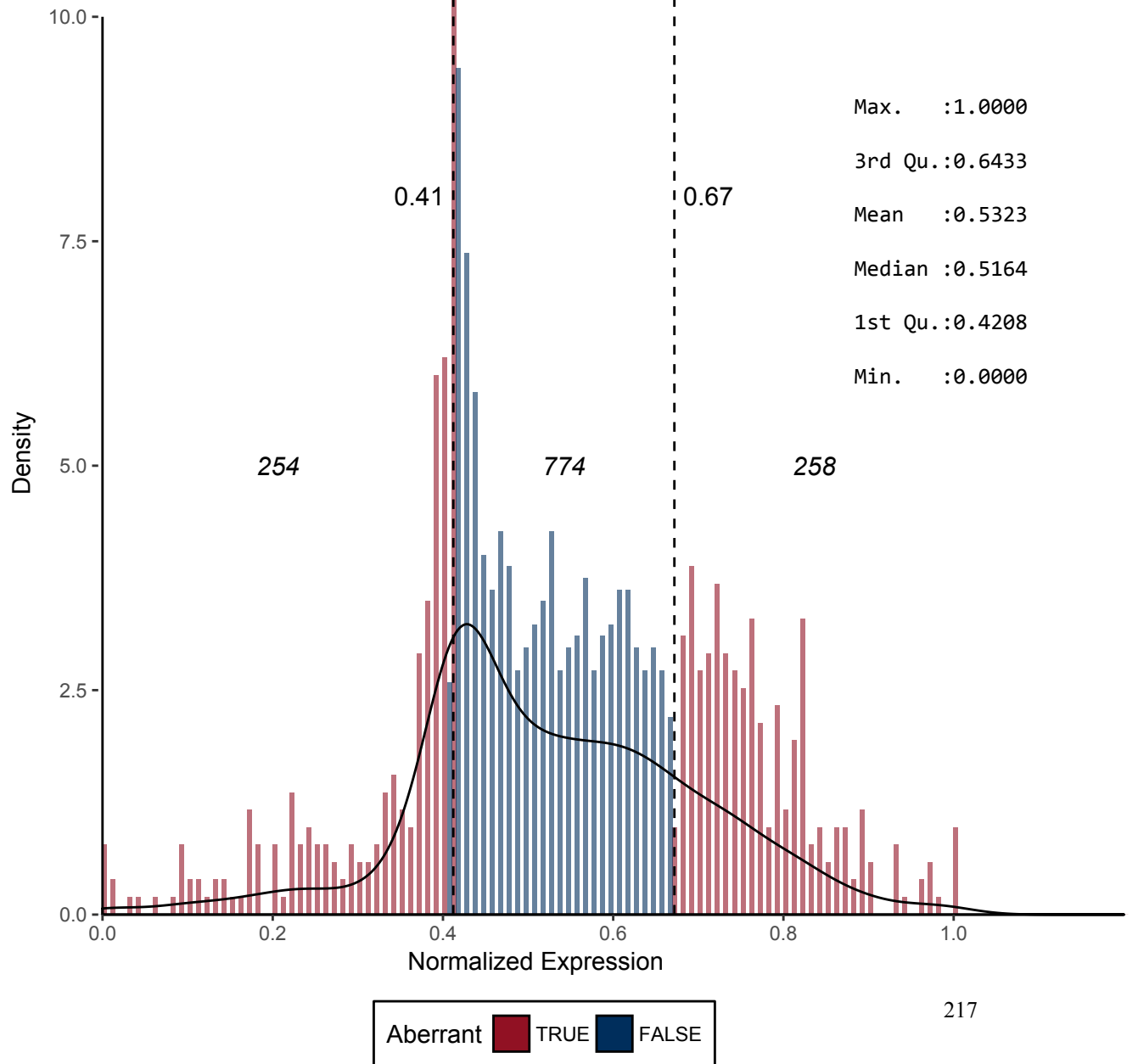
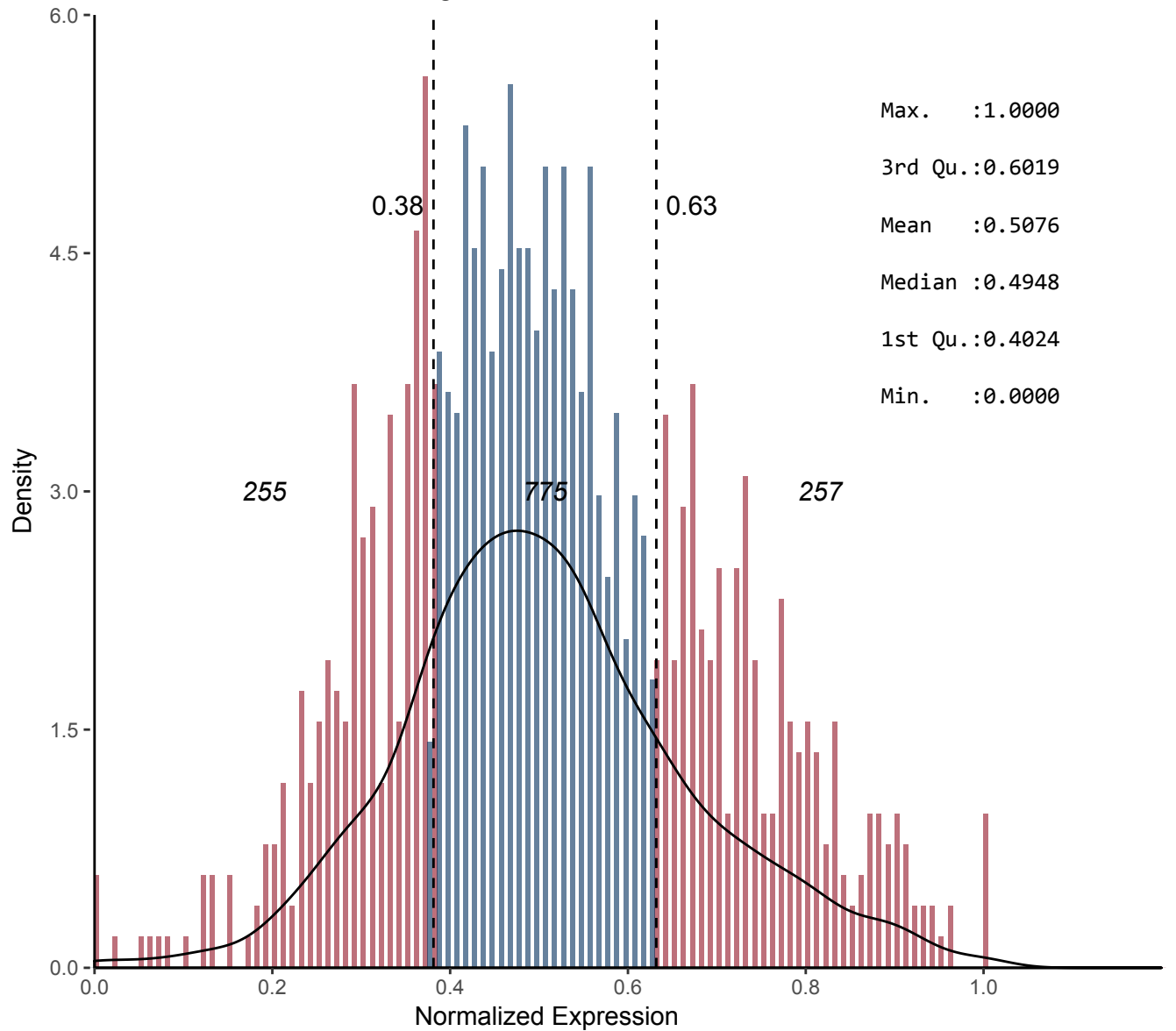
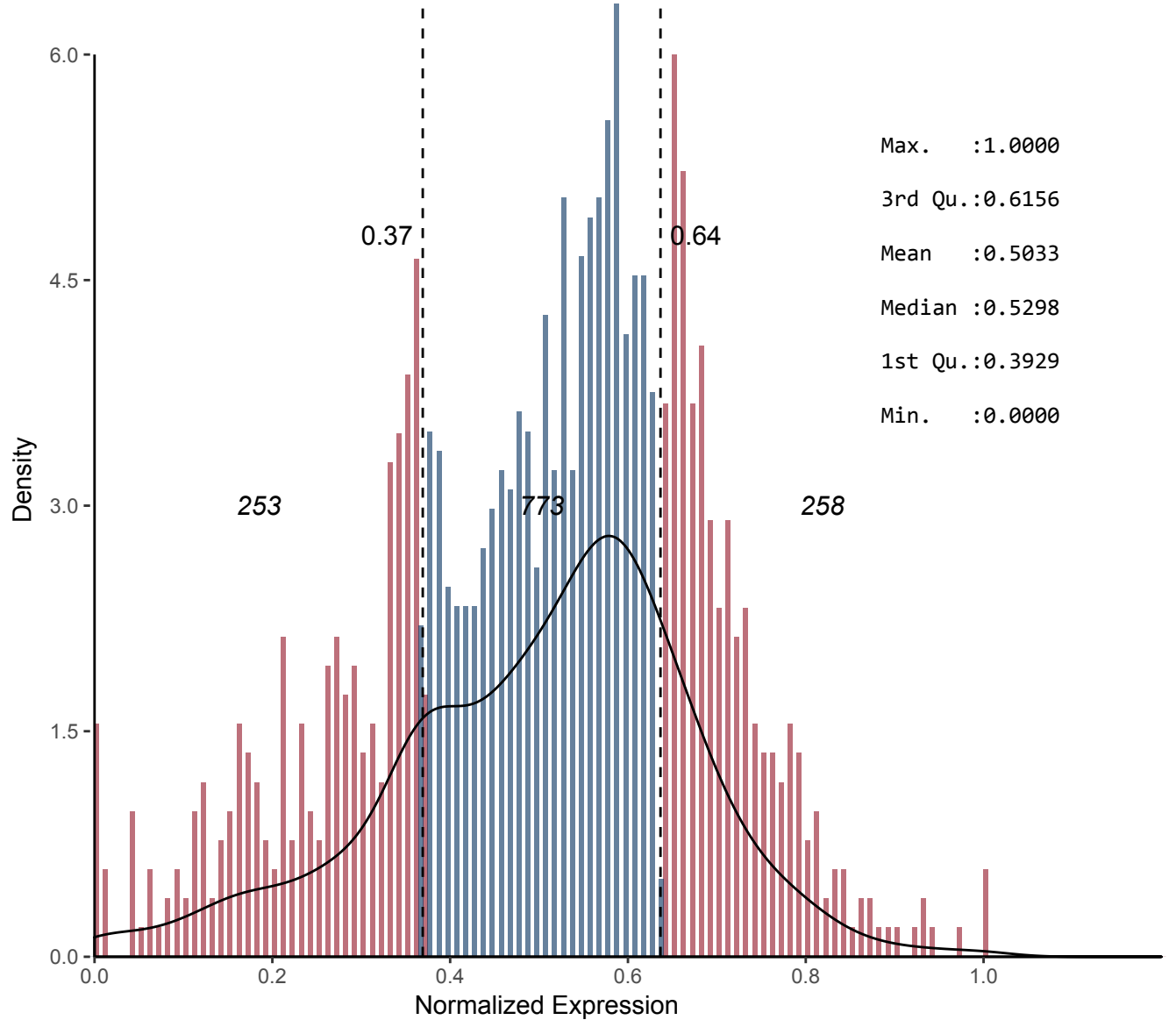


Figure 201 - CD184



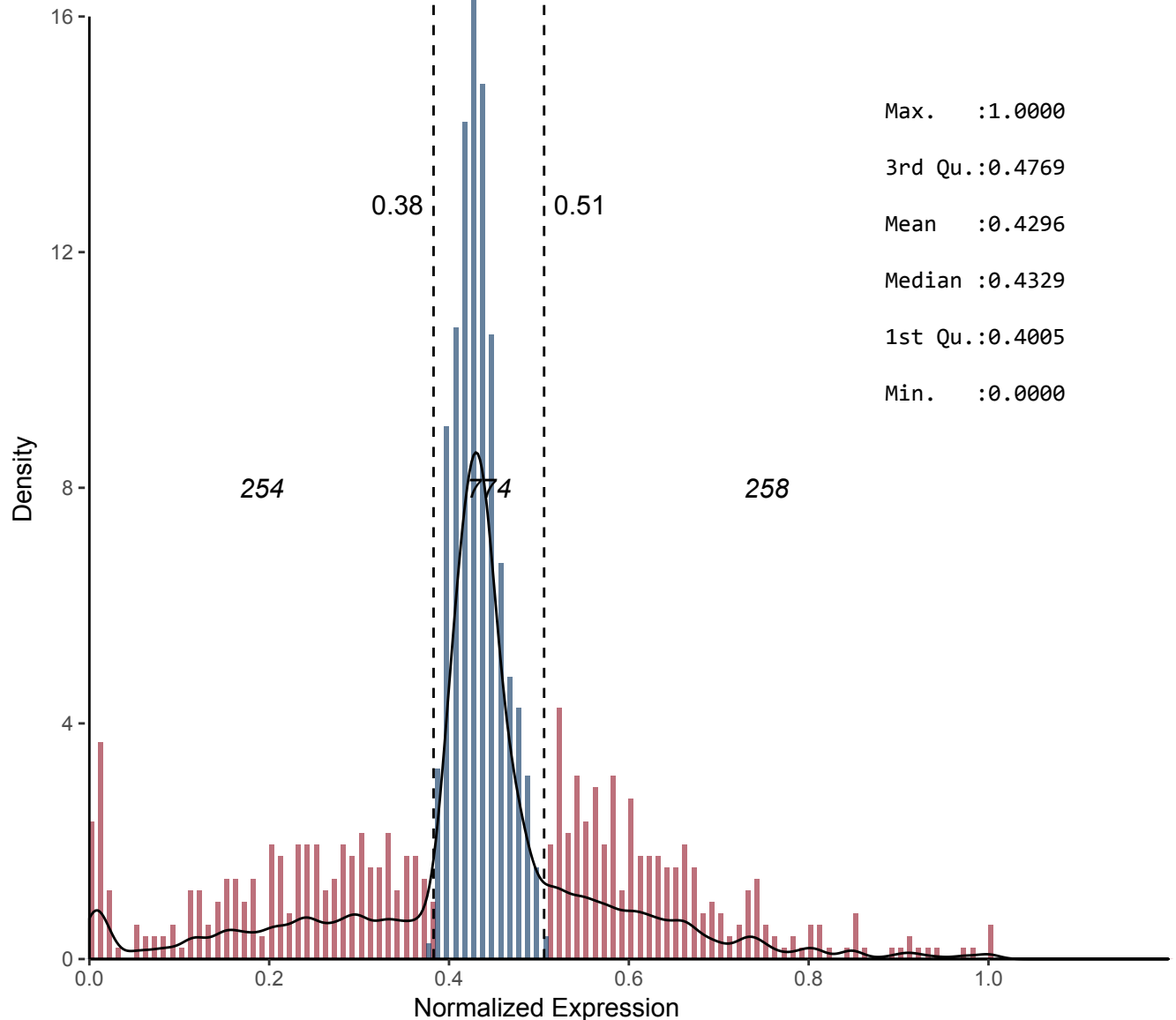
Aberrant TRUE FALSE

Figure 202 - CD185



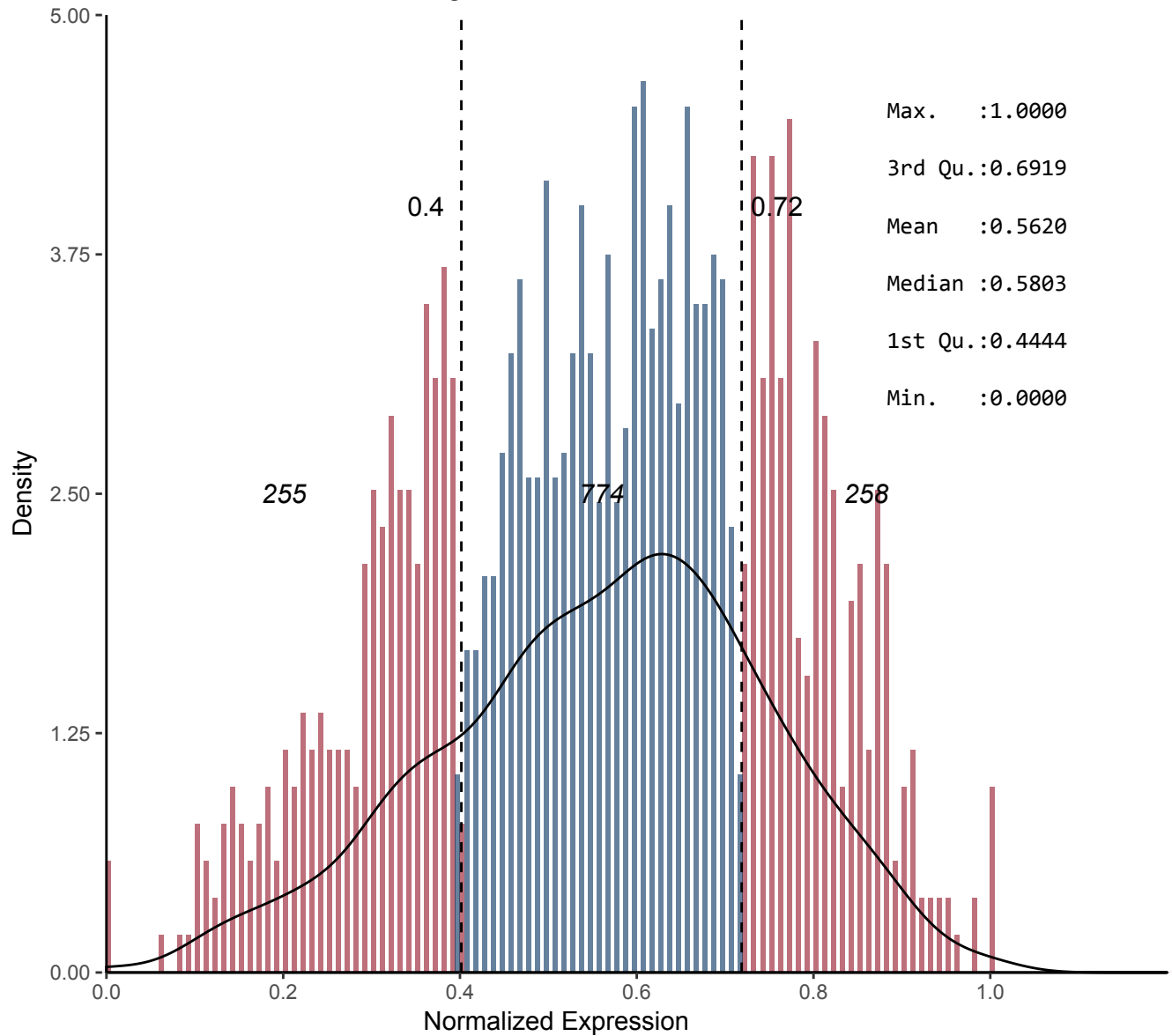
Aberrant TRUE FALSE

Figure 203 - CD186



Aberrant TRUE FALSE

Figure 204 - CD191



Aberrant TRUE FALSE

Figure 205 - CD193

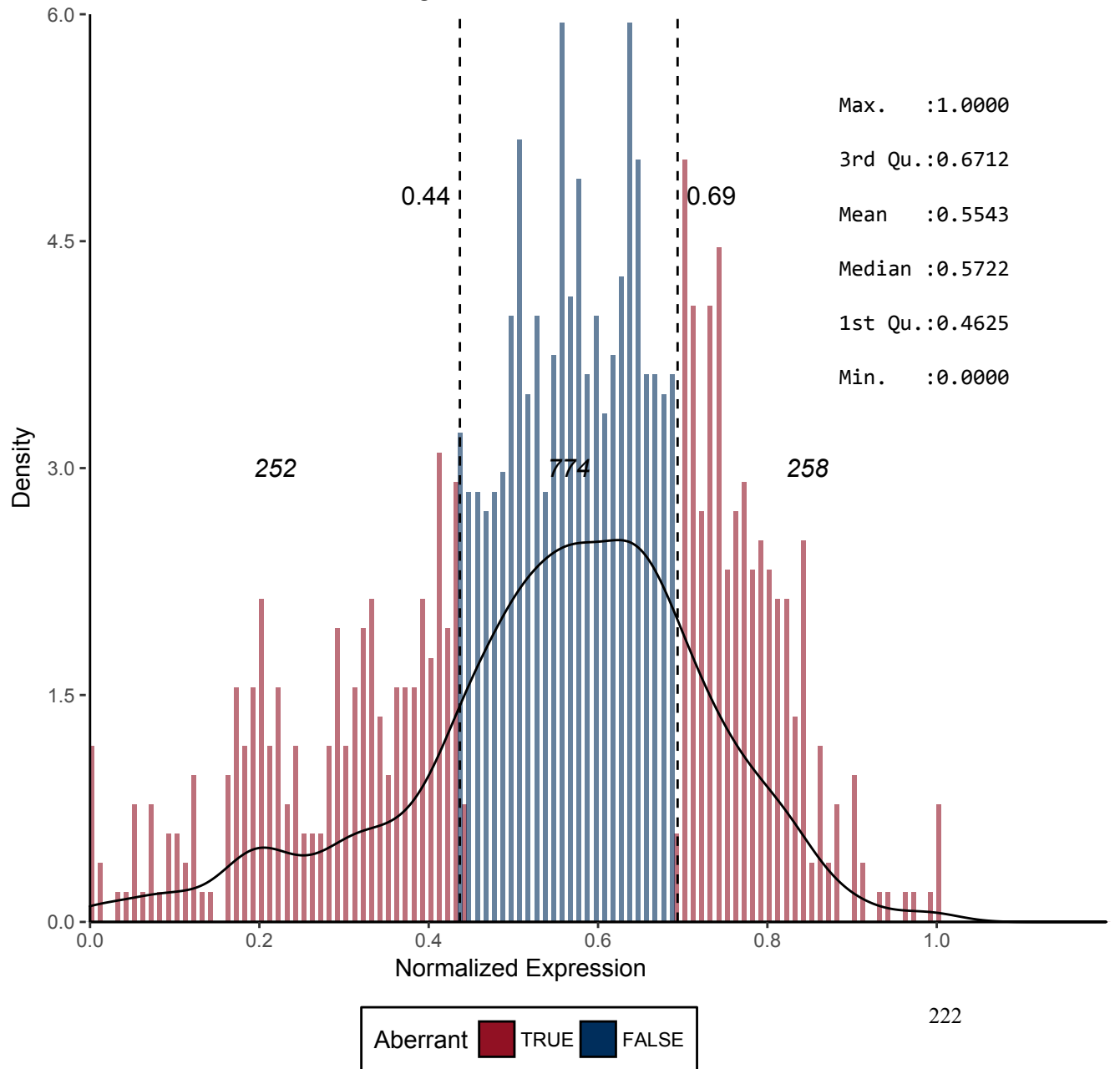


Figure 206 - CD194*

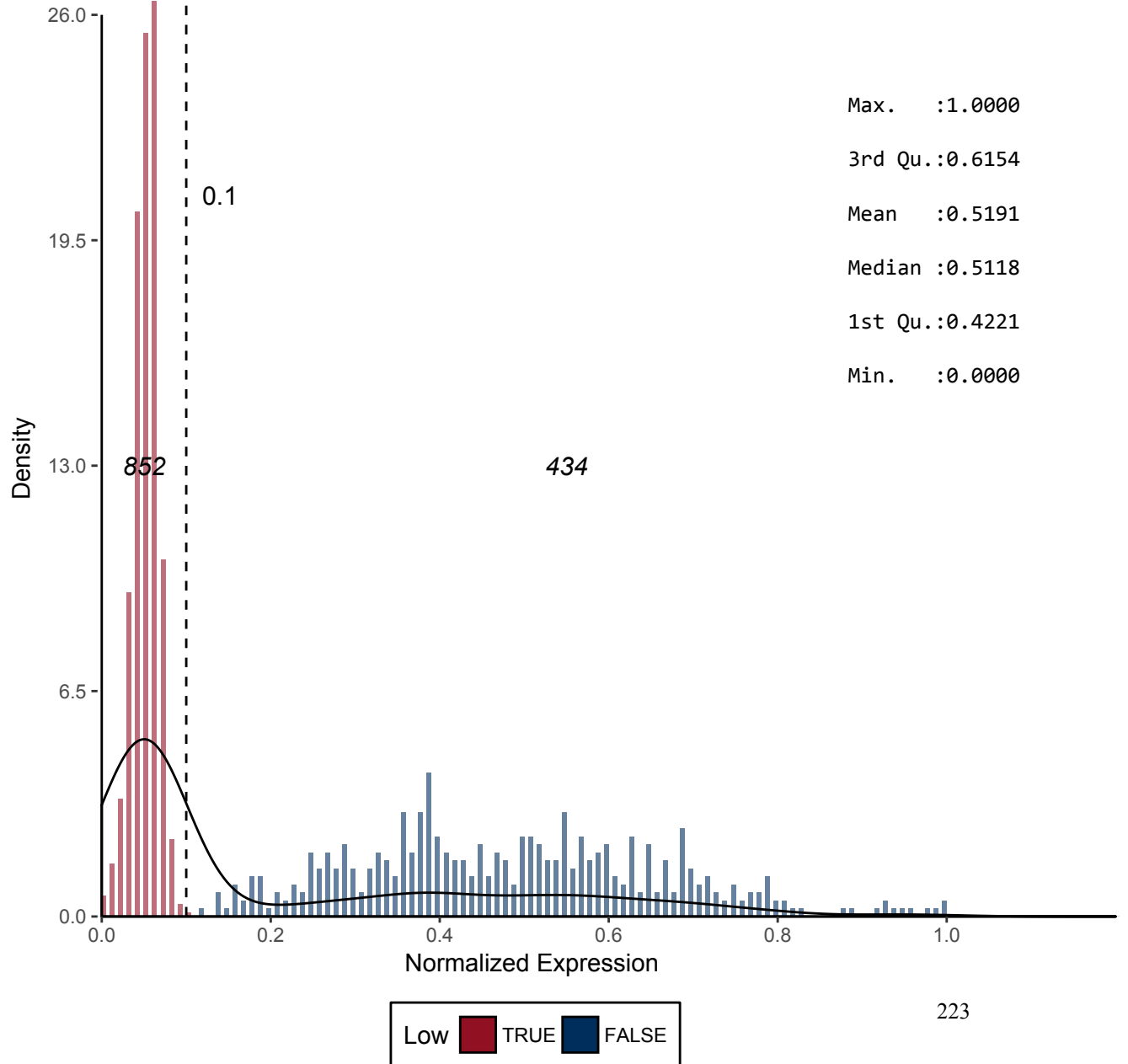


Figure 207 - CD195

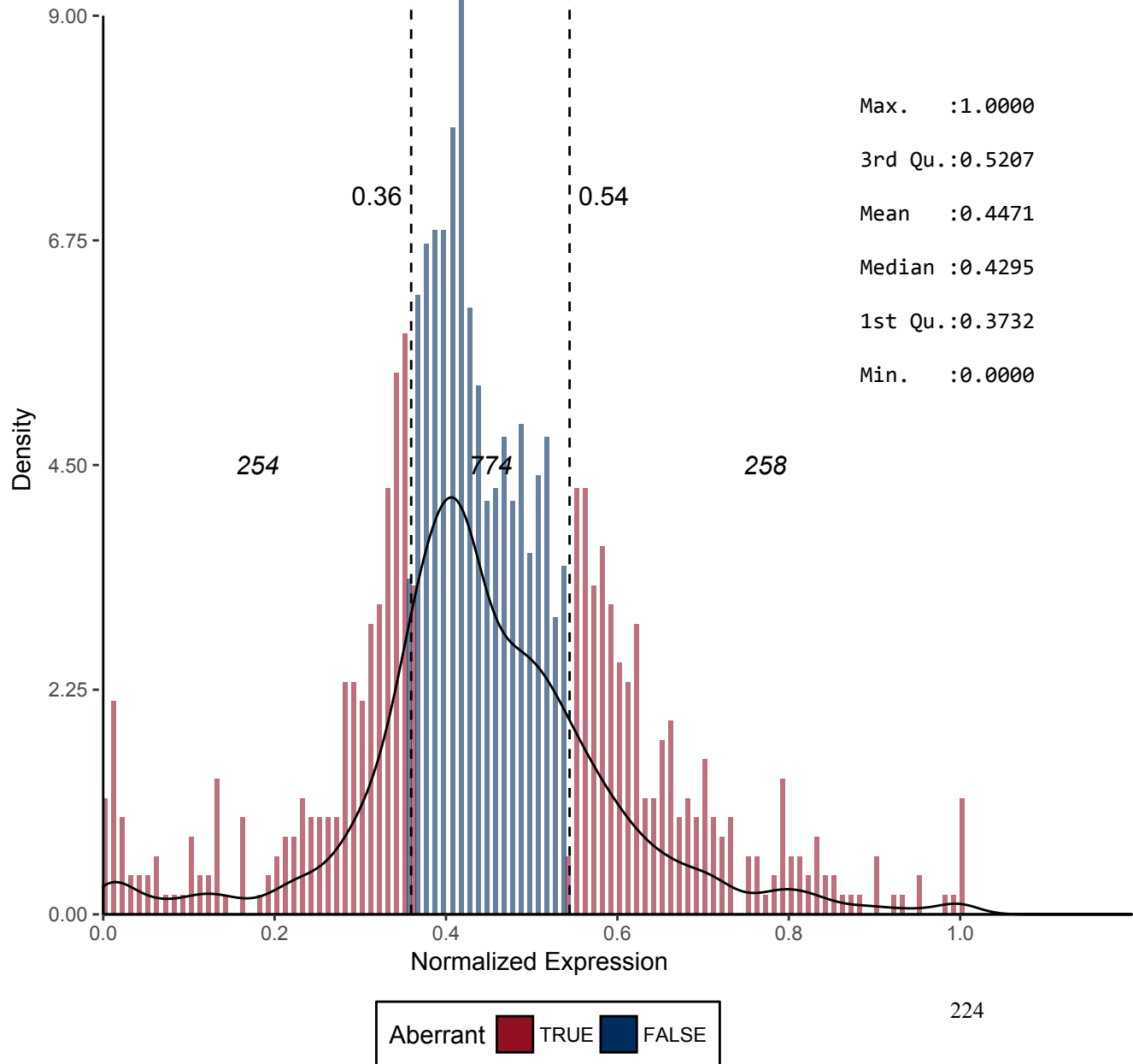


Figure 208 - CD196

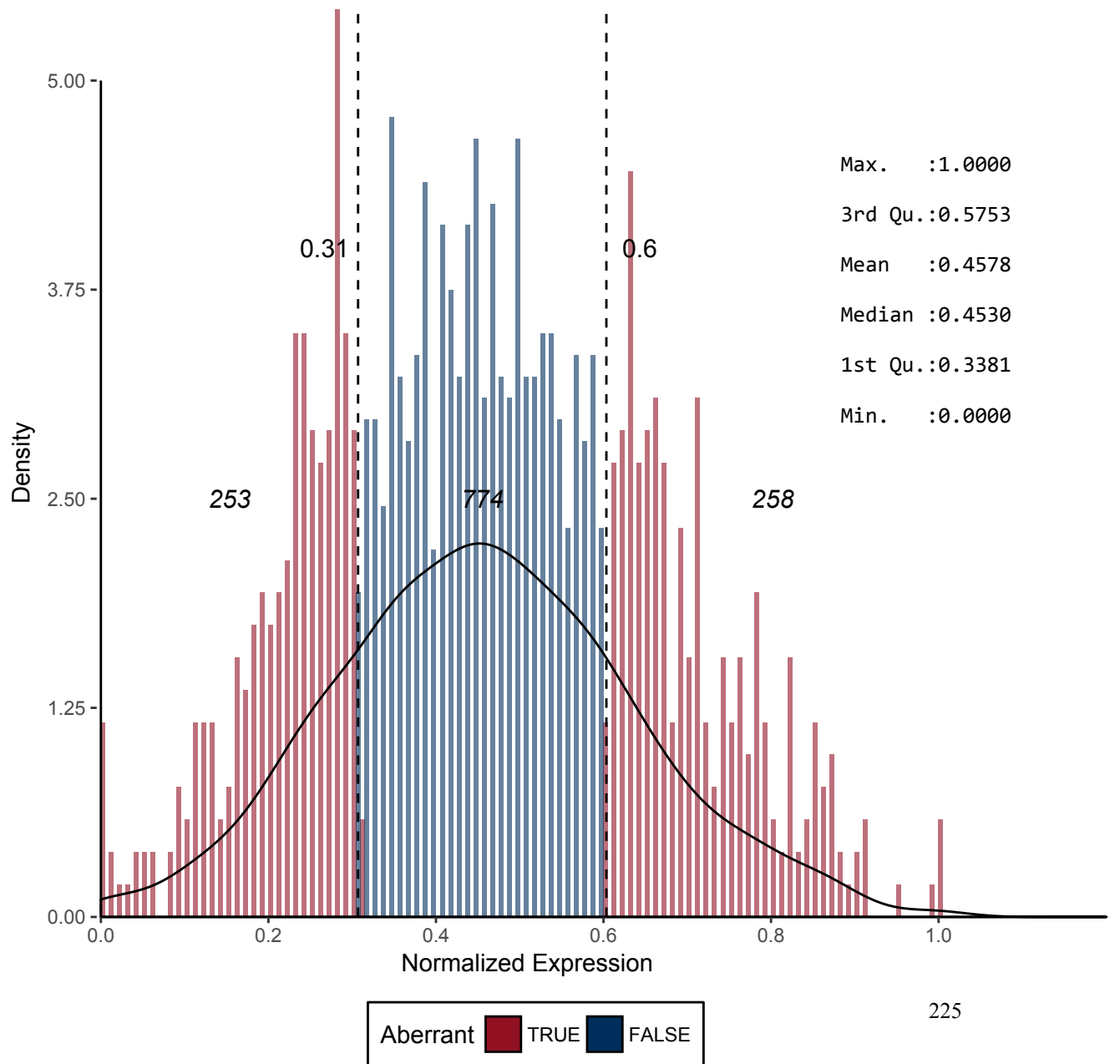
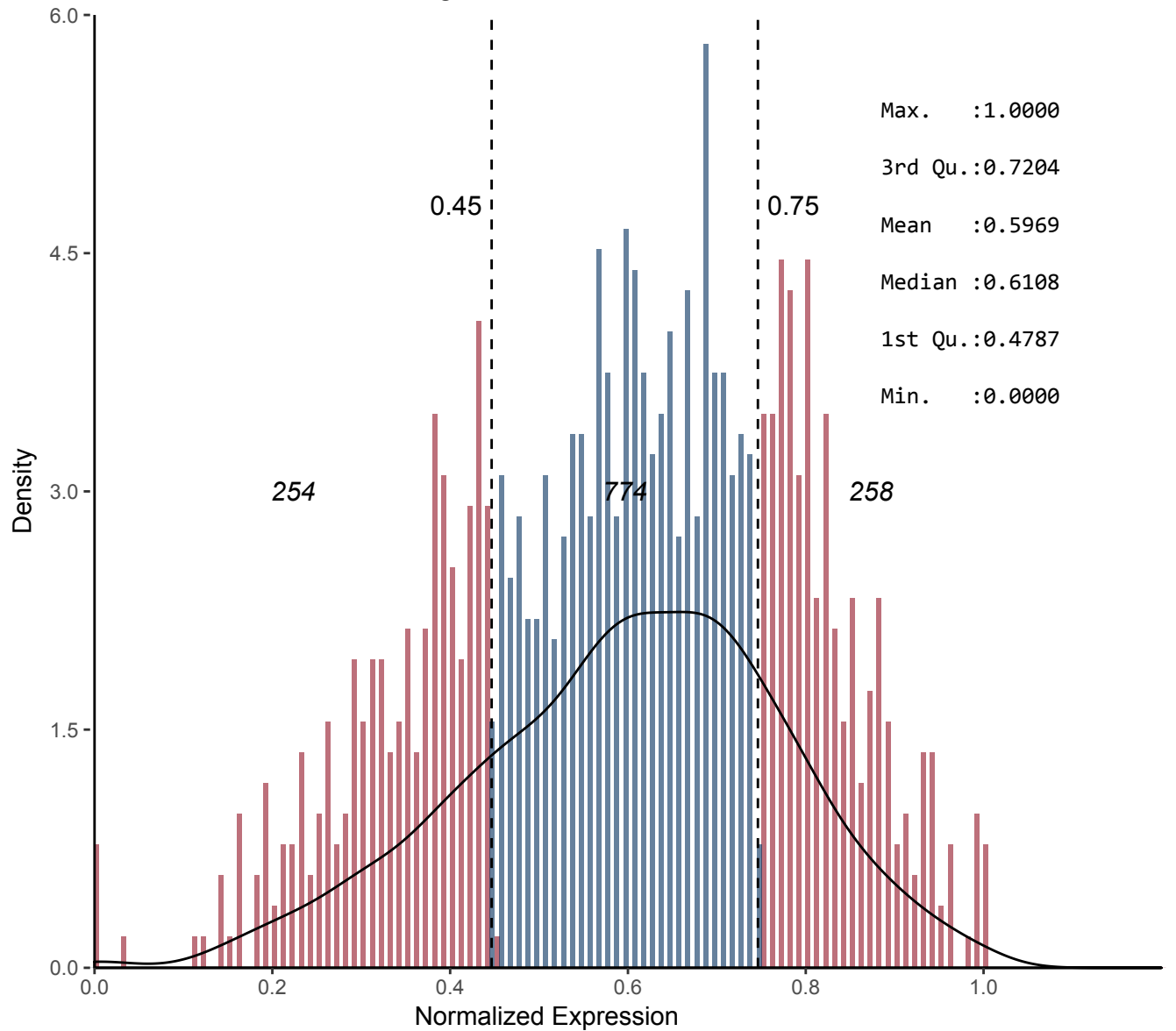


Figure 209 - CD197



Aberrant TRUE FALSE

Figure 210 - CD199

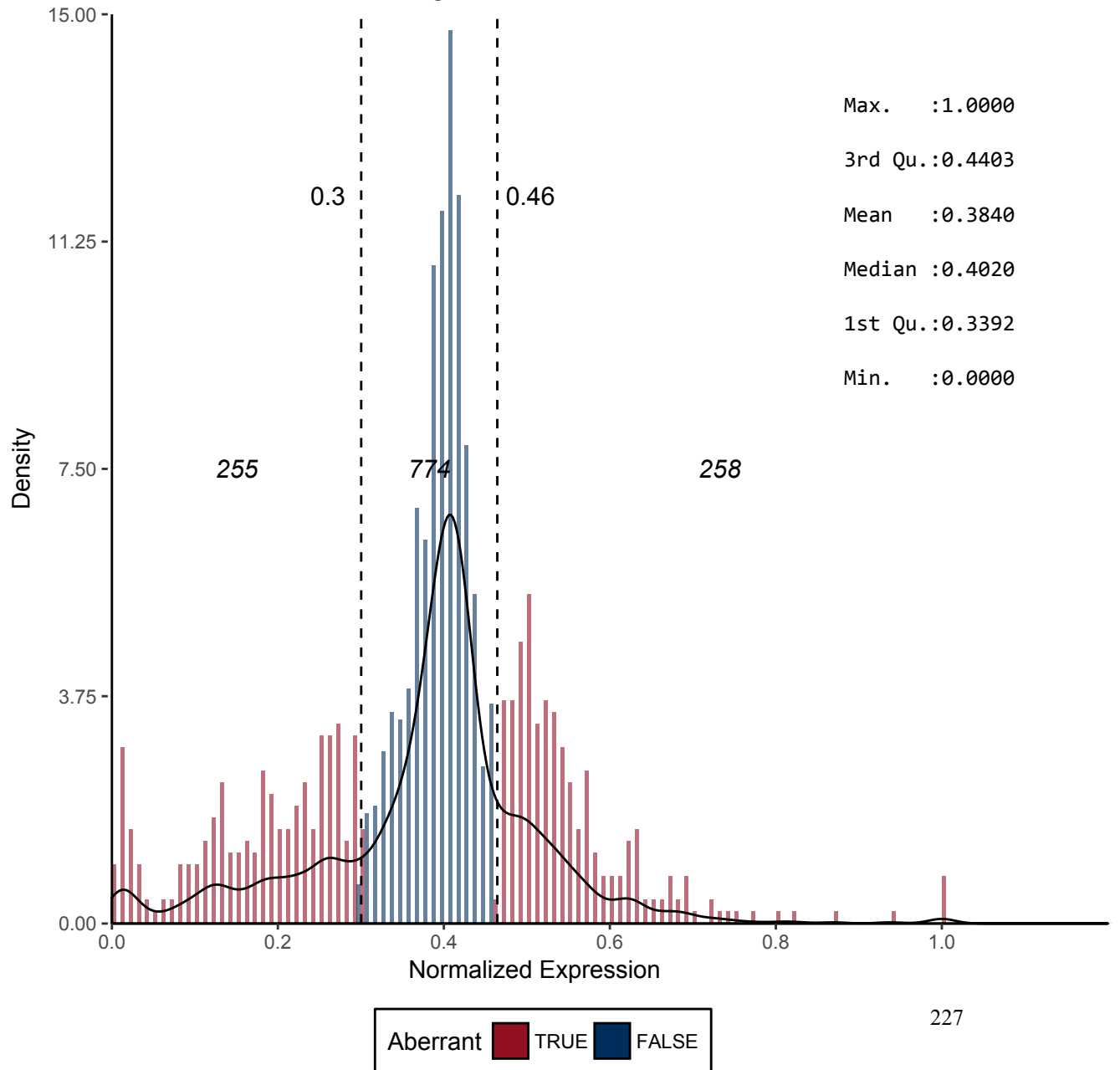


Figure 211 - CD200*

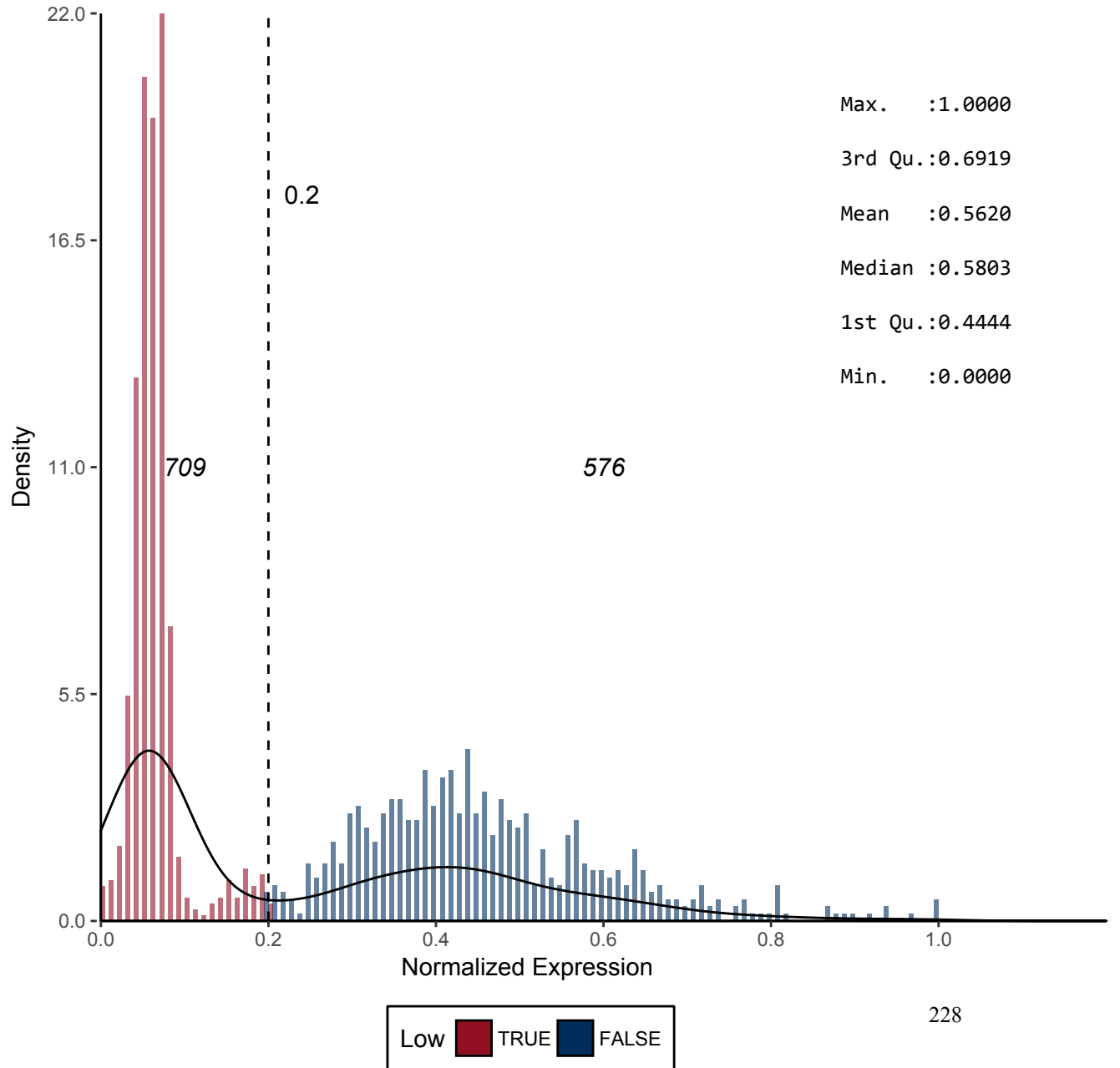


Figure 212 - CD201

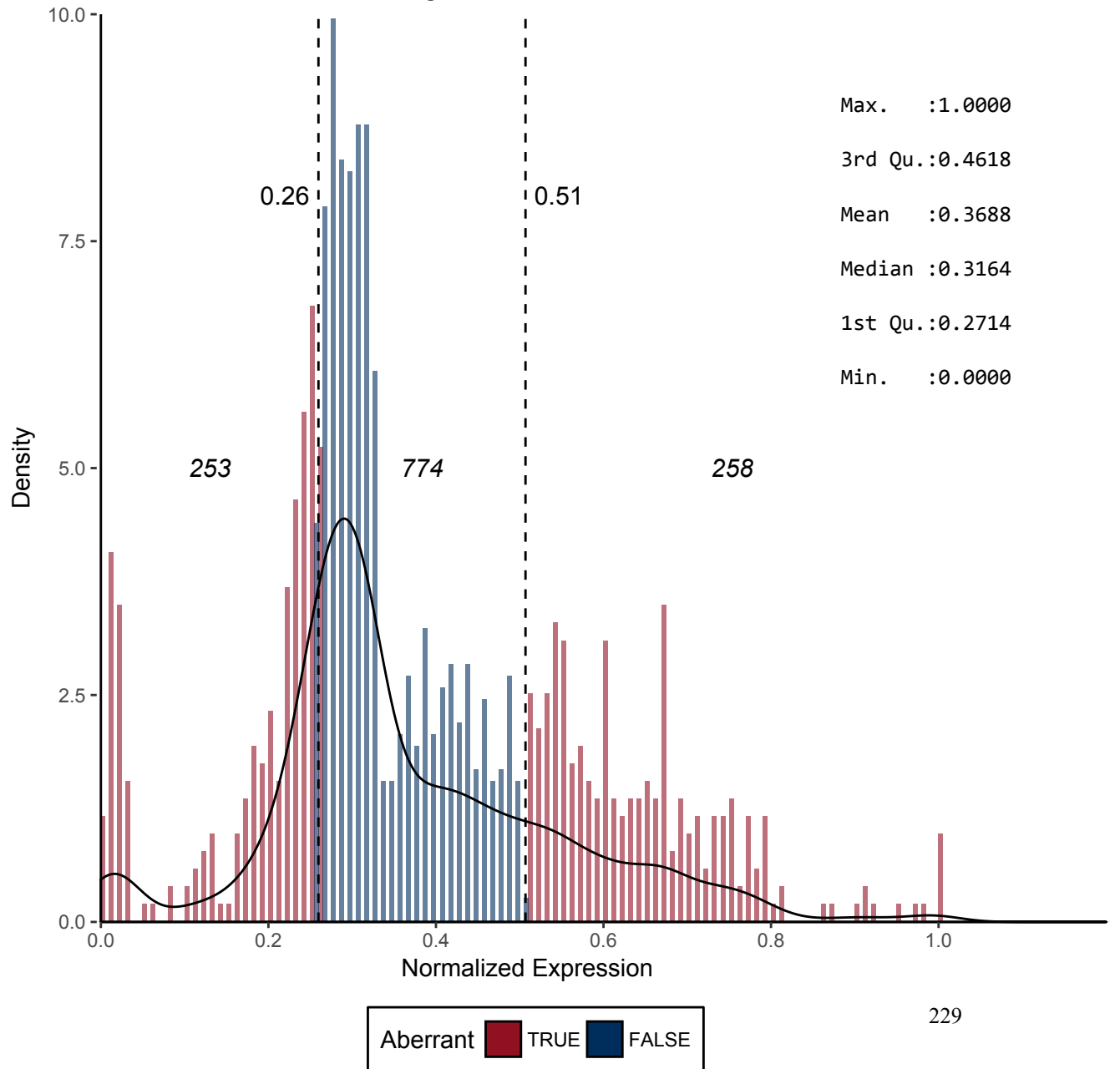


Figure 213 - CD202B*

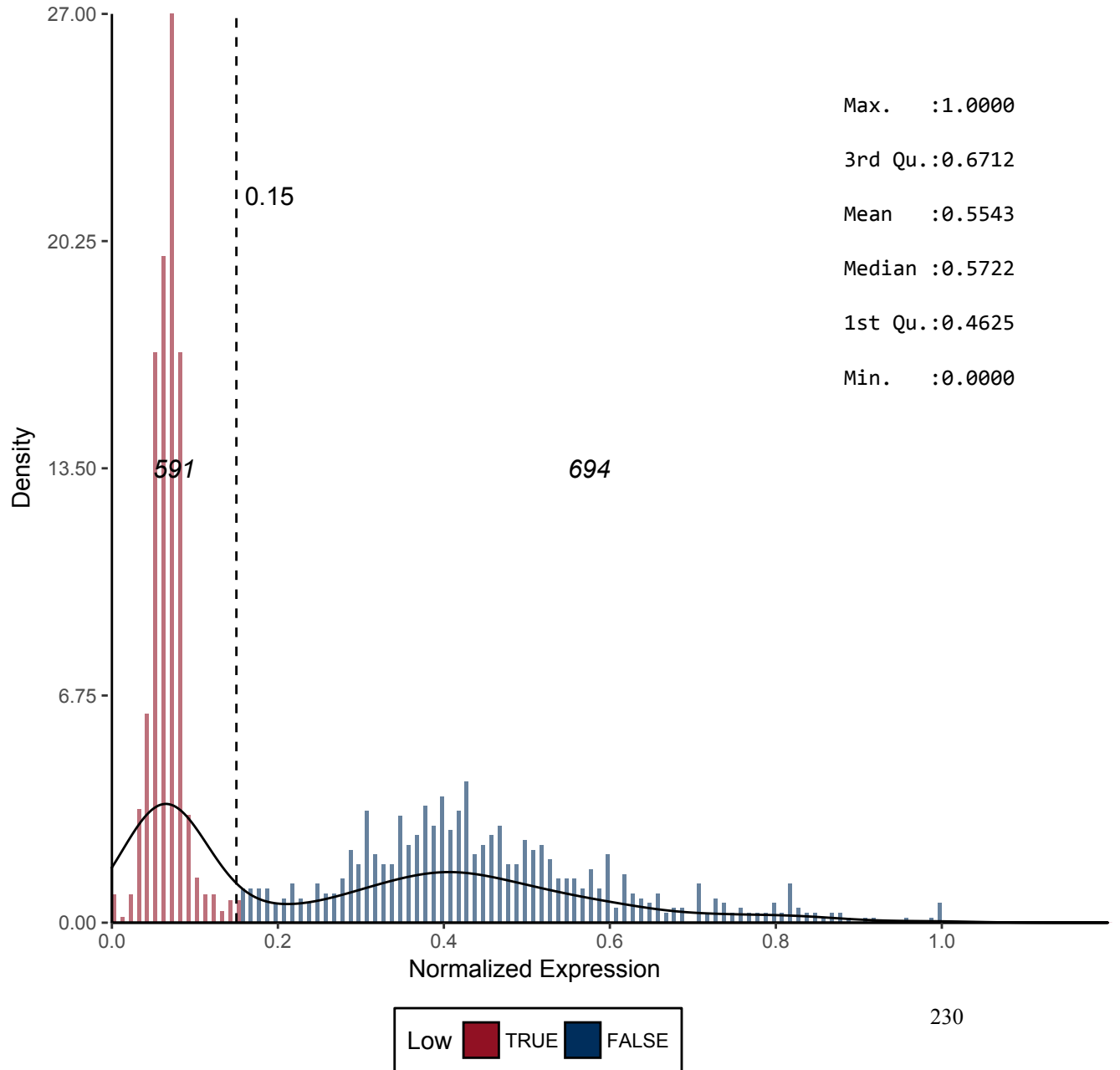


Figure 214 - CD203C*

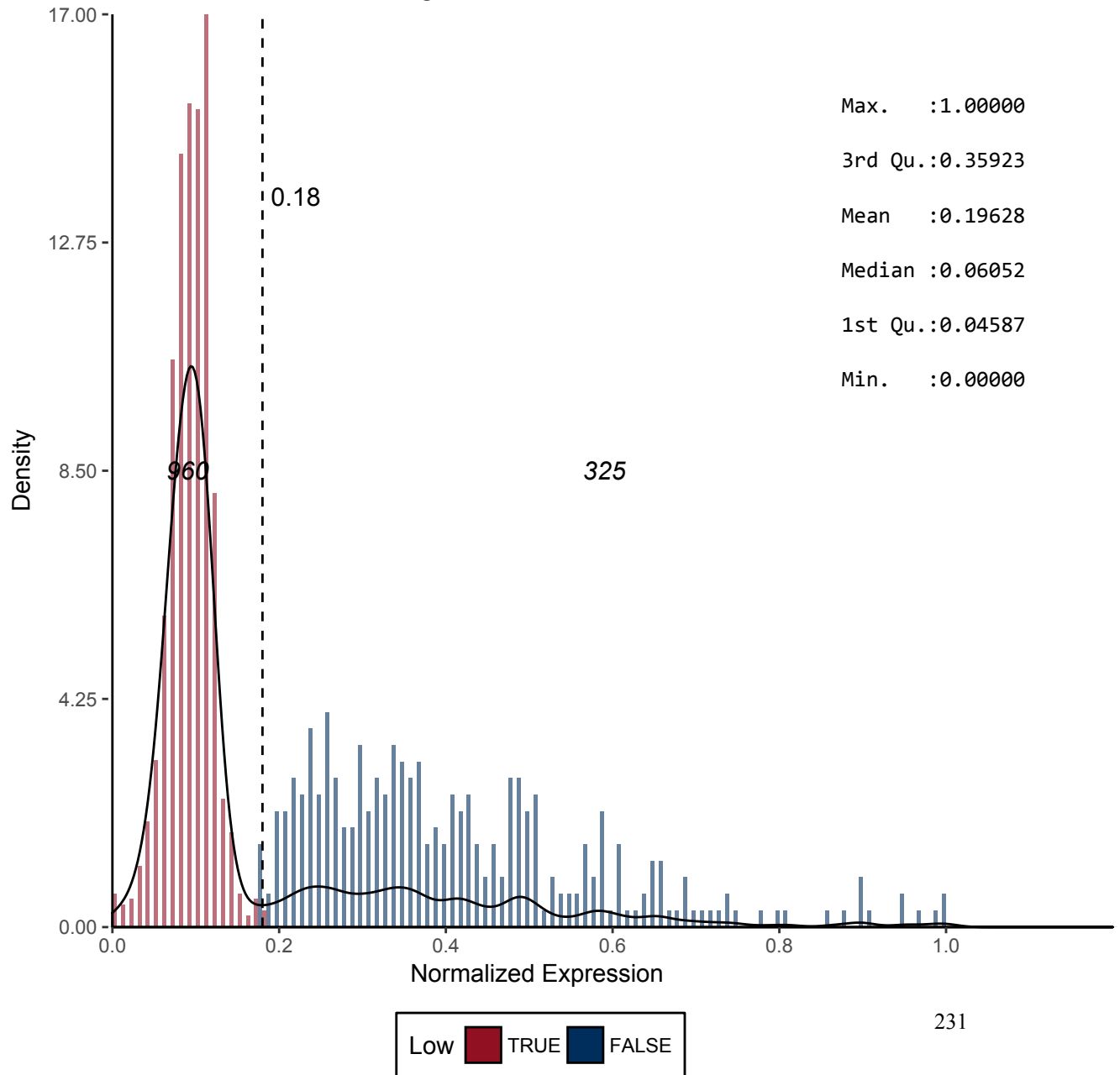


Figure 215 - CD204*

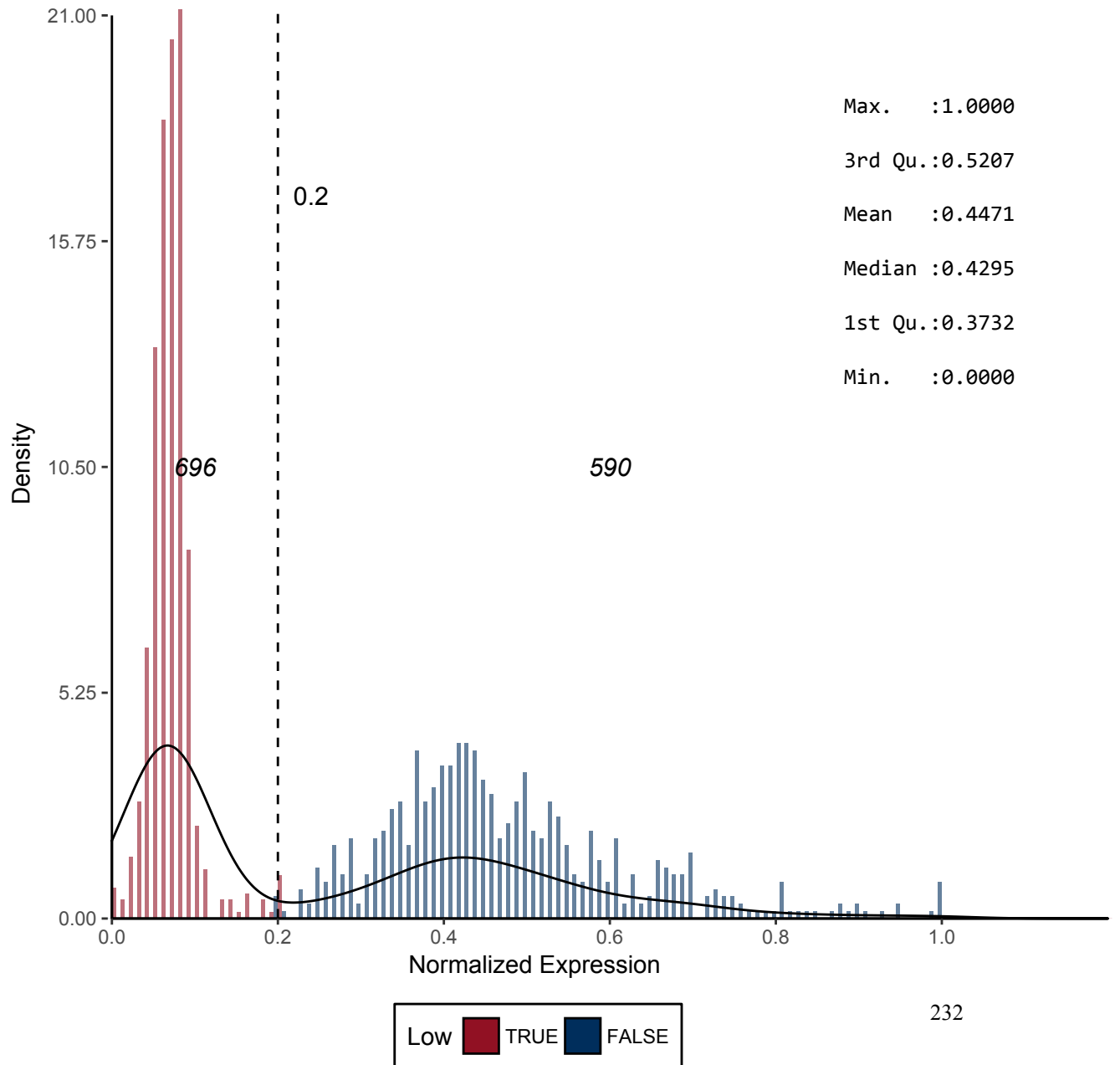


Figure 216 - CD205

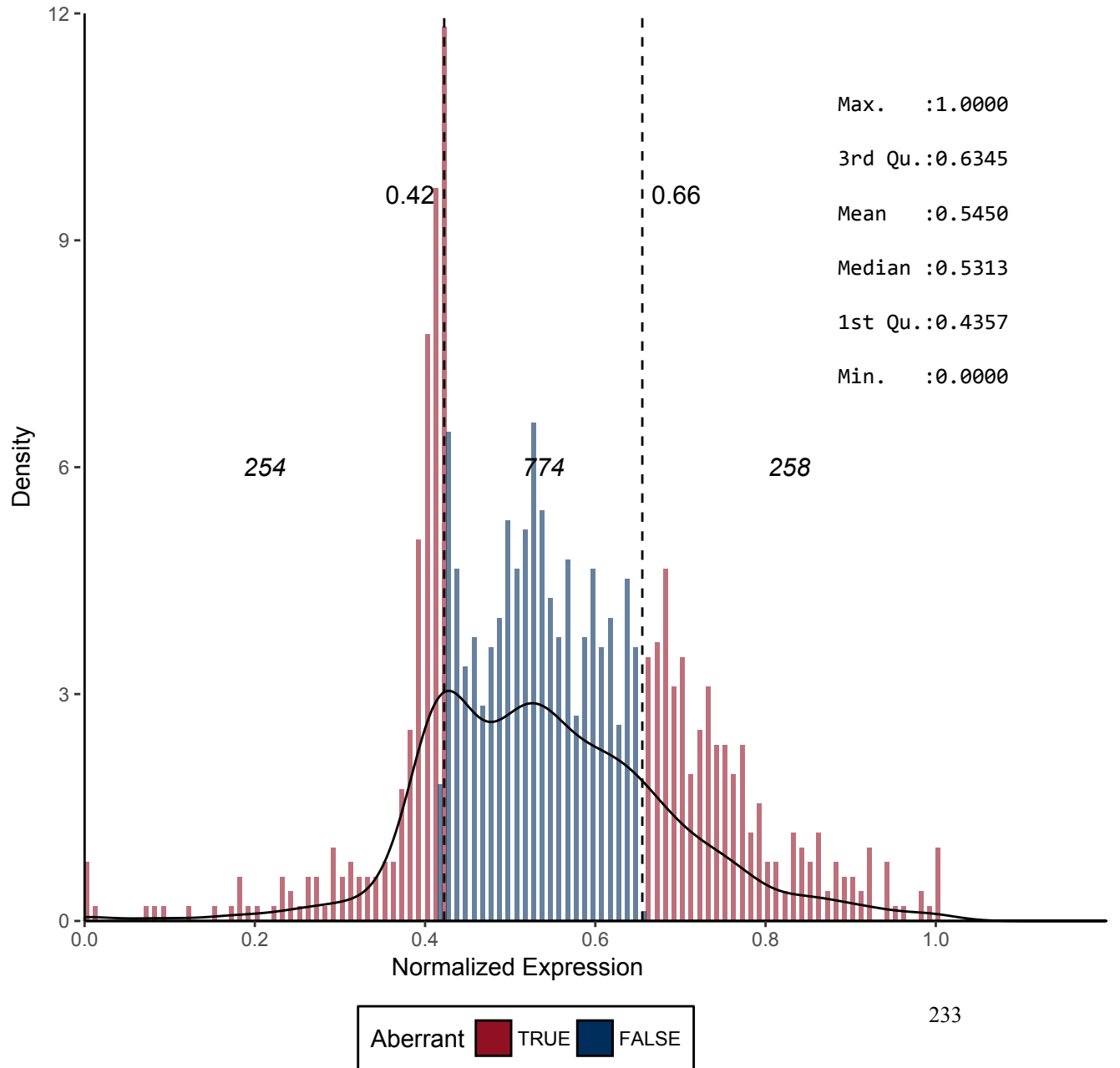


Figure 217 - CD206*

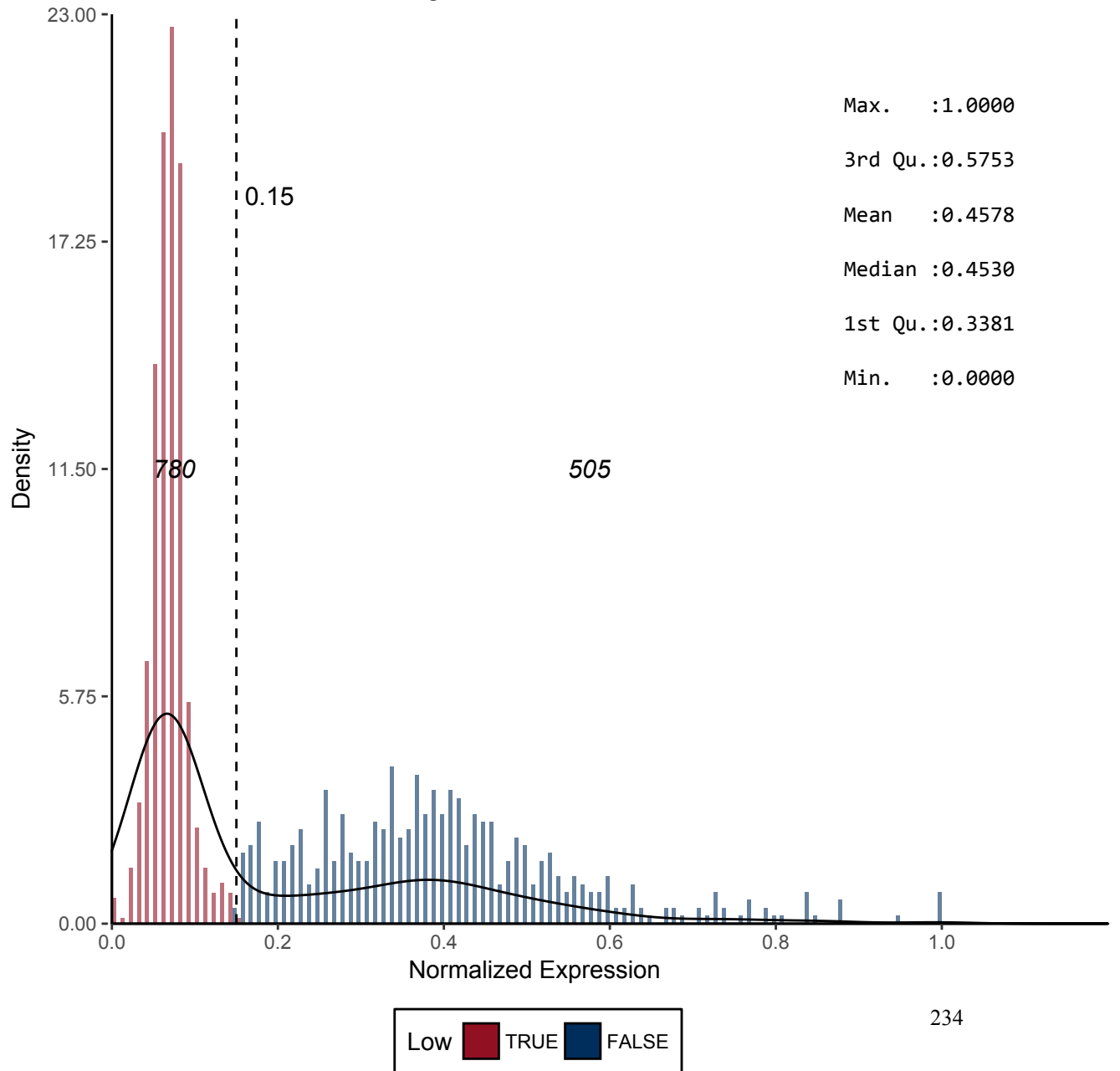


Figure 218 - CD207*

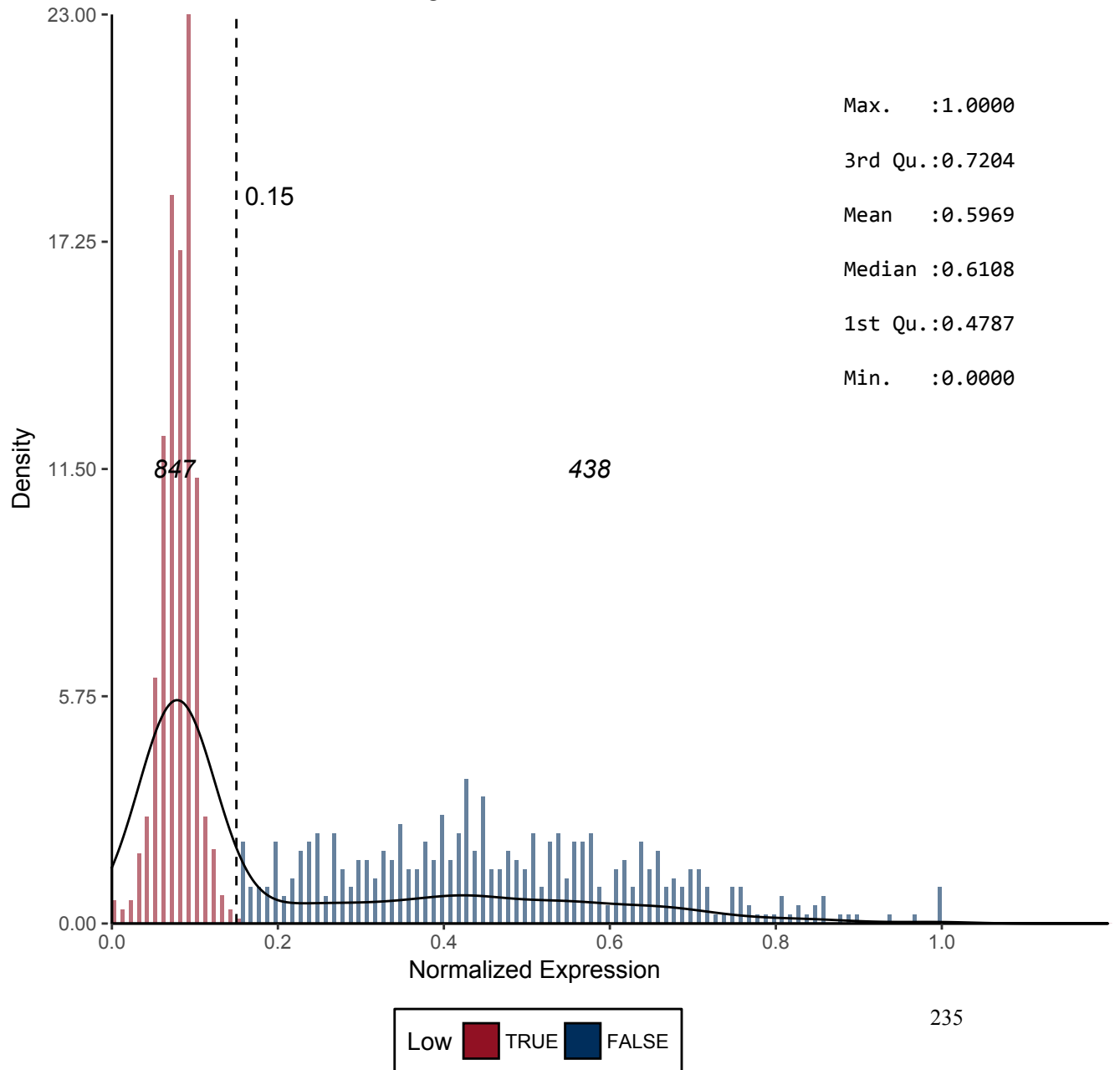
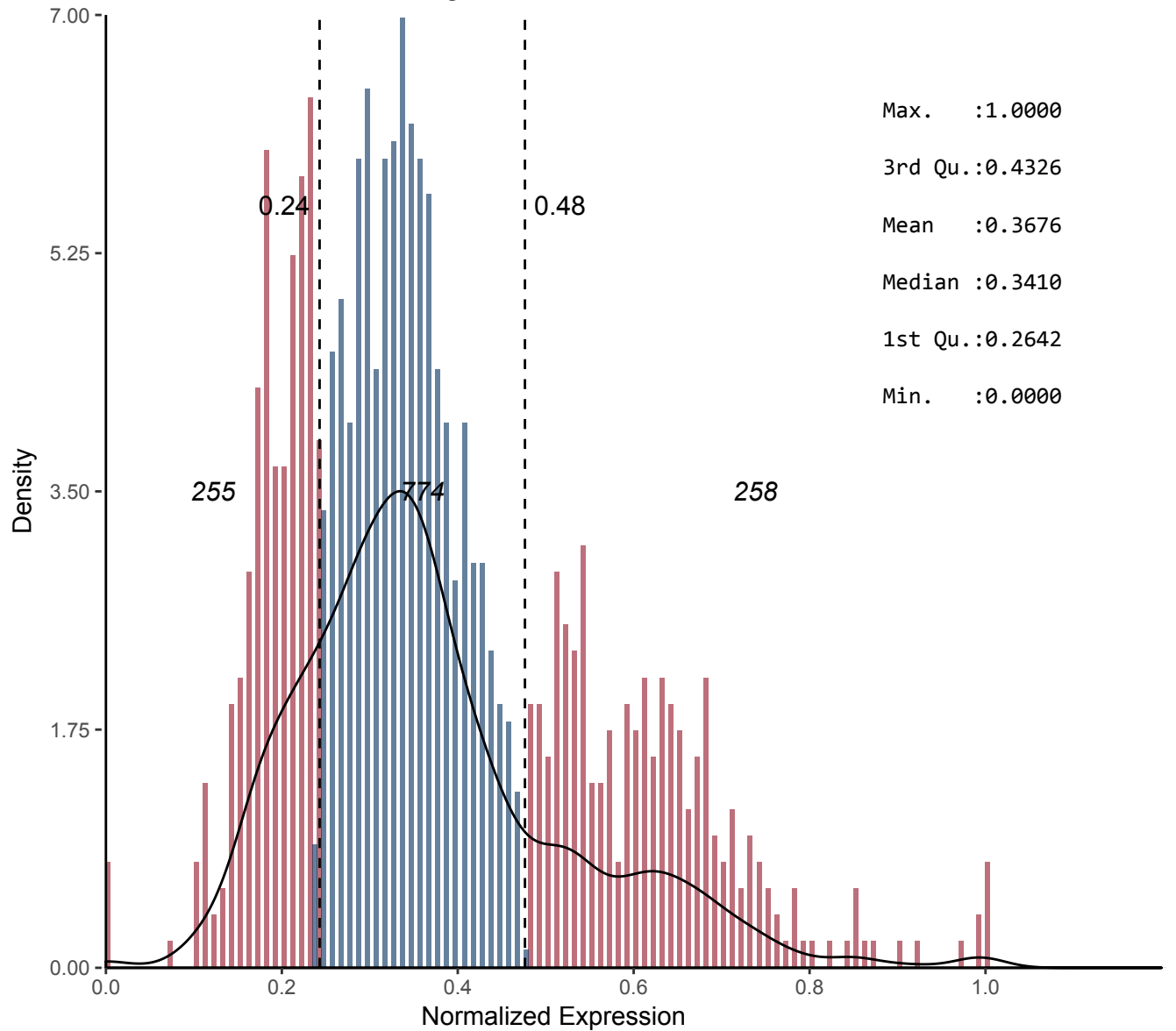


Figure 219 - CD208



Aberrant TRUE FALSE

Figure 220 - CD209*

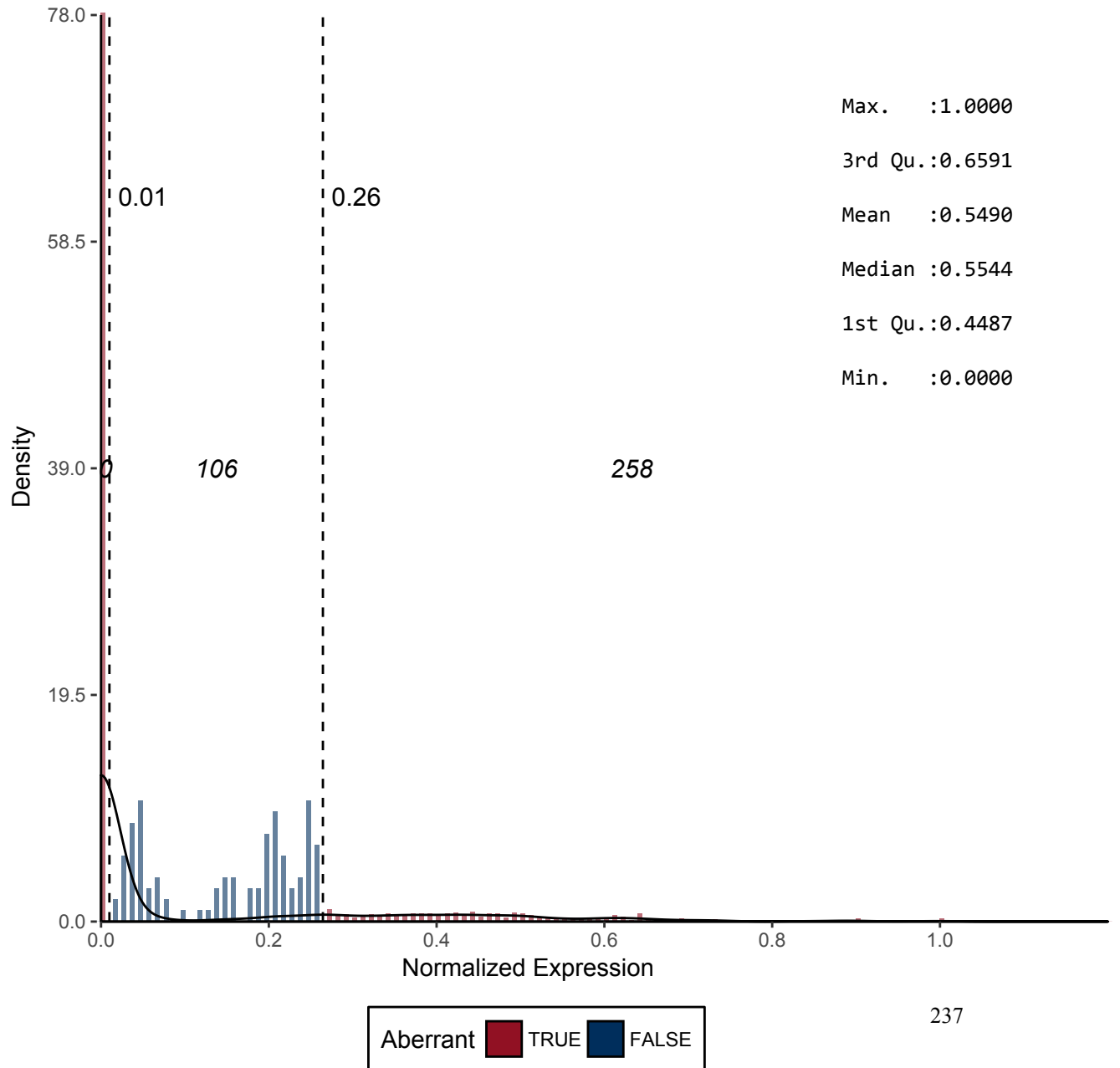


Figure 221 - CD210

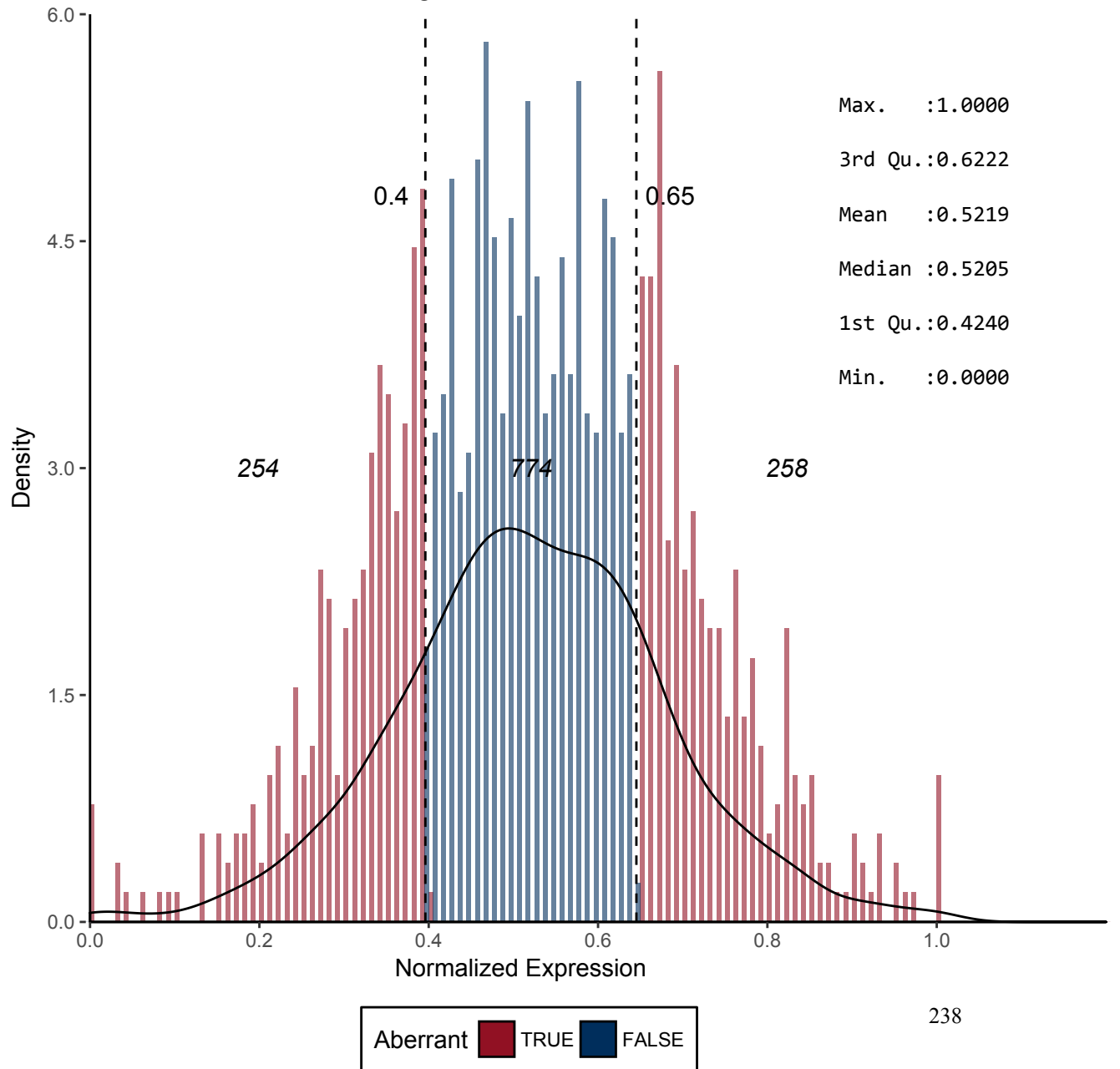


Figure 222 - CDW210B

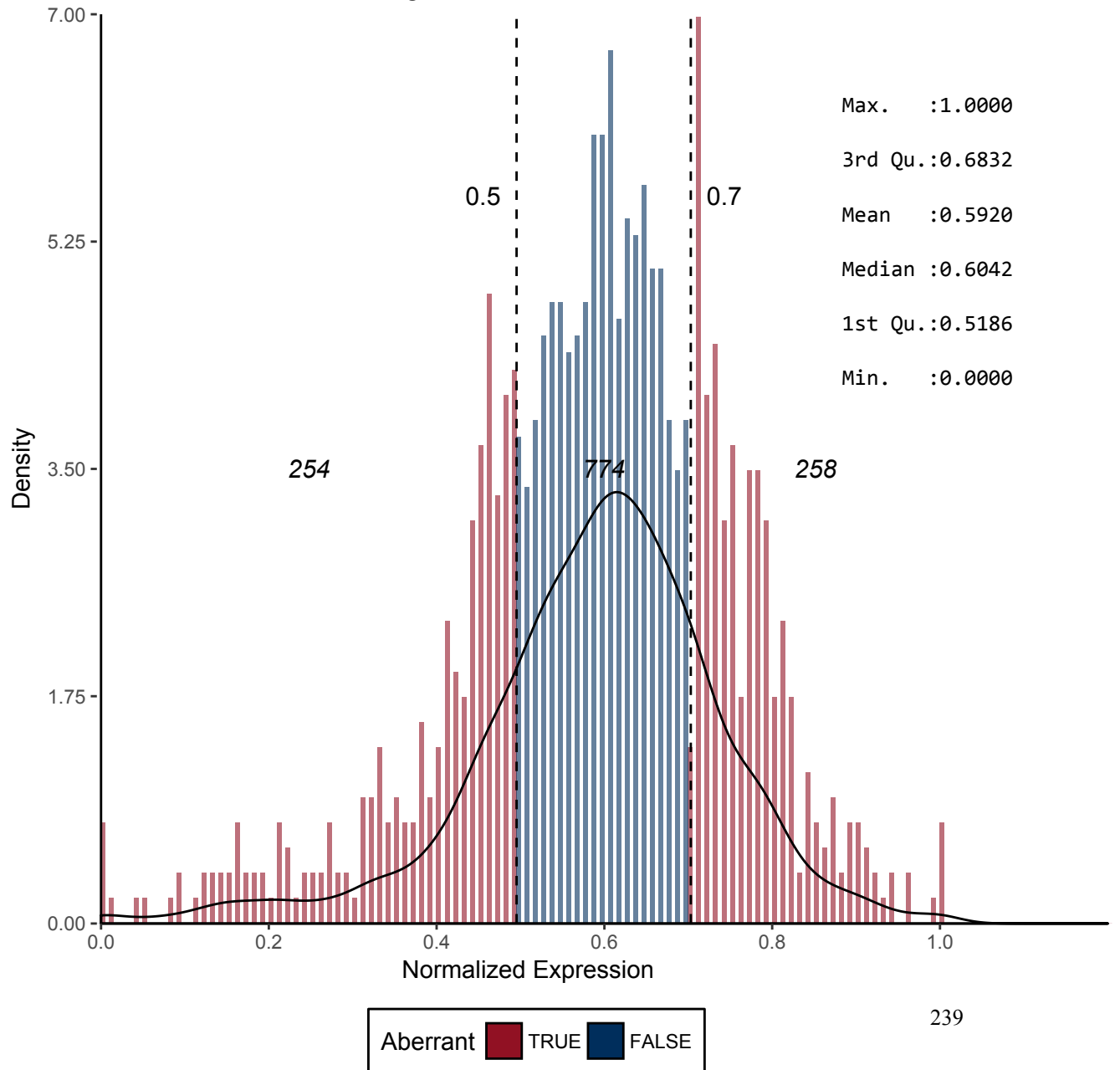


Figure 223 - CD212

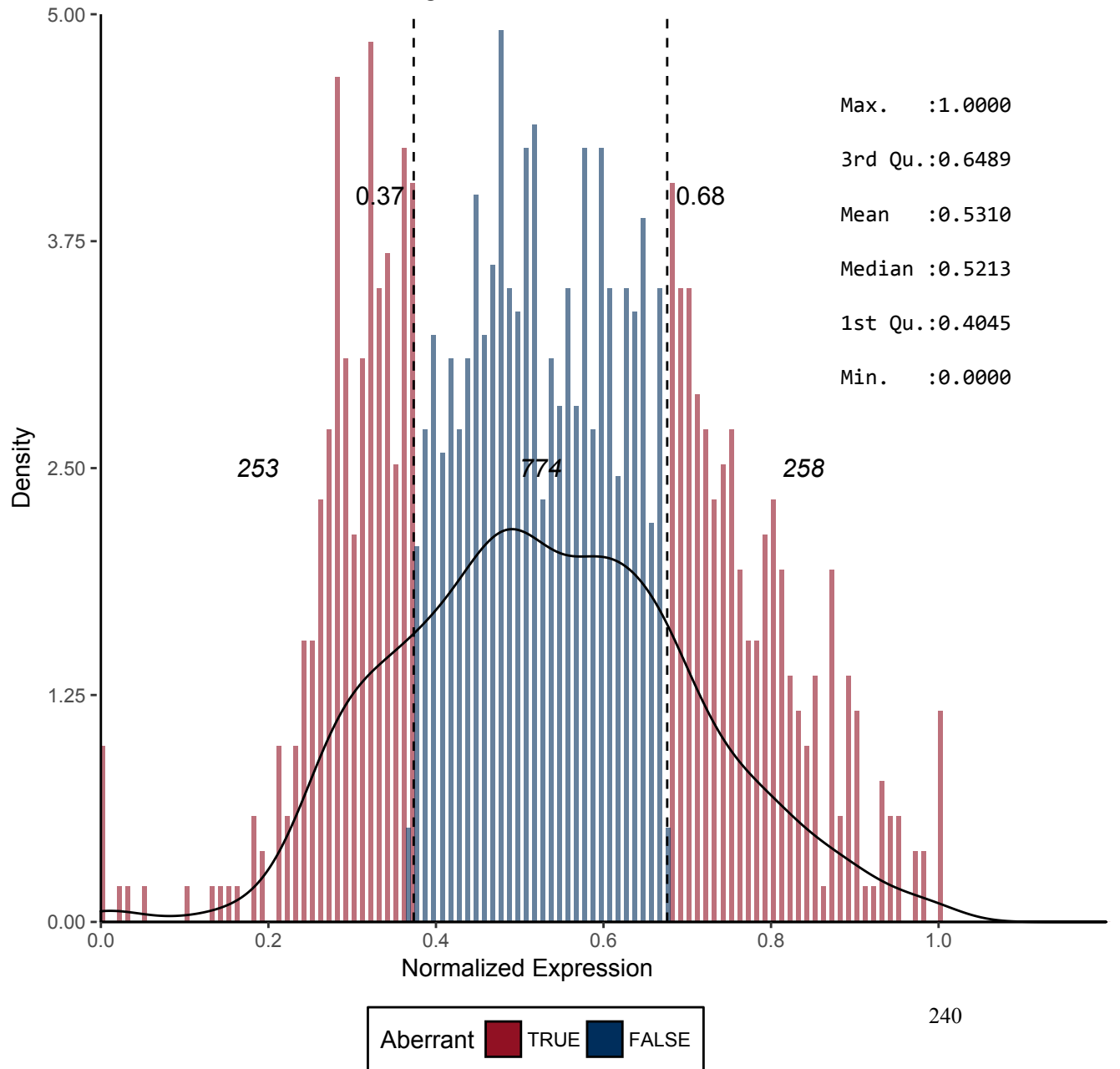


Figure 224 - CD213A1

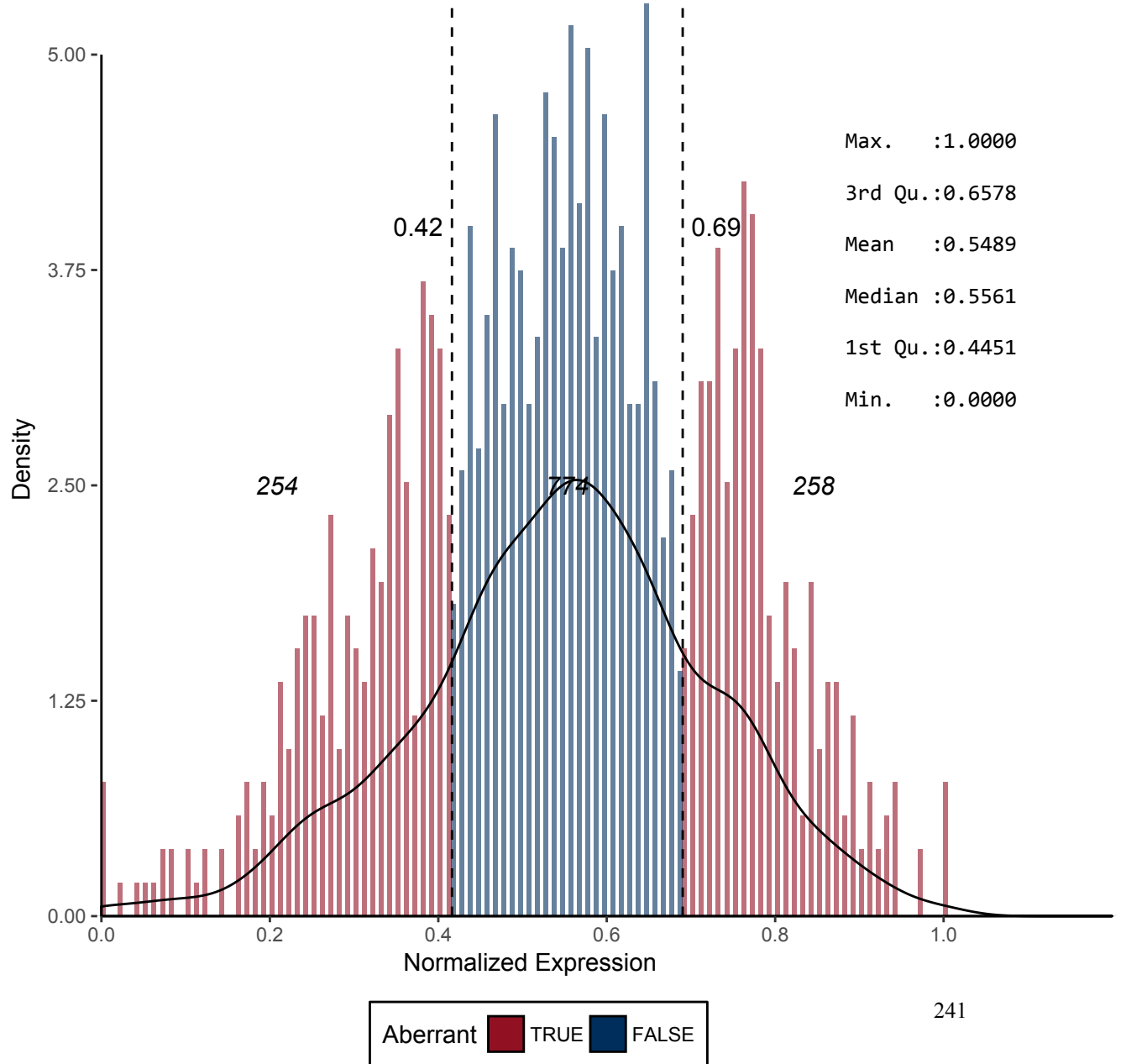


Figure 225 - CD213A2*

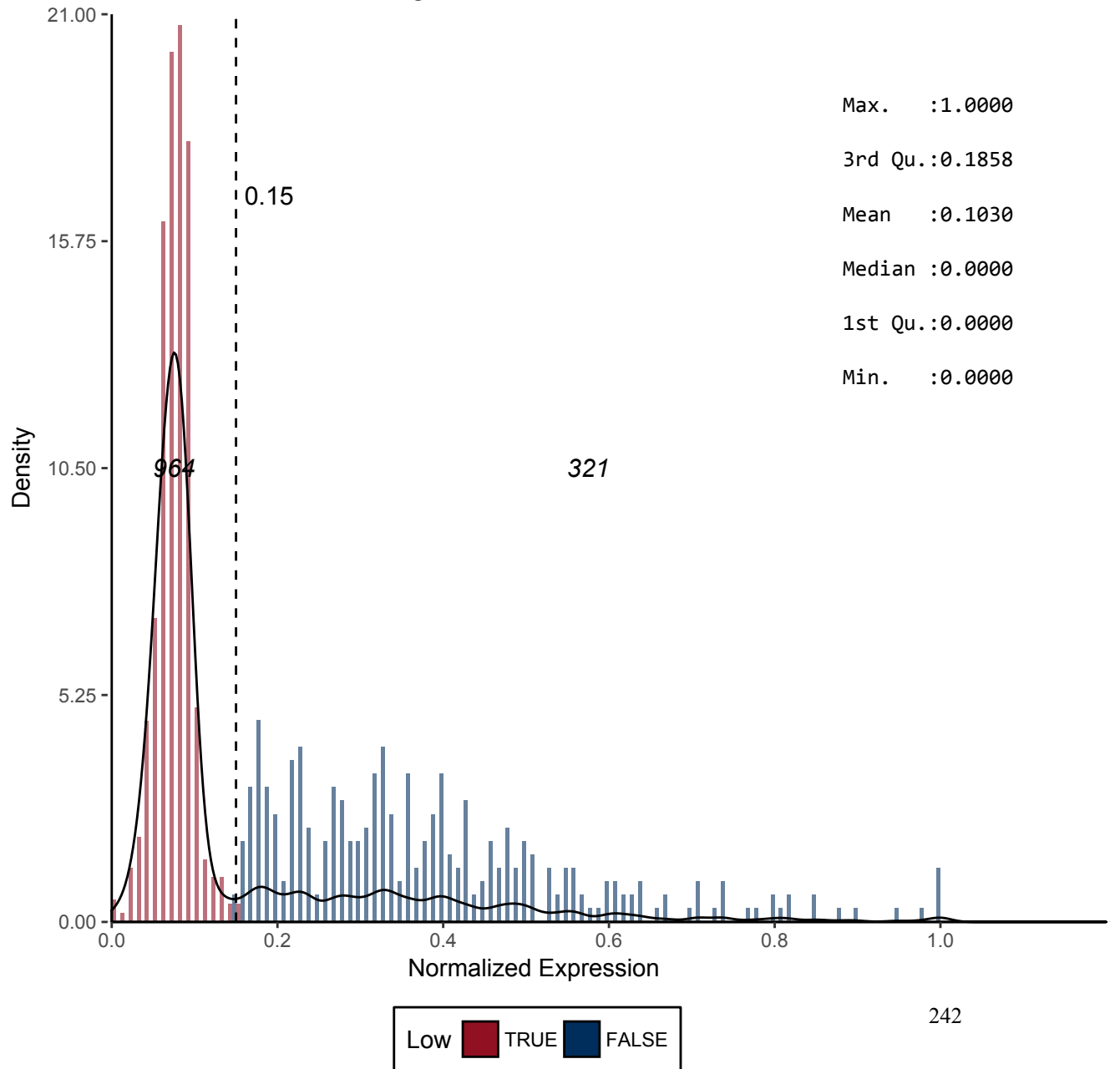


Figure 226 - CD215*

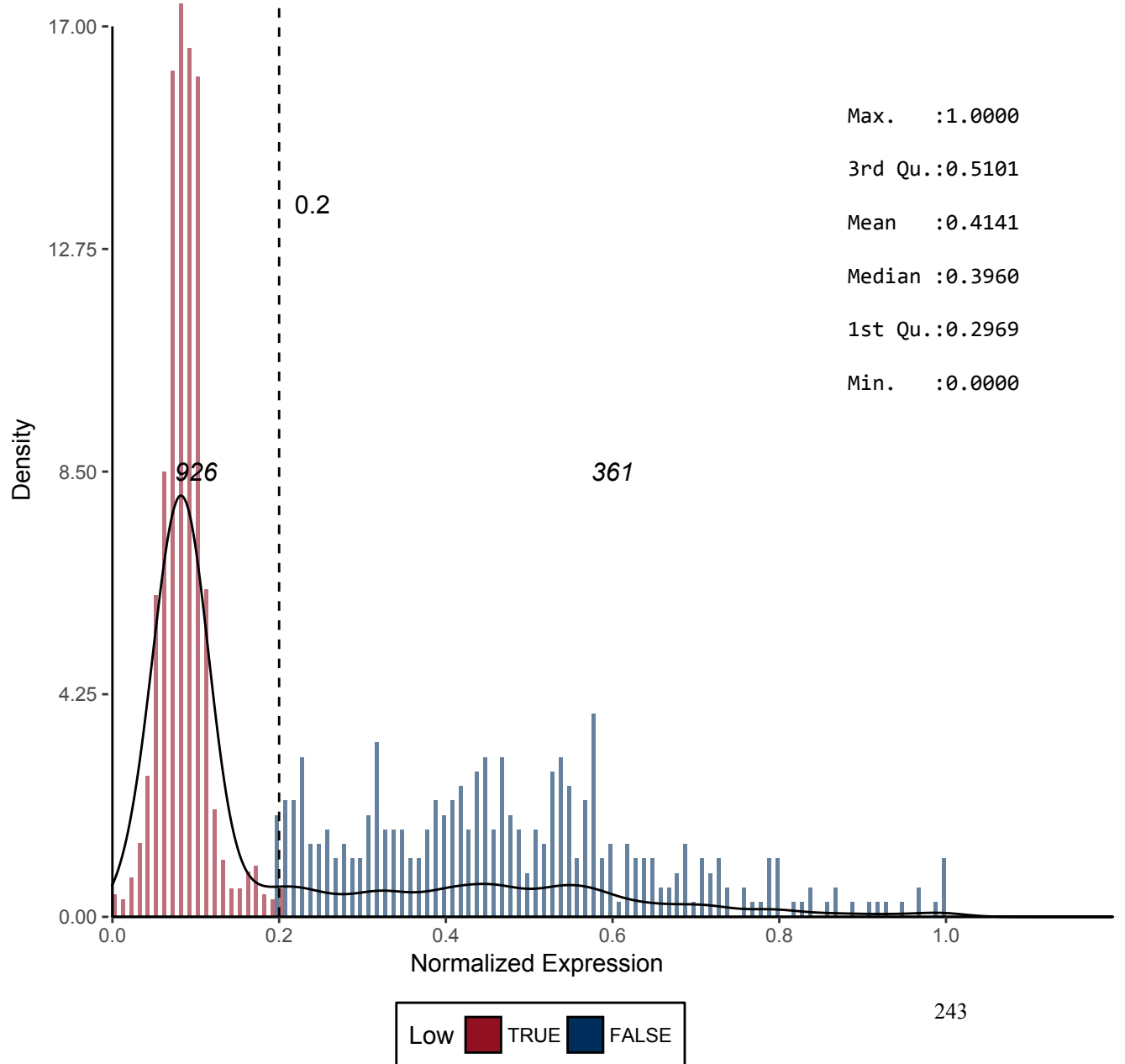


Figure 227 - CD217A

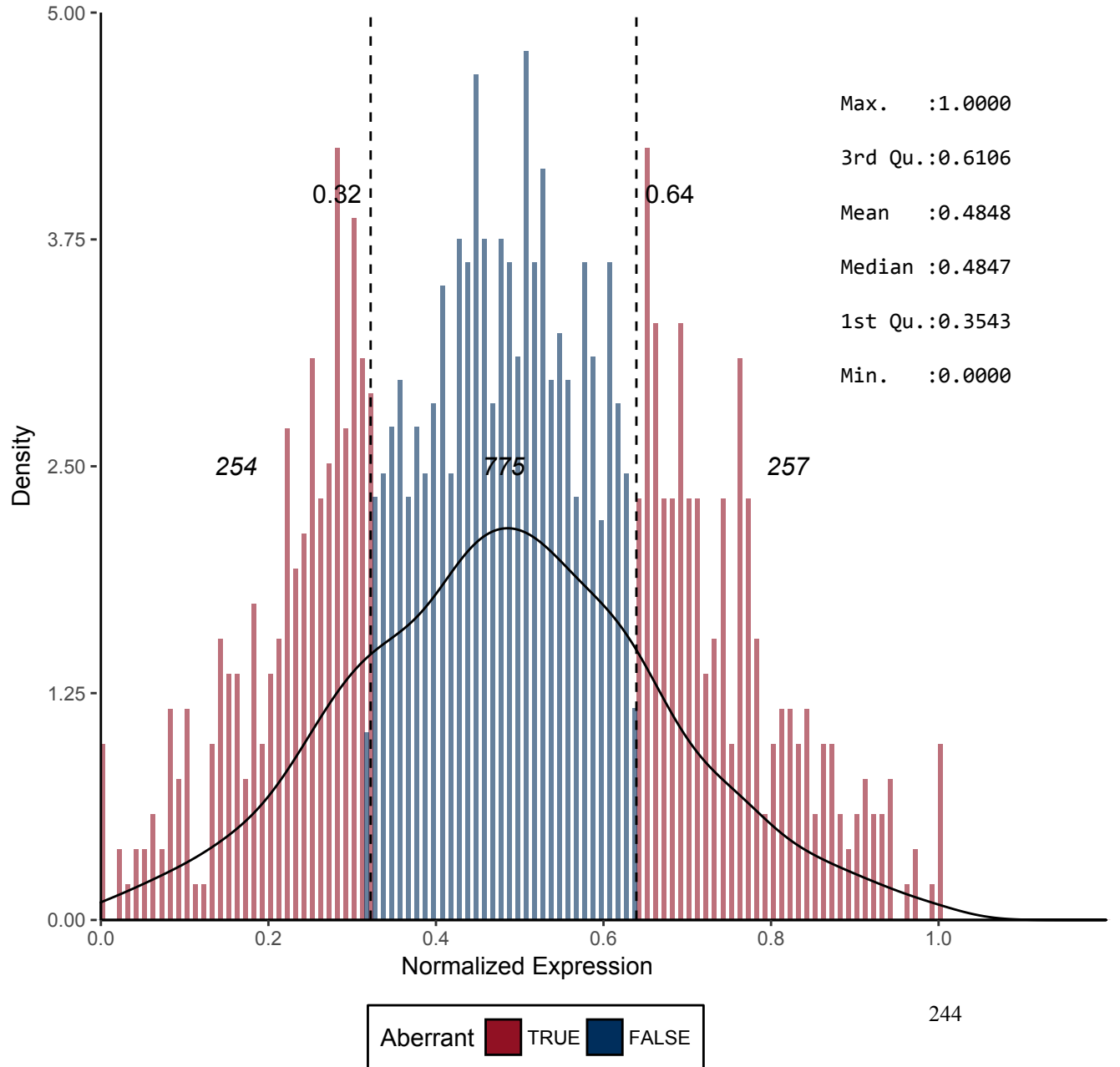


Figure 228 - CD218A

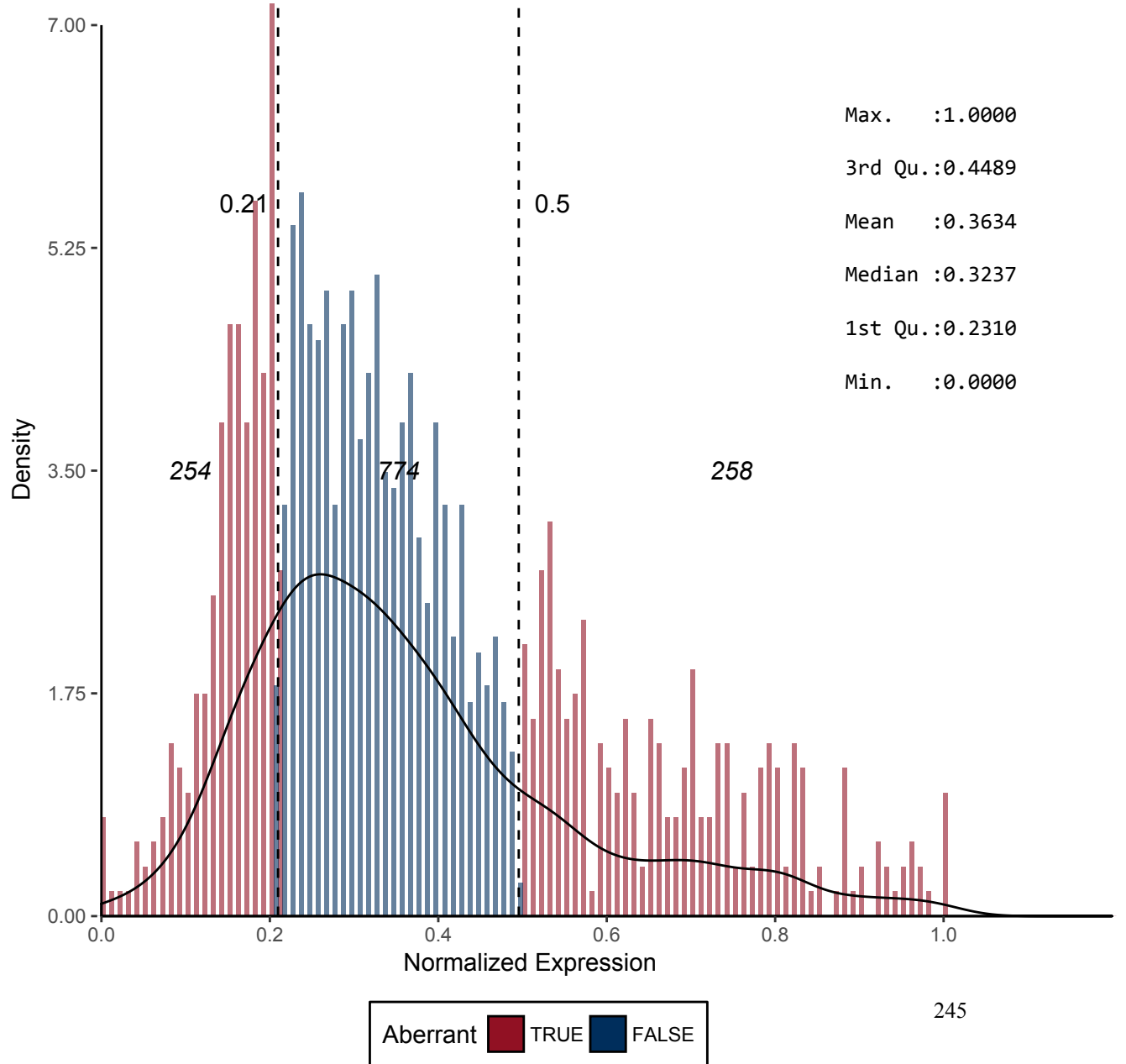


Figure 229 - CD218B

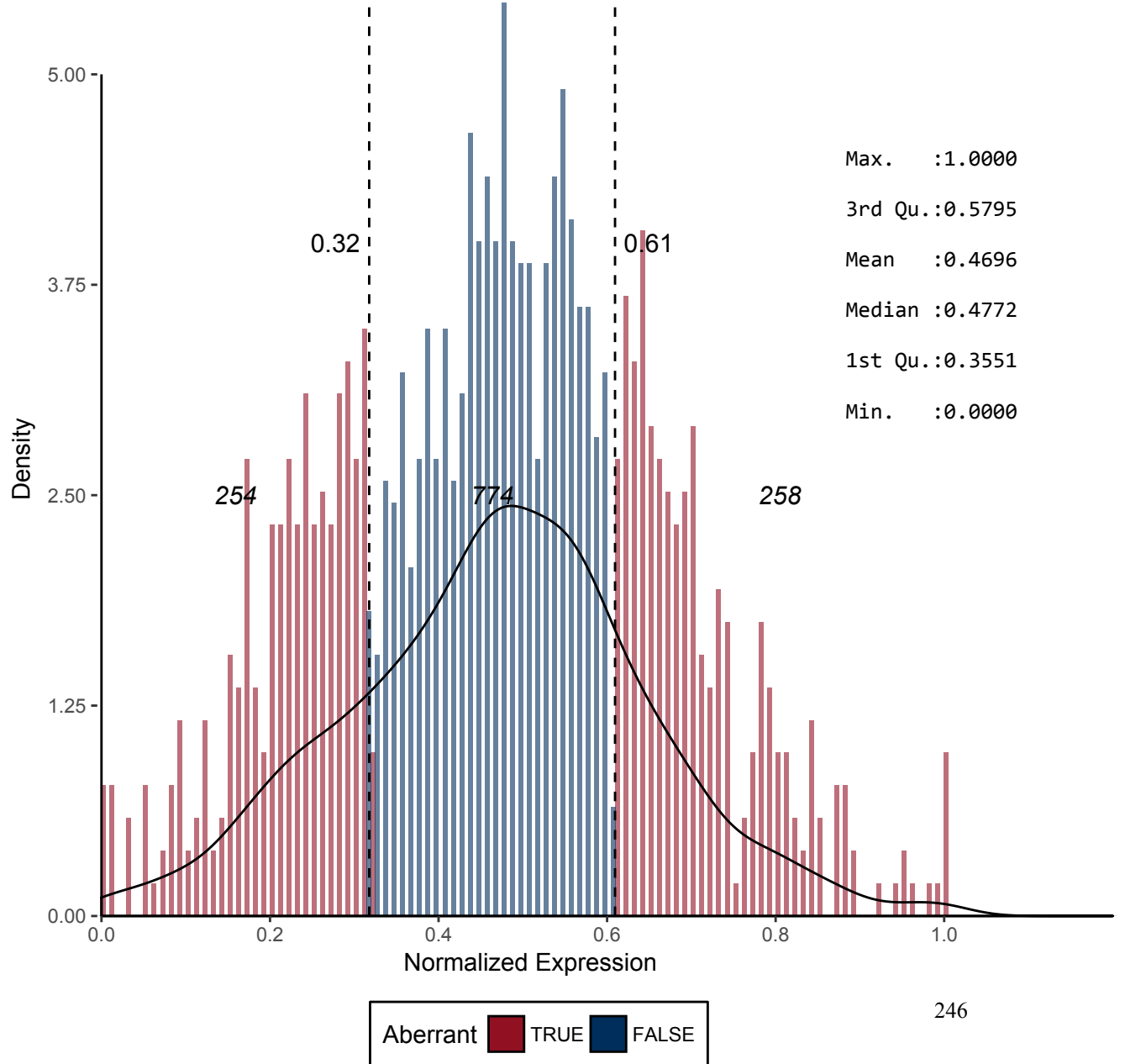


Figure 230 - CD220*

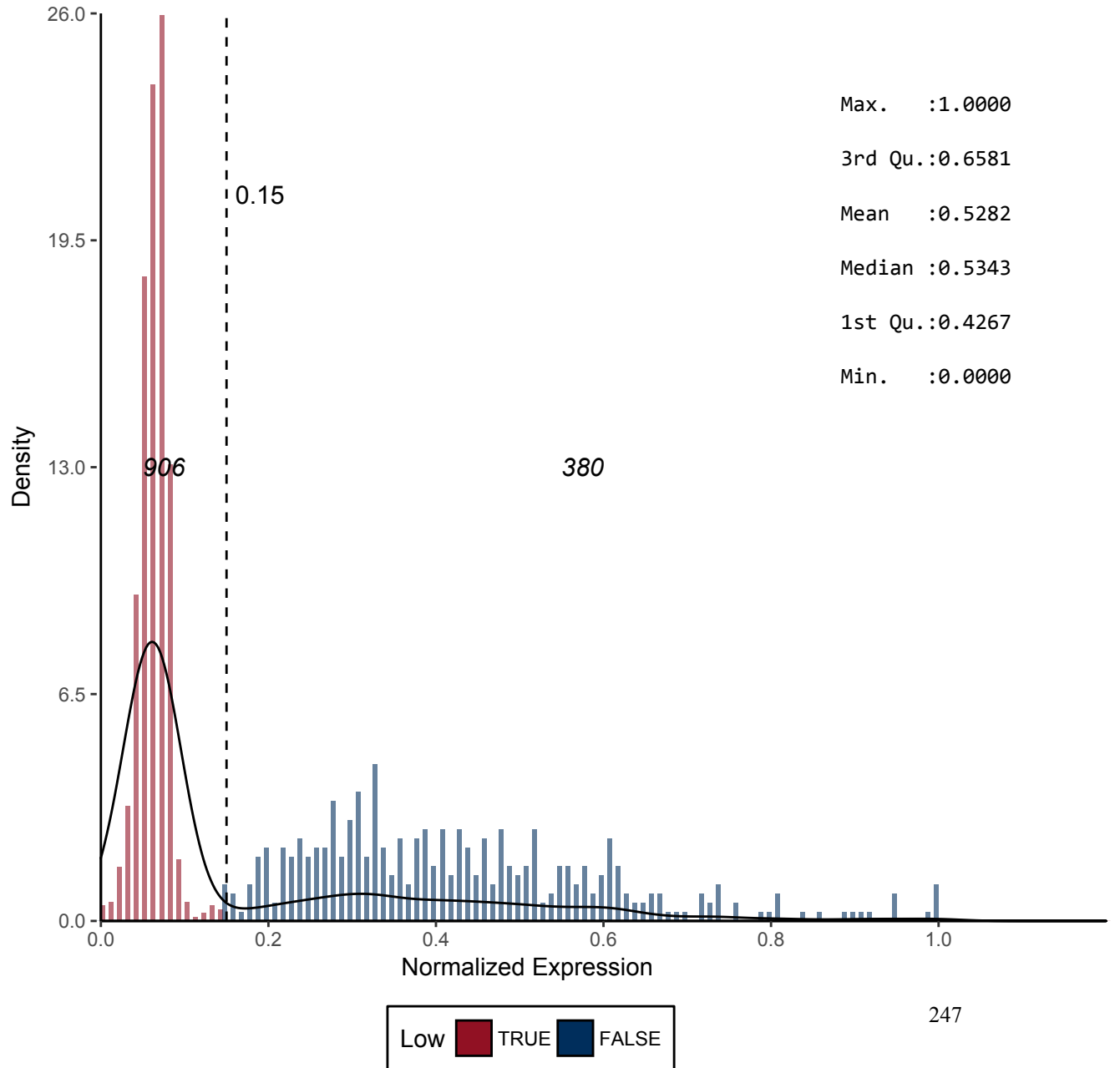


Figure 231 - CD221

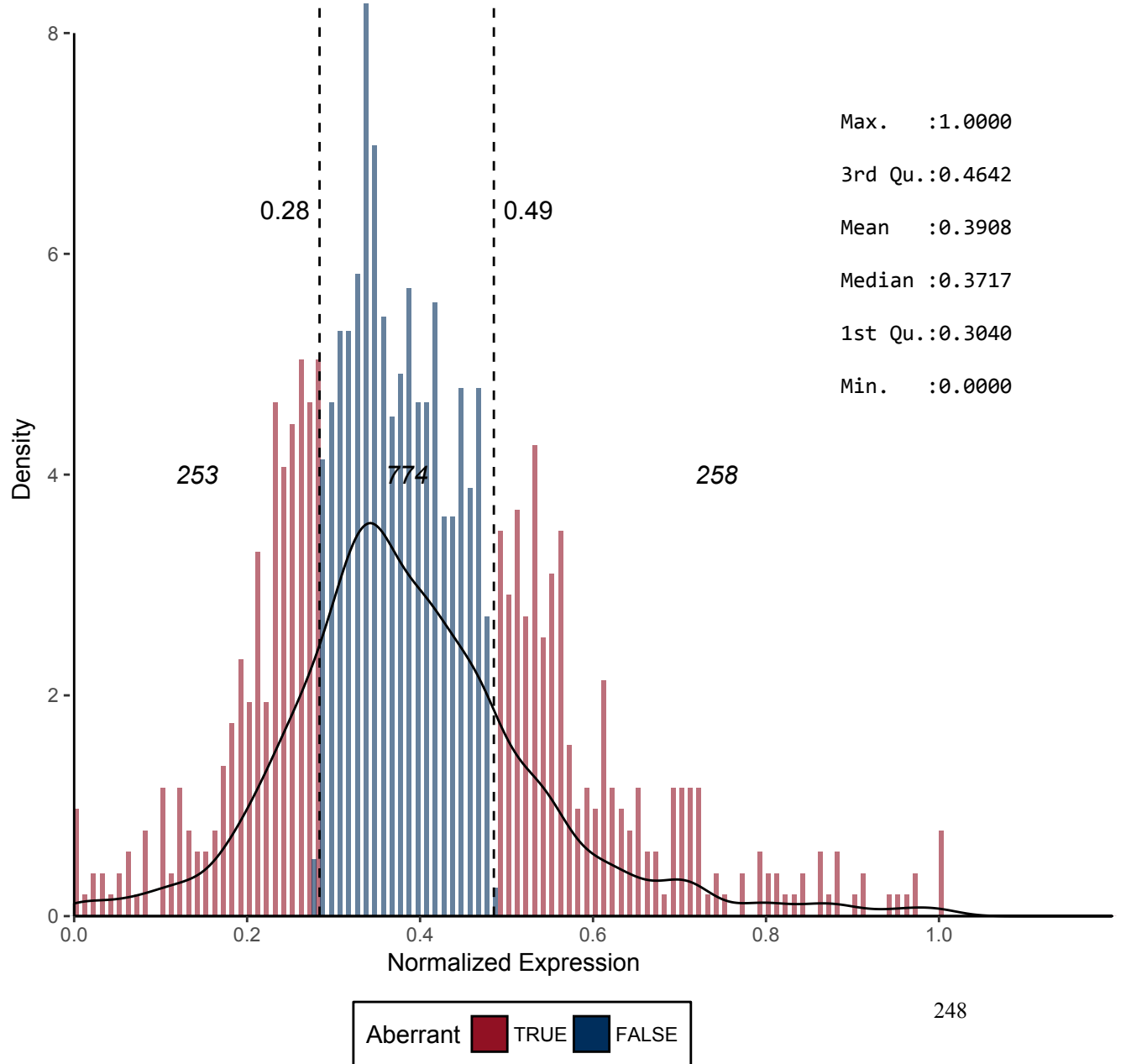


Figure 232 - CD222

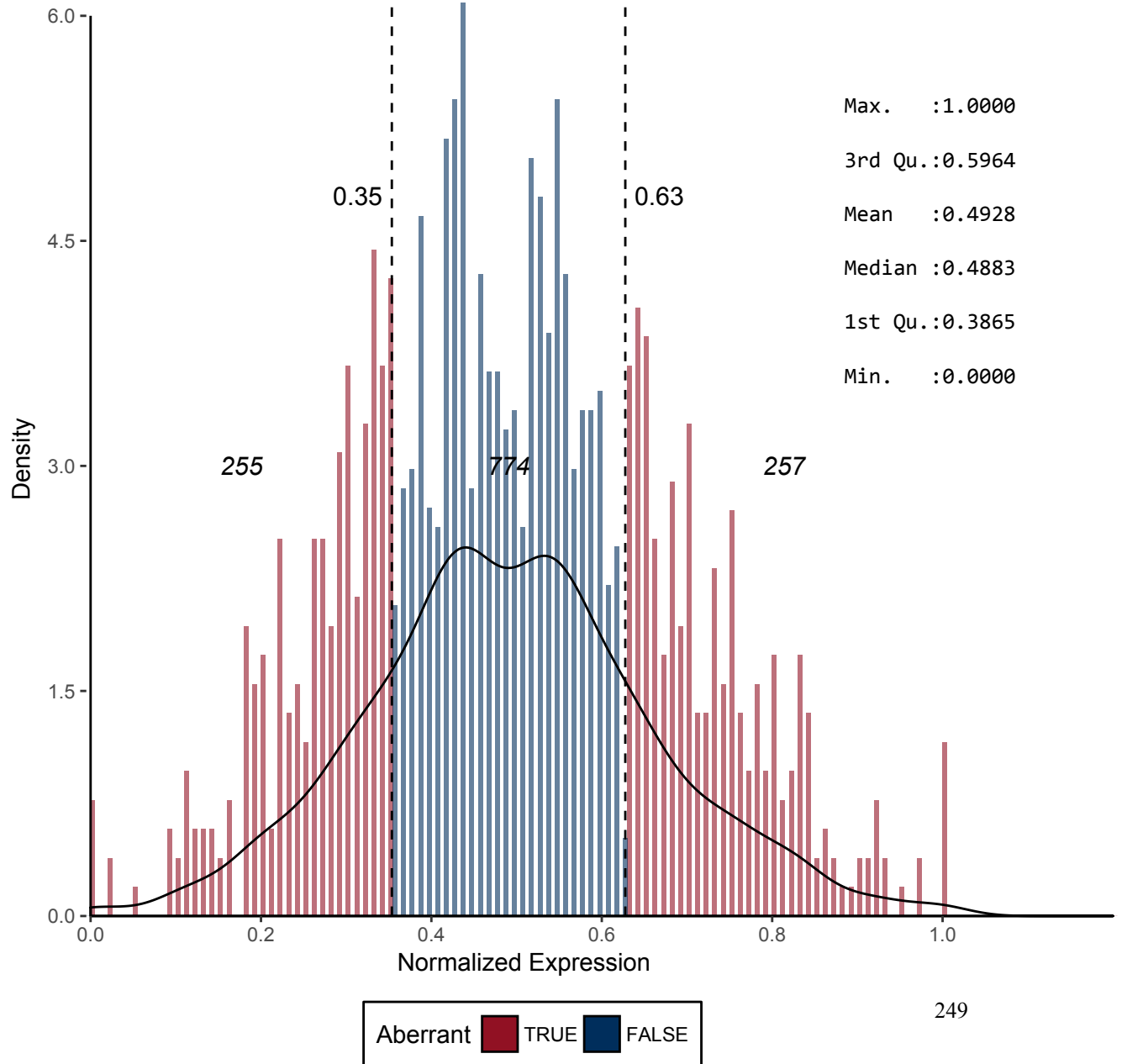


Figure 233 - CD223

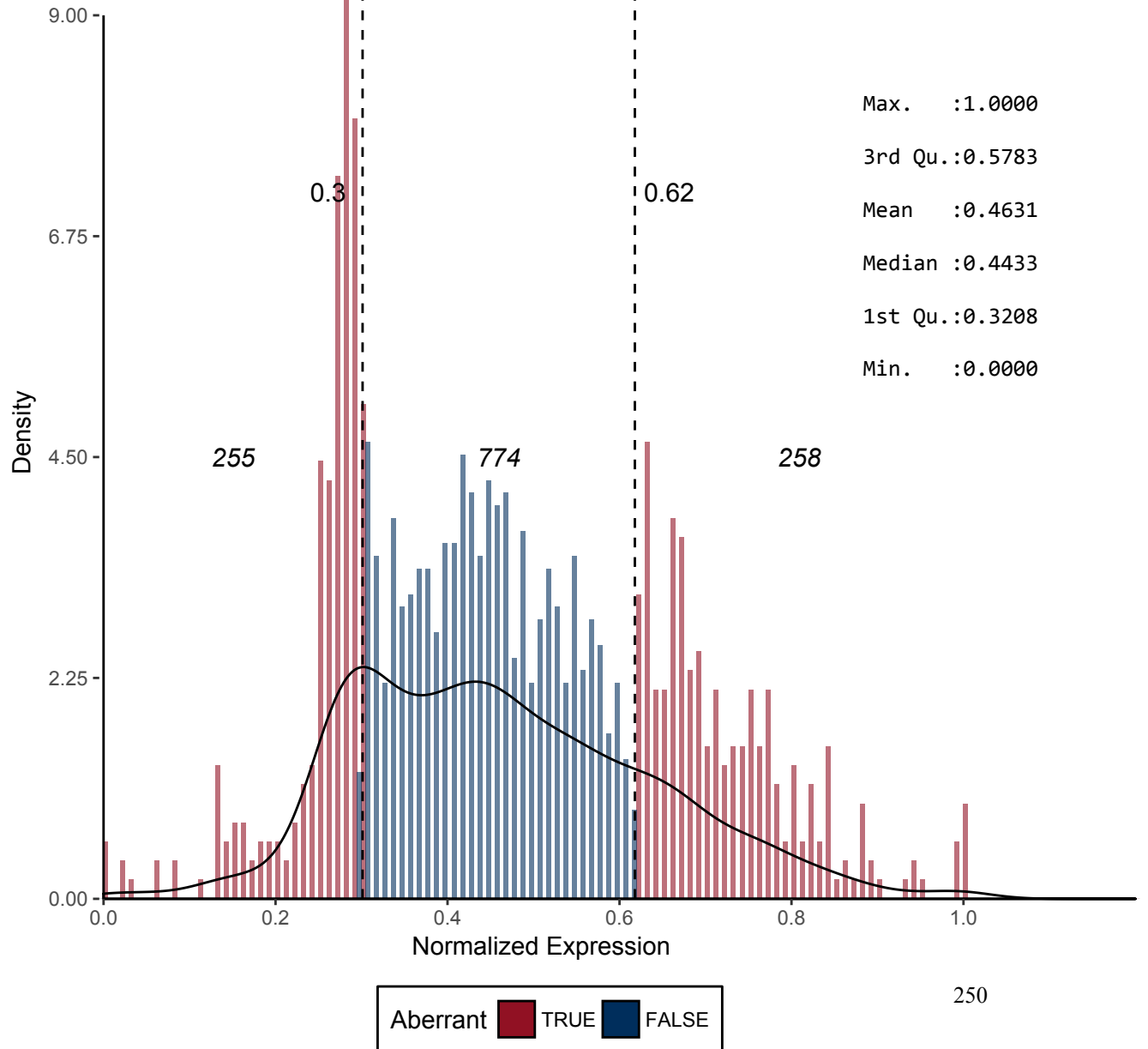


Figure 234 - CD225*

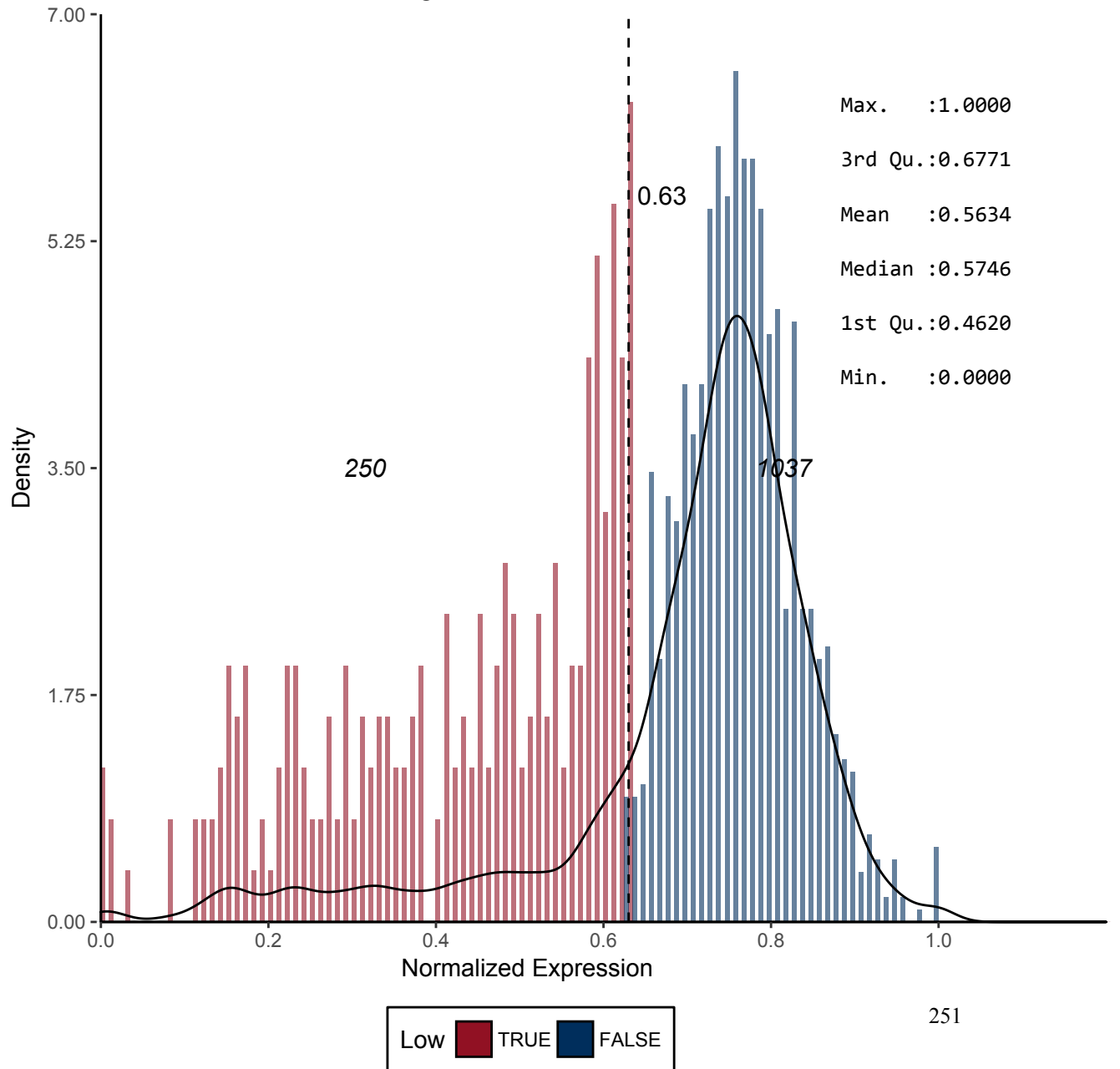
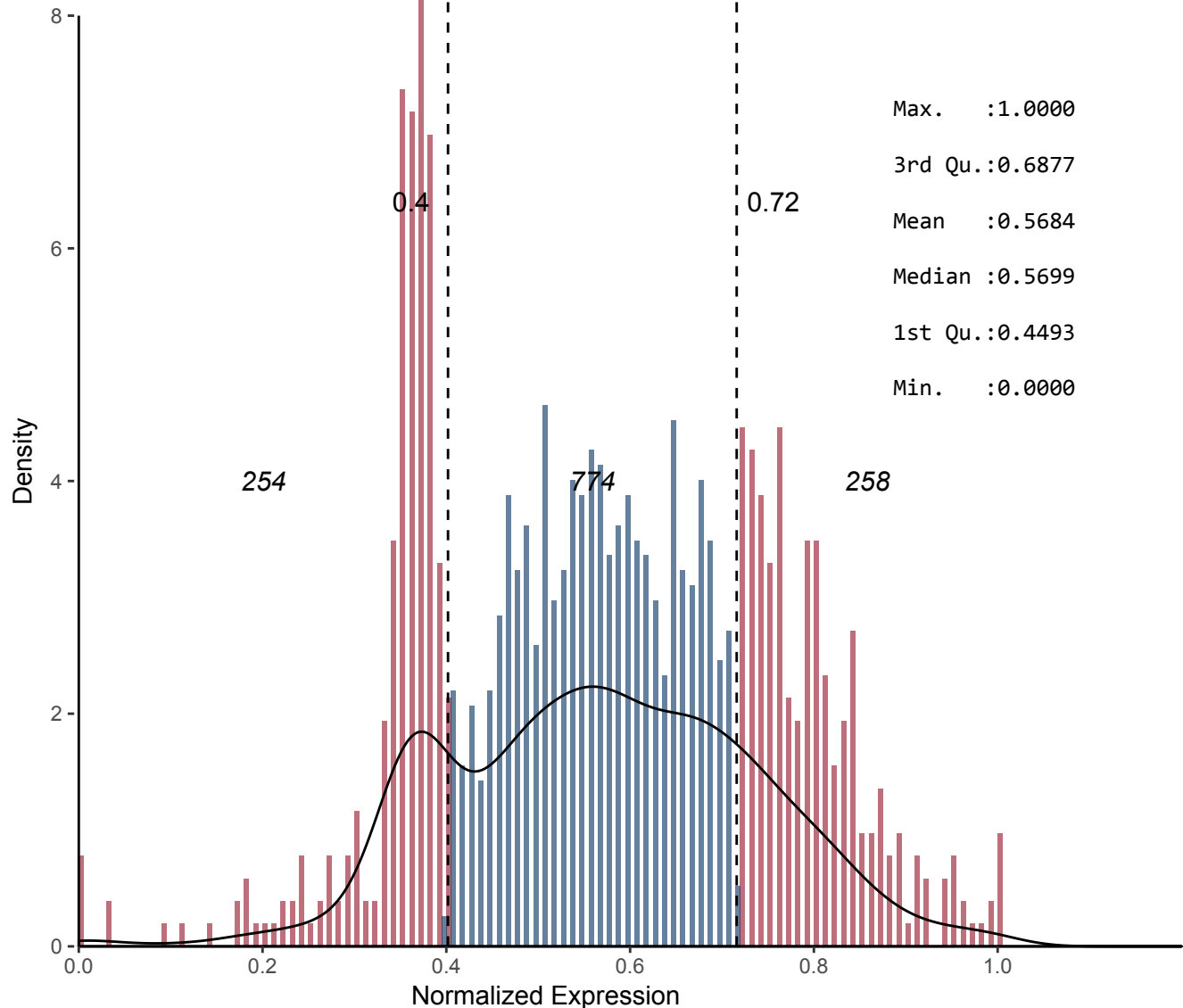


Figure 235 - CD226



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Figure 236 - CD227

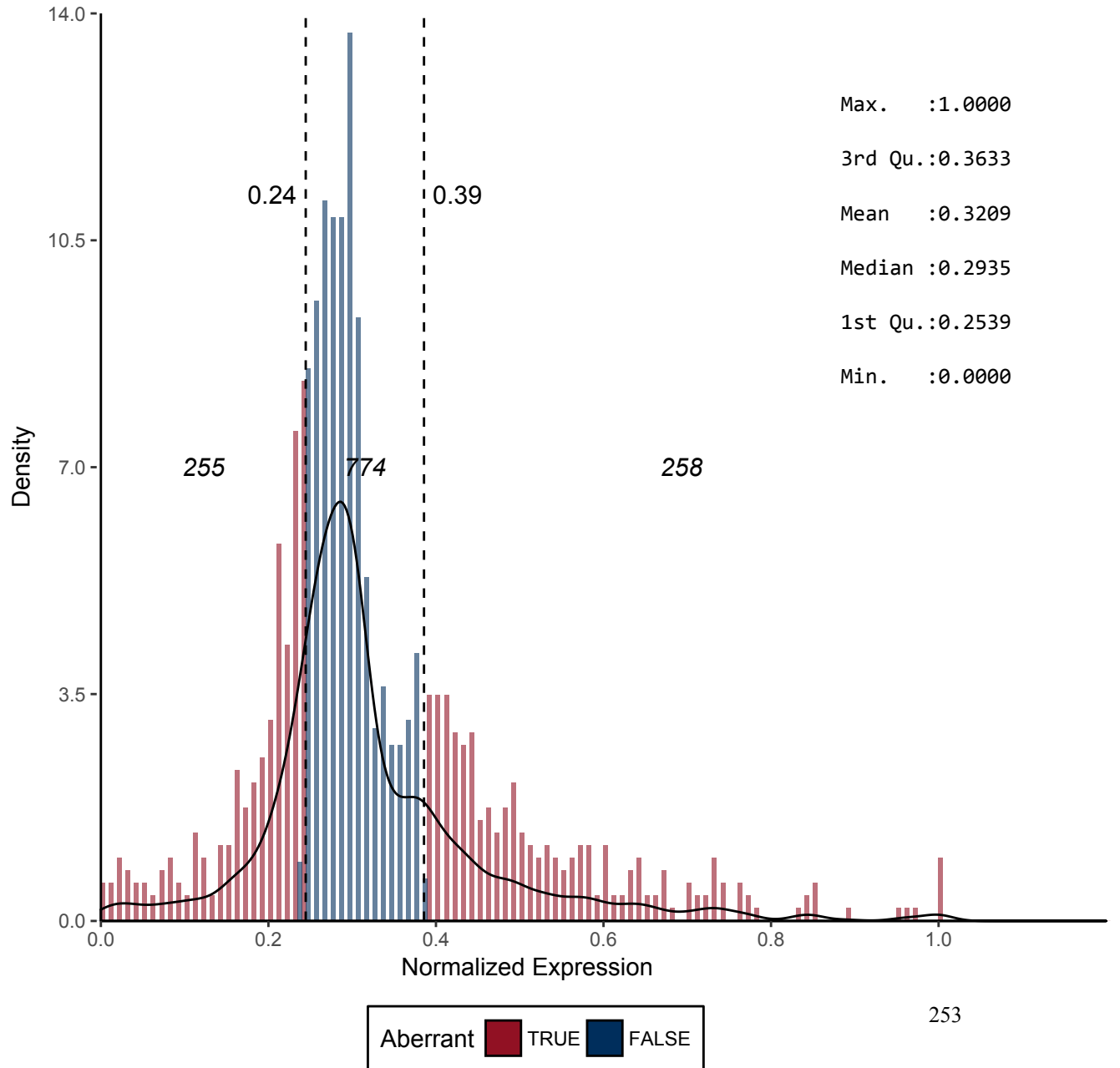


Figure 237 - CD228*

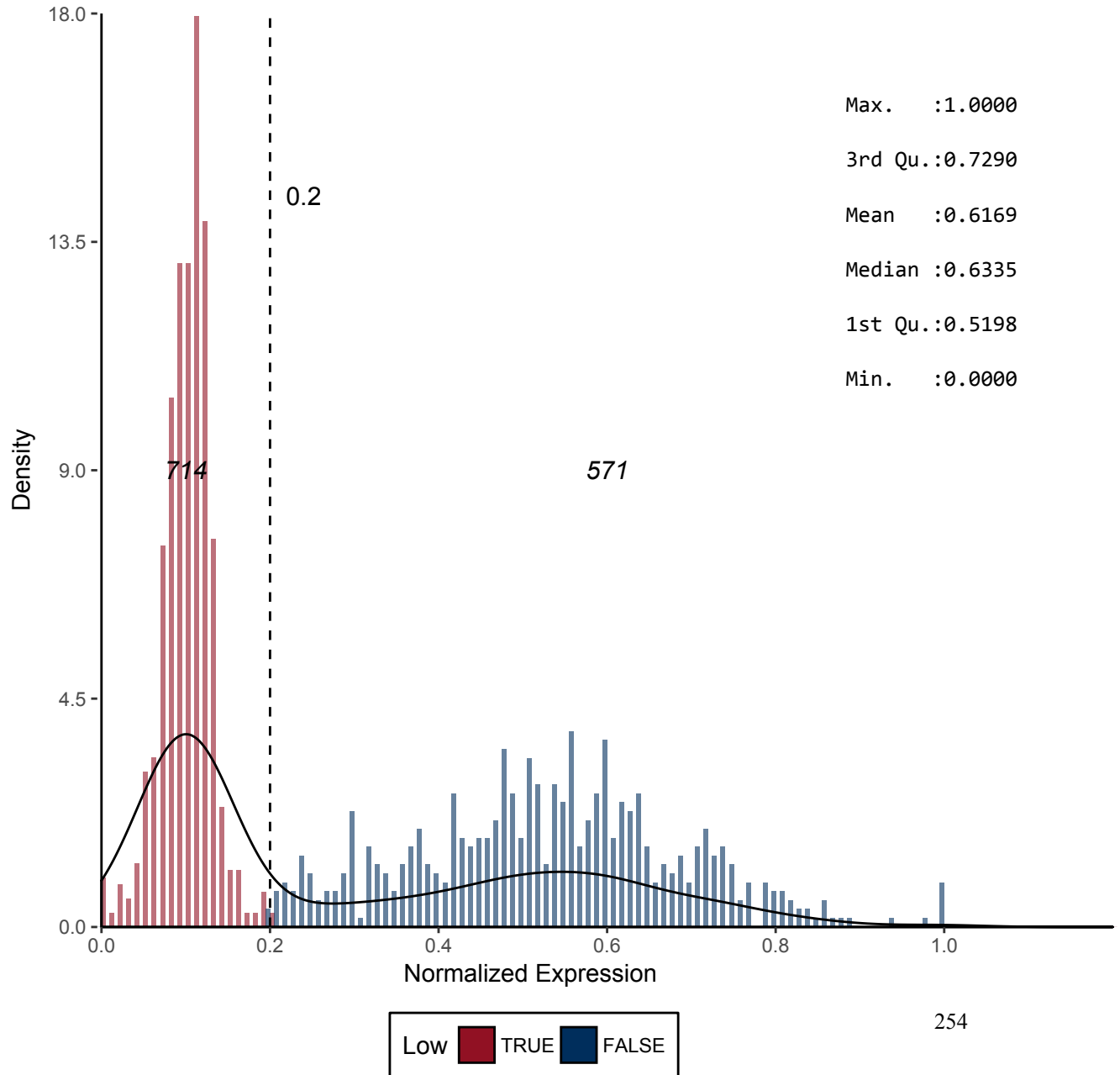


Figure 238 - CD229

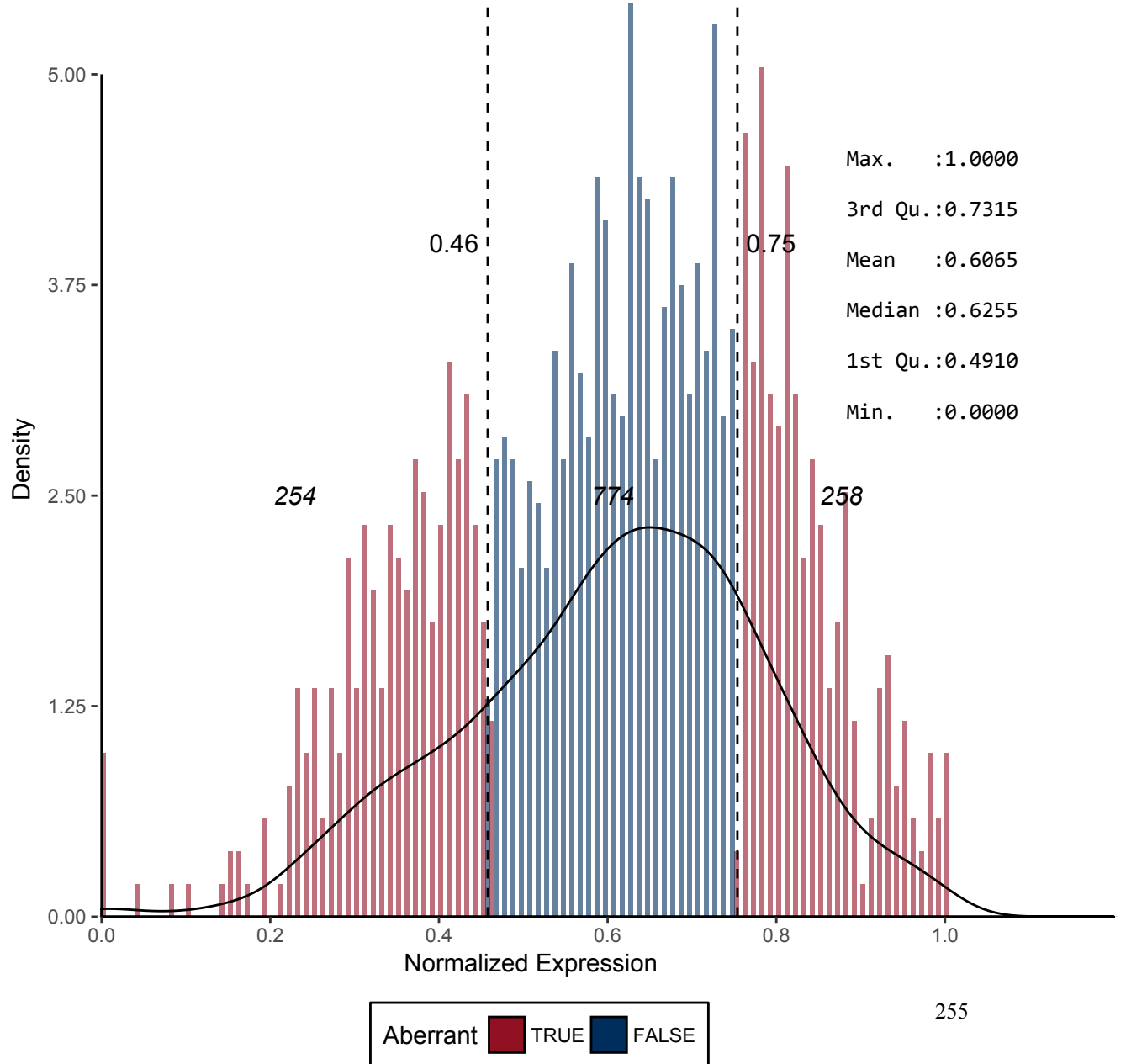


Figure 239 - CD230

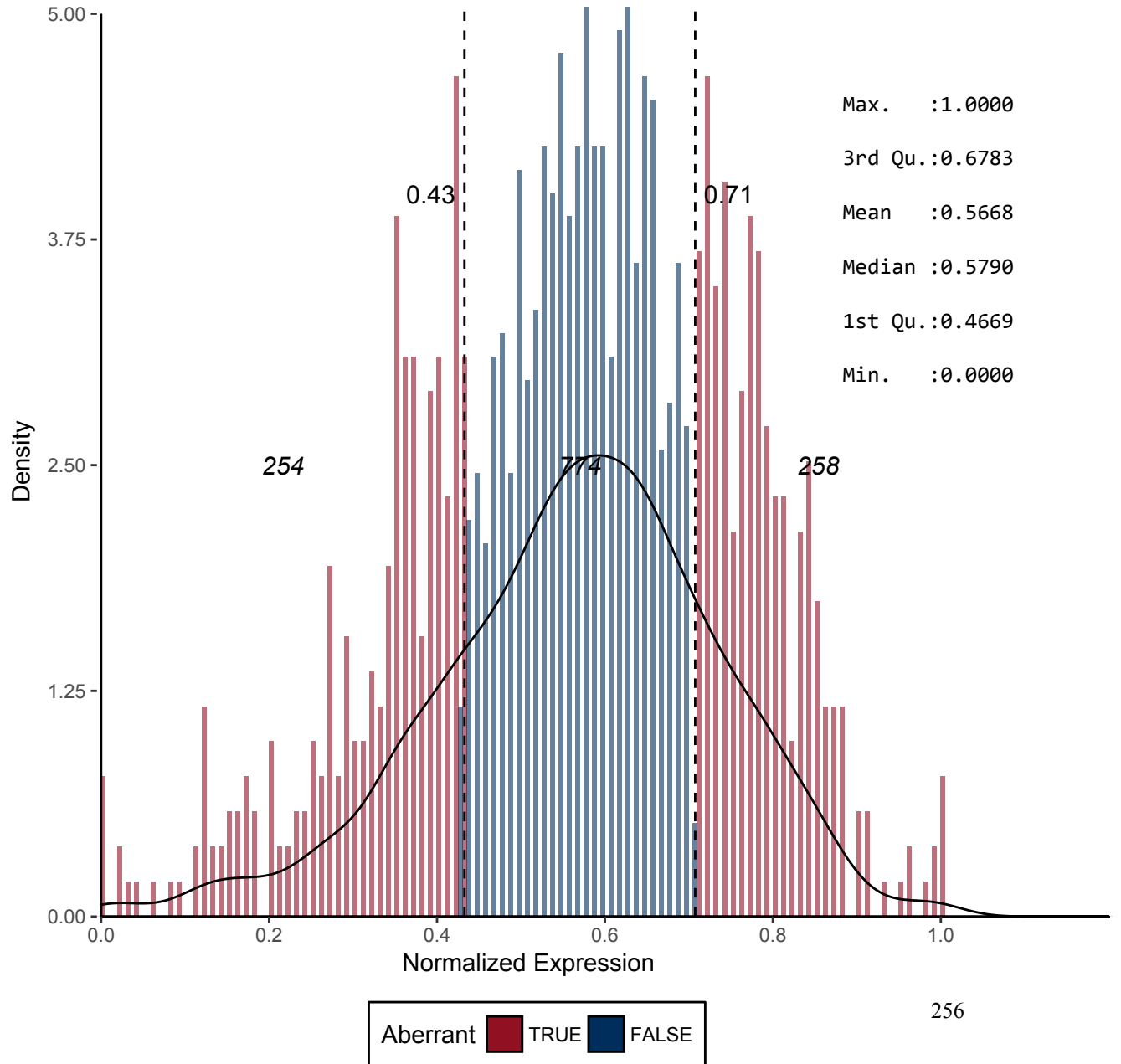
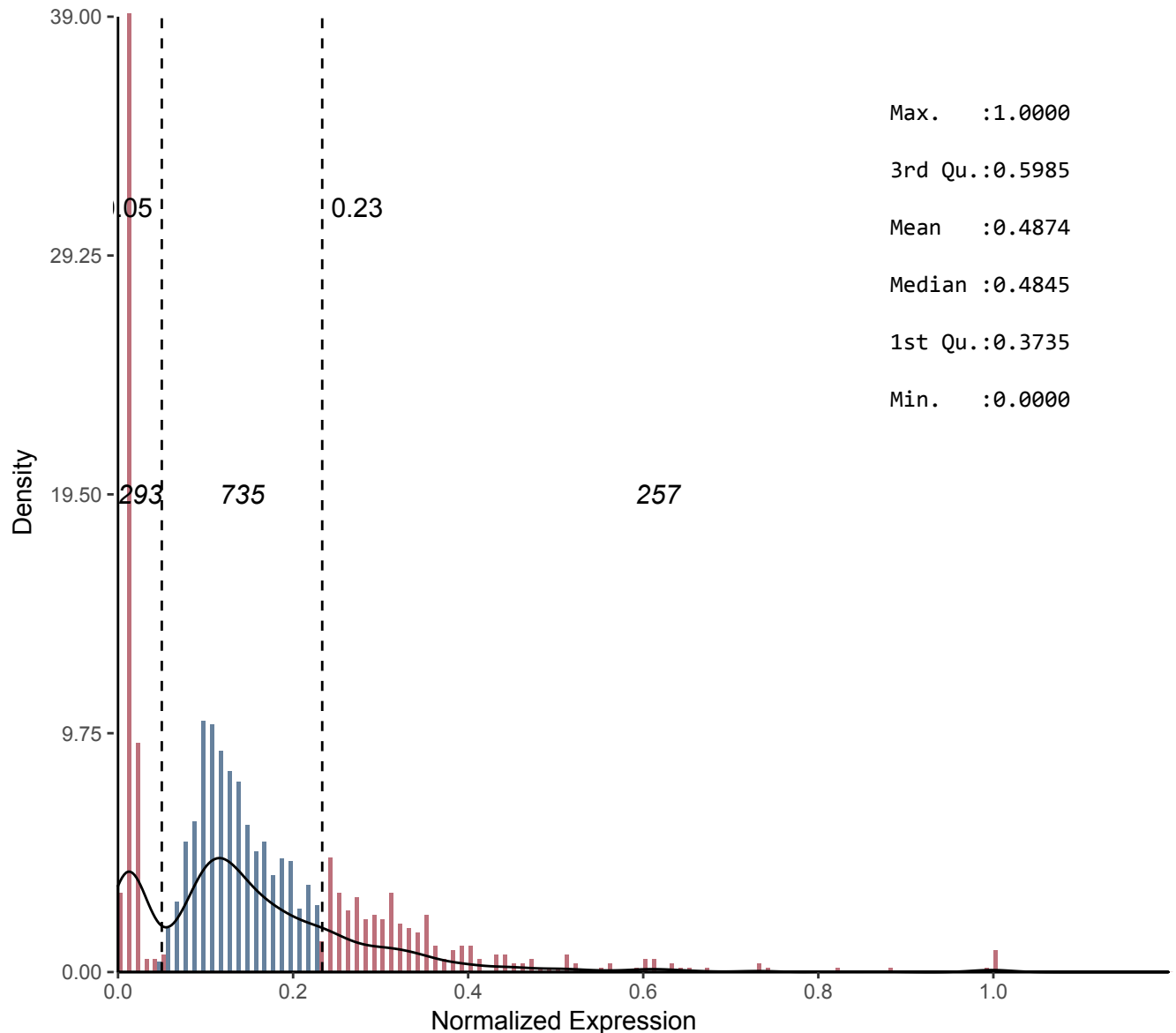


Figure 240 - CD231*



Aberrant ■ TRUE ■ FALSE

257

Figure 241 - CD232

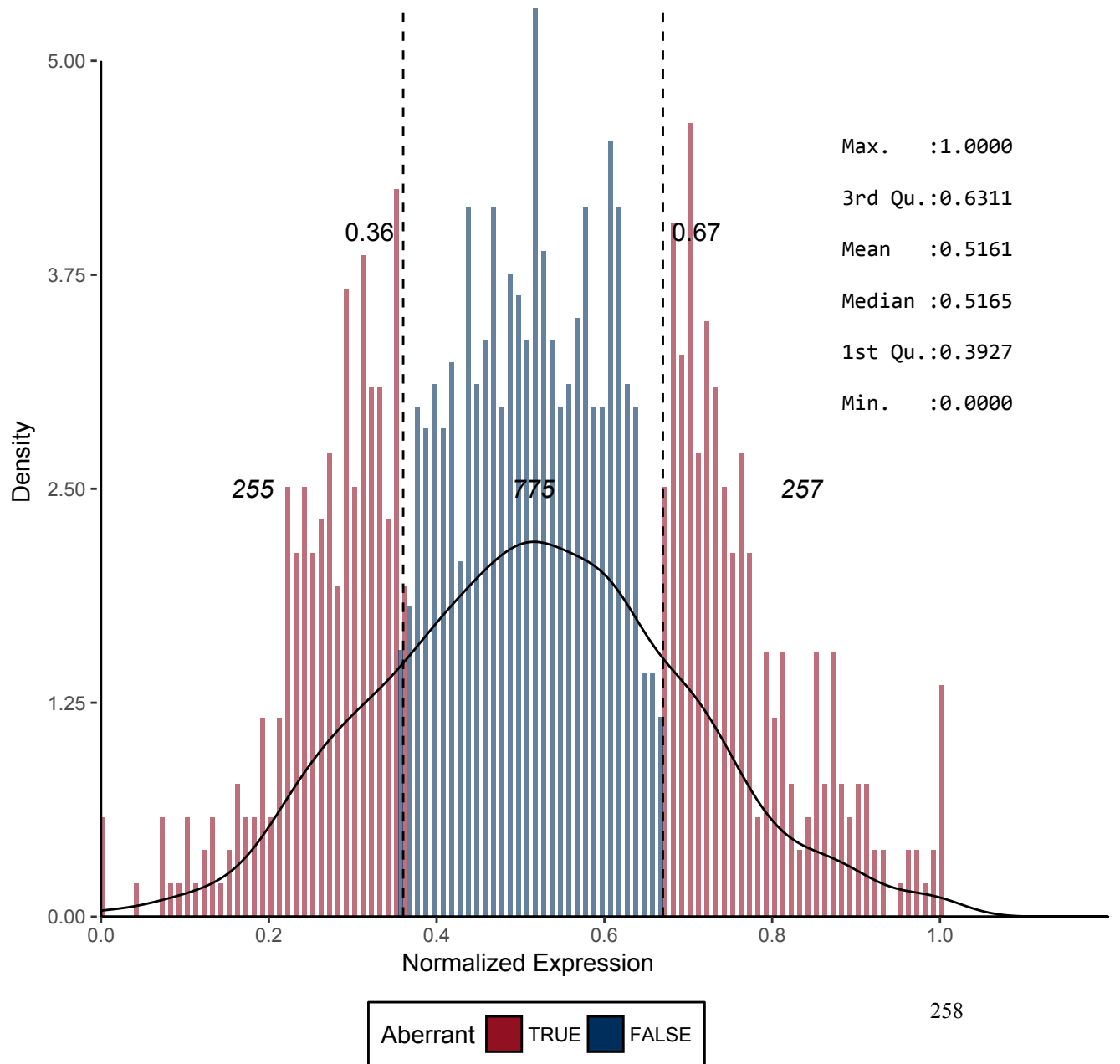


Figure 242 - CD233

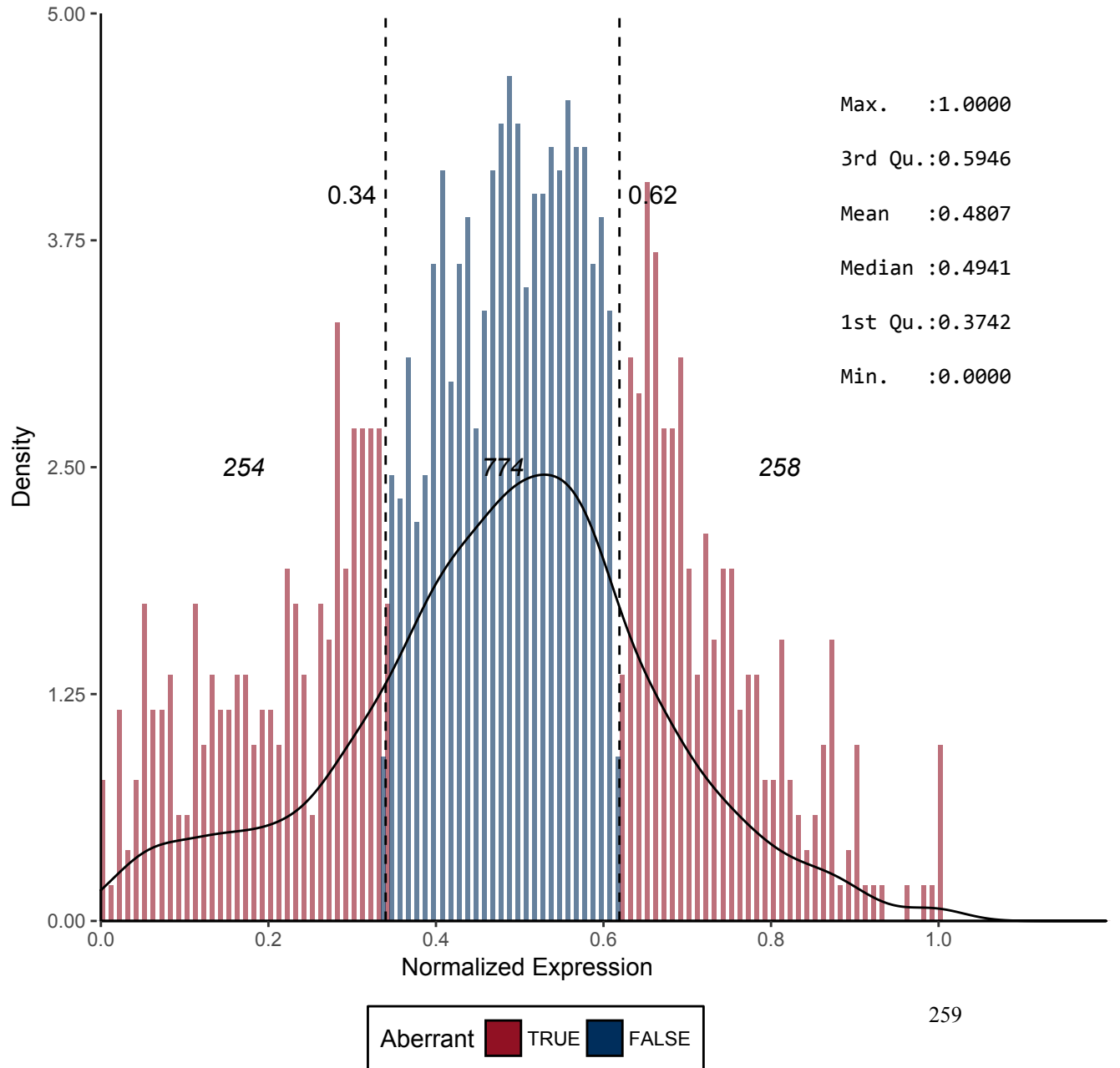


Figure 243 - CD234

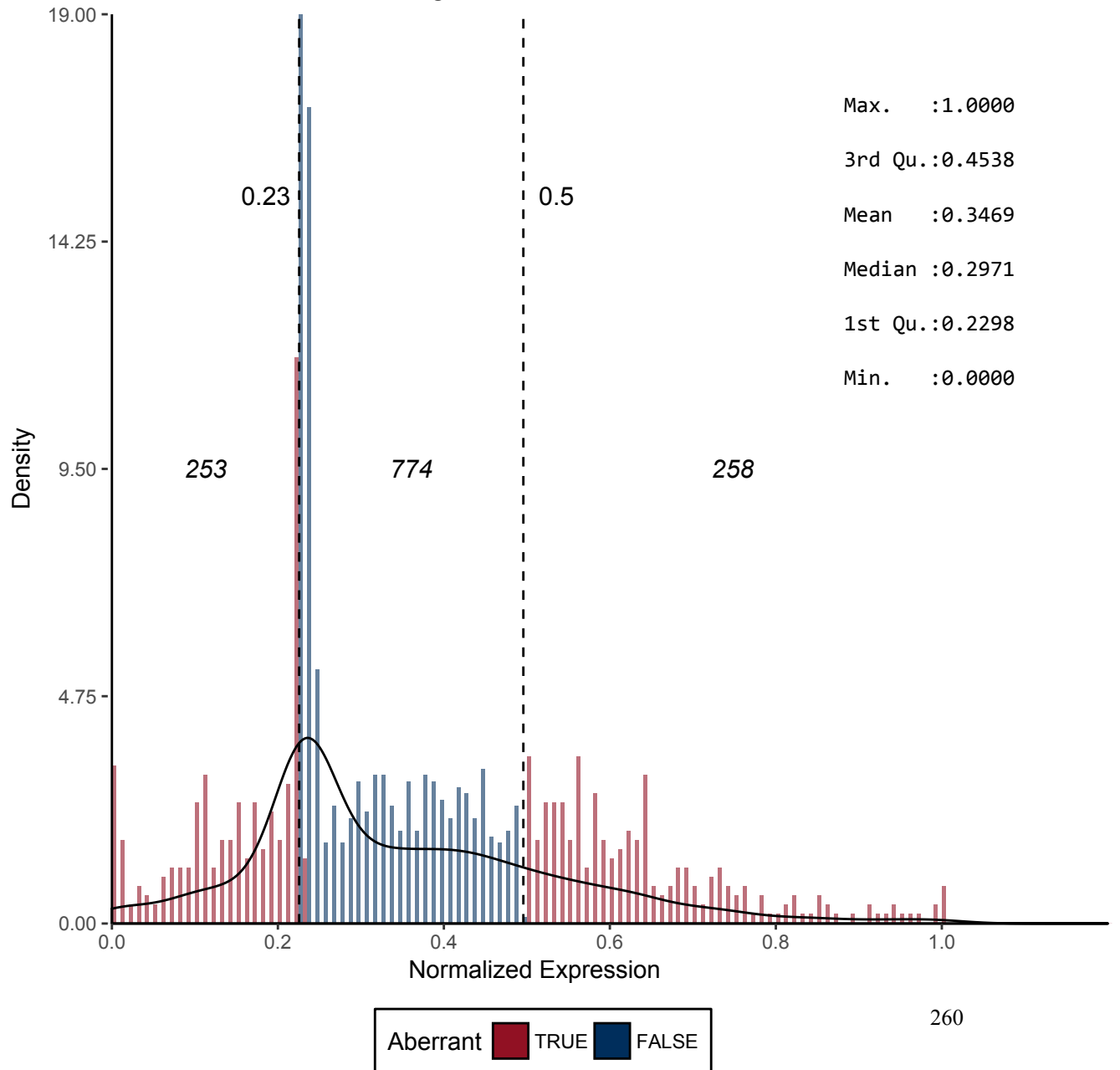


Figure 244 - CD235A*

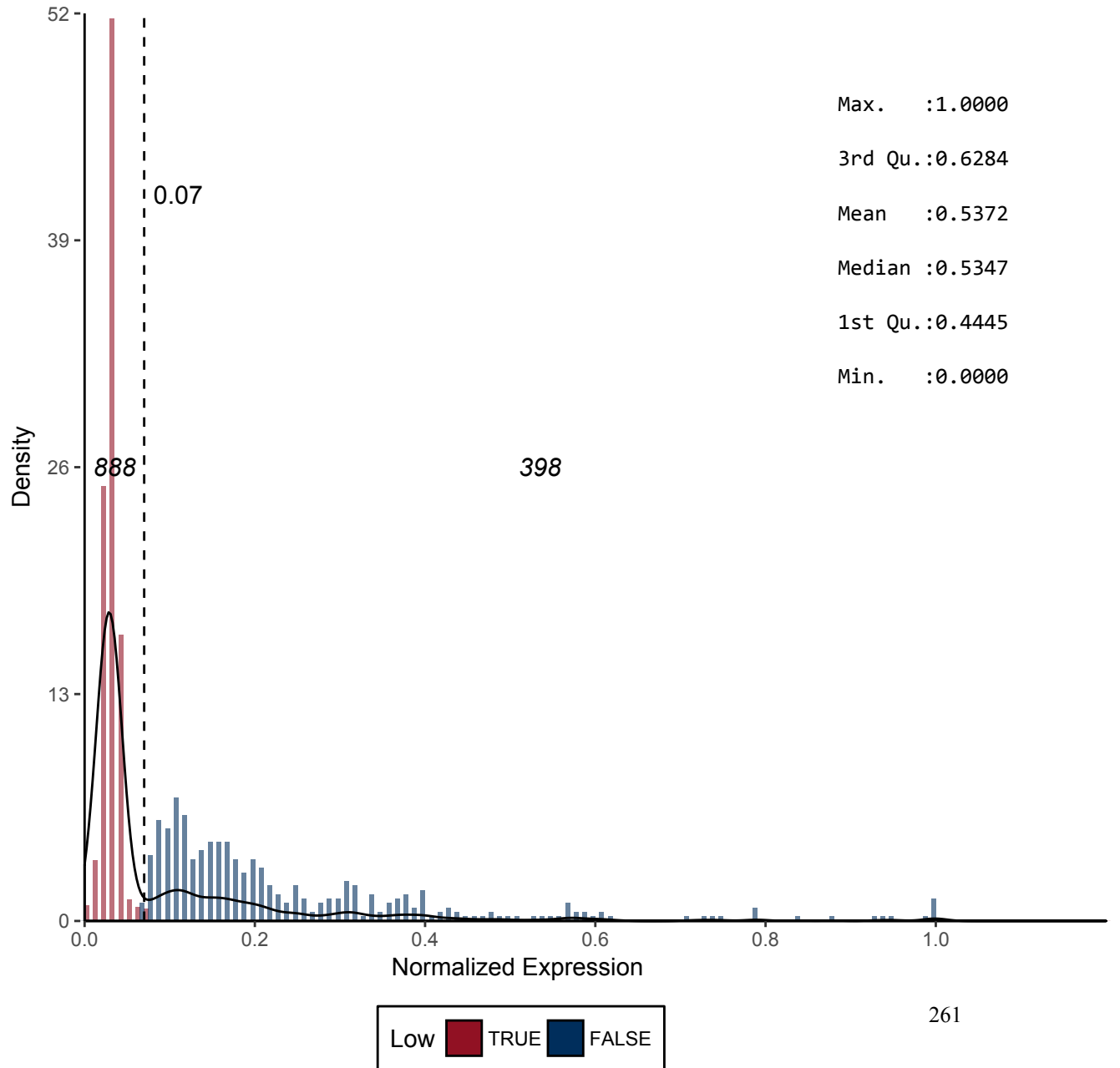


Figure 245 - CD235B

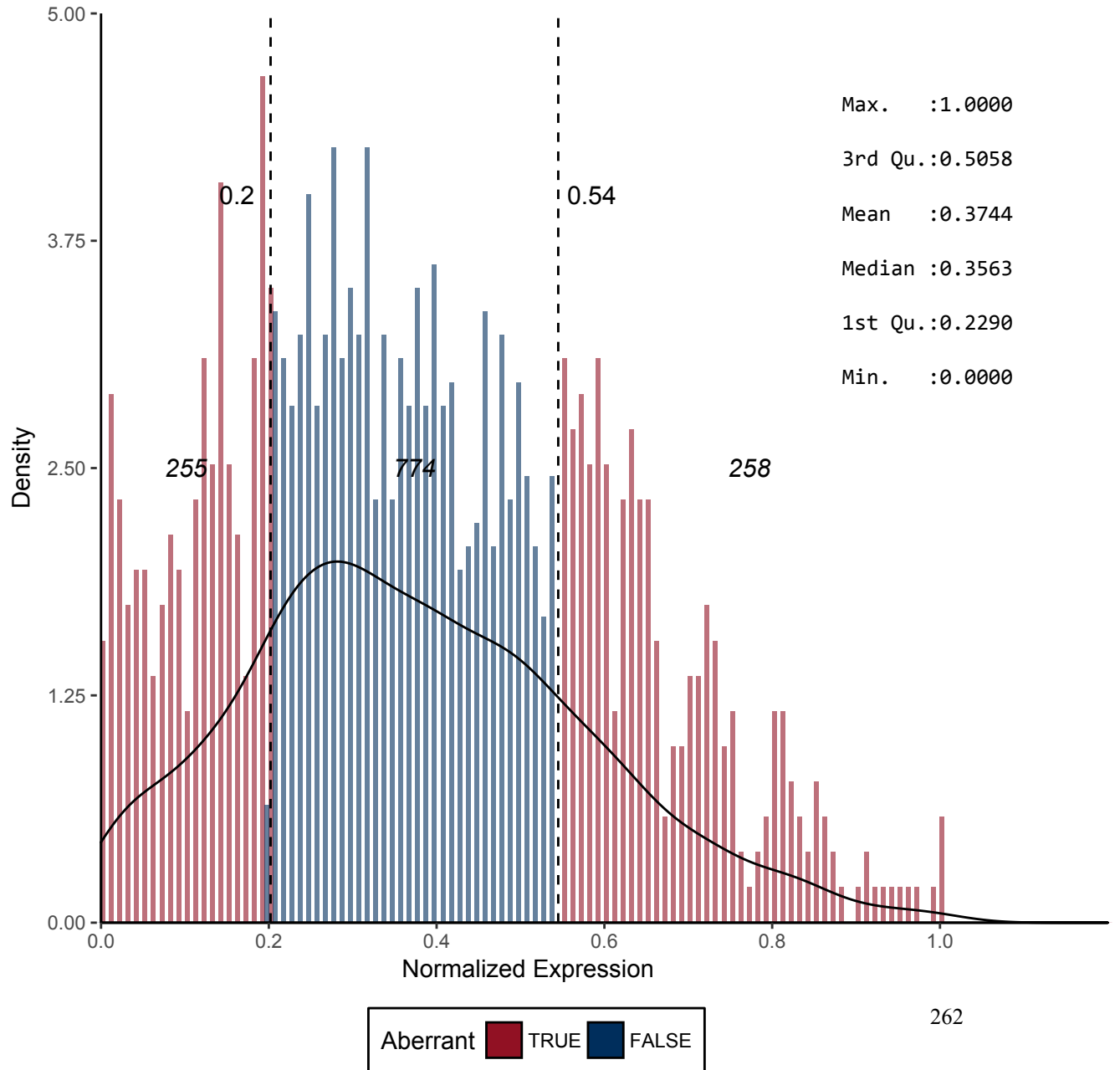


Figure 246 - CD236

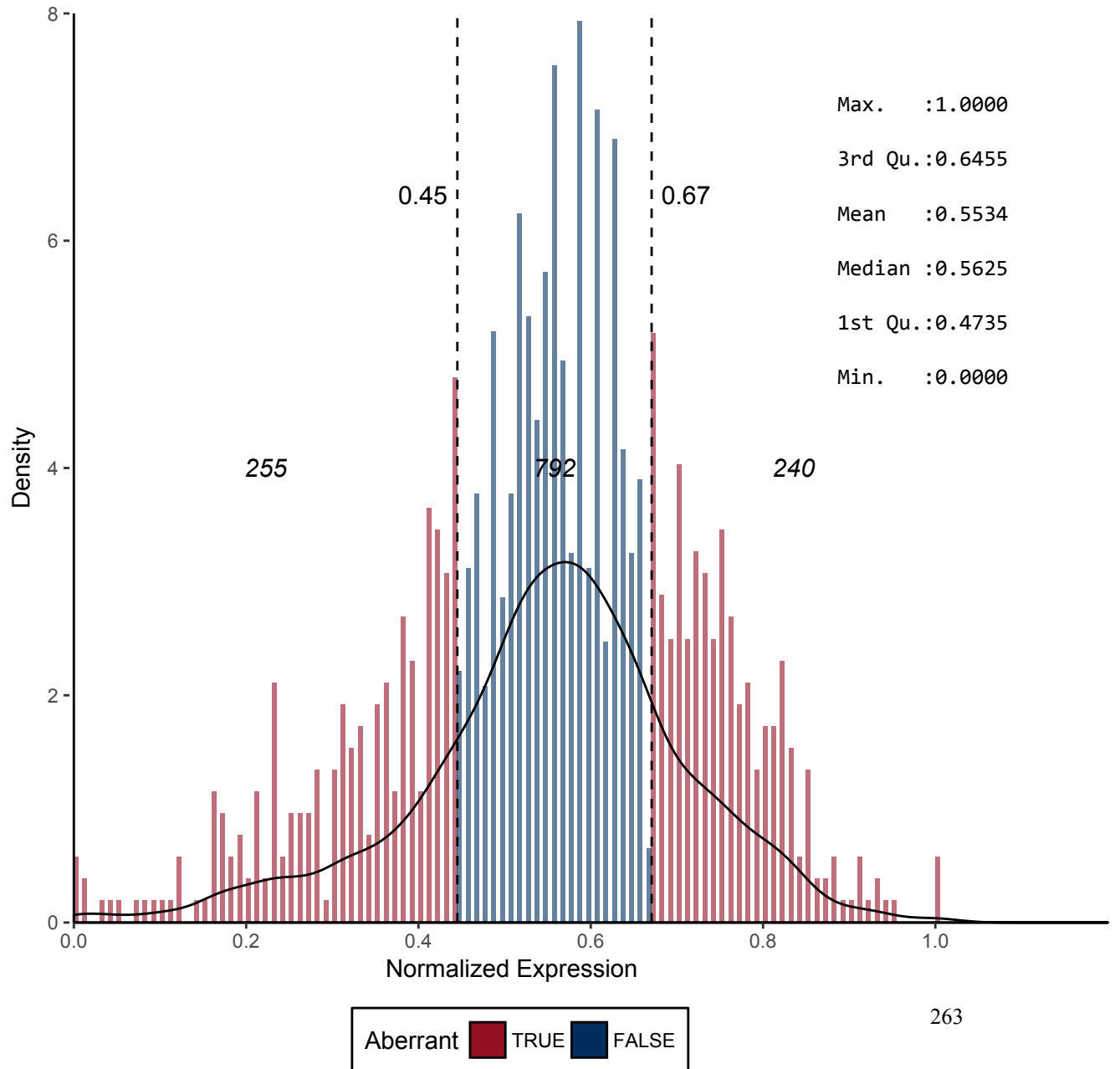


Figure 247 - CD238

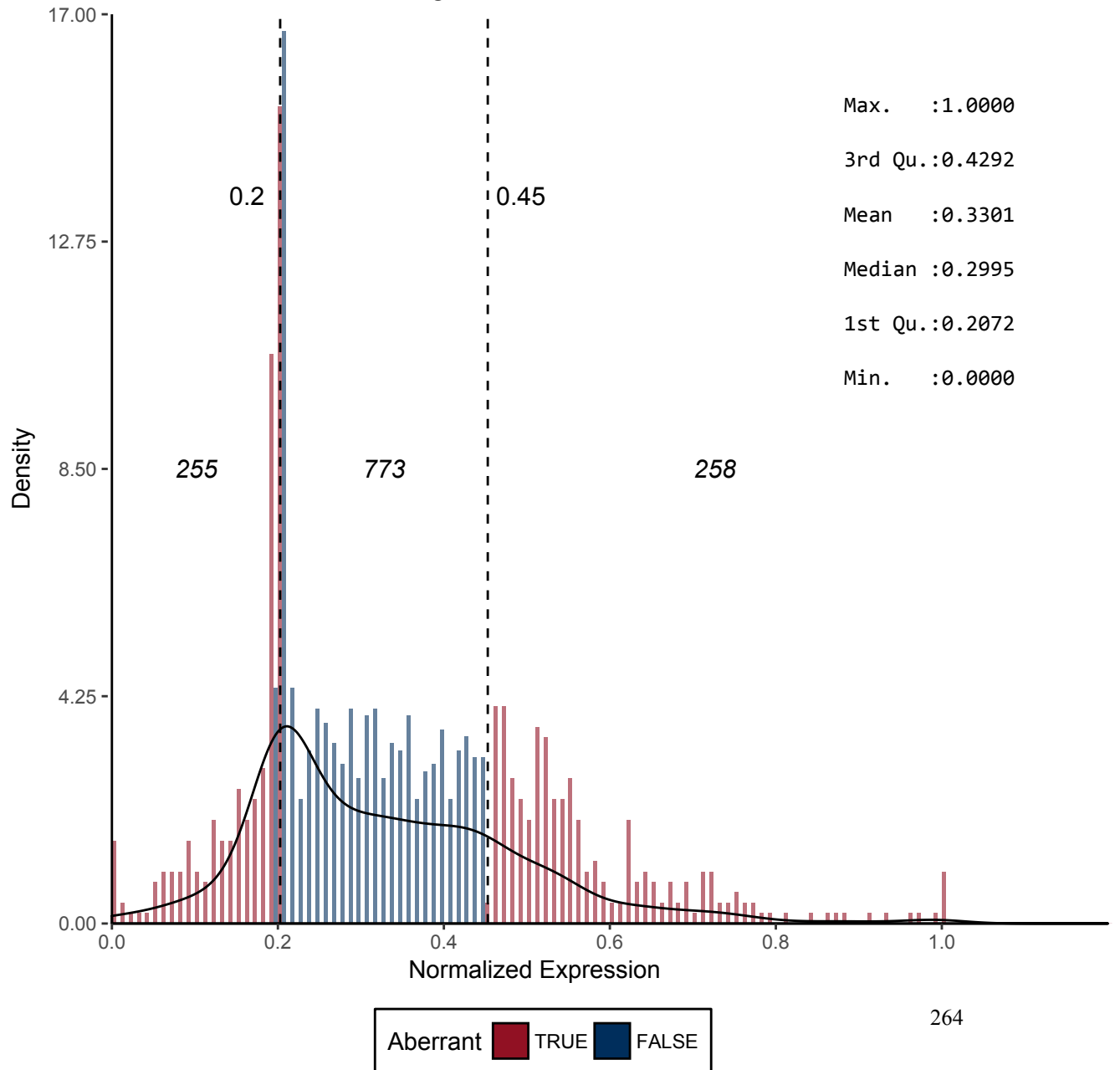


Figure 248 - CD239*

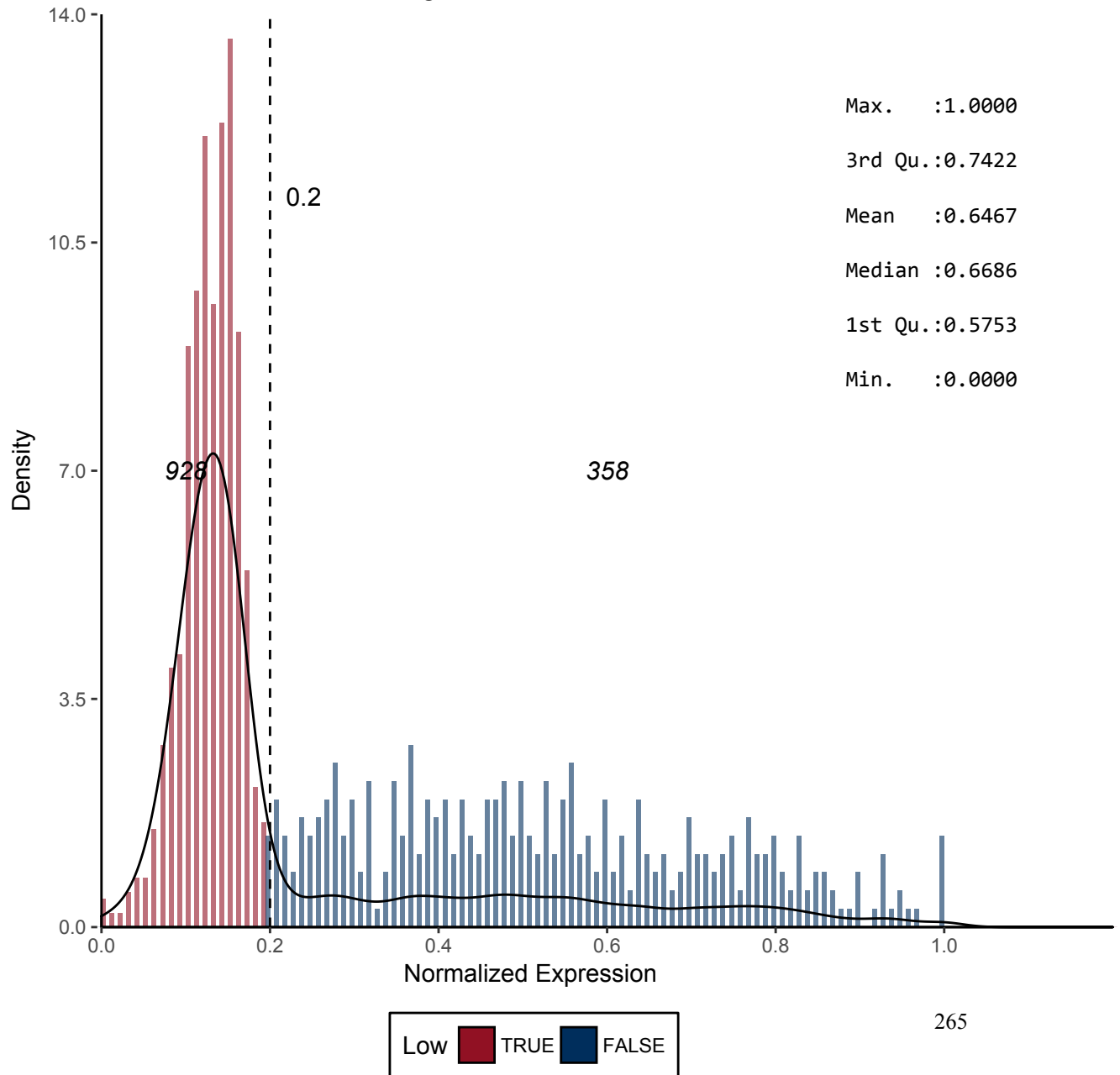


Figure 249 - CD240CE

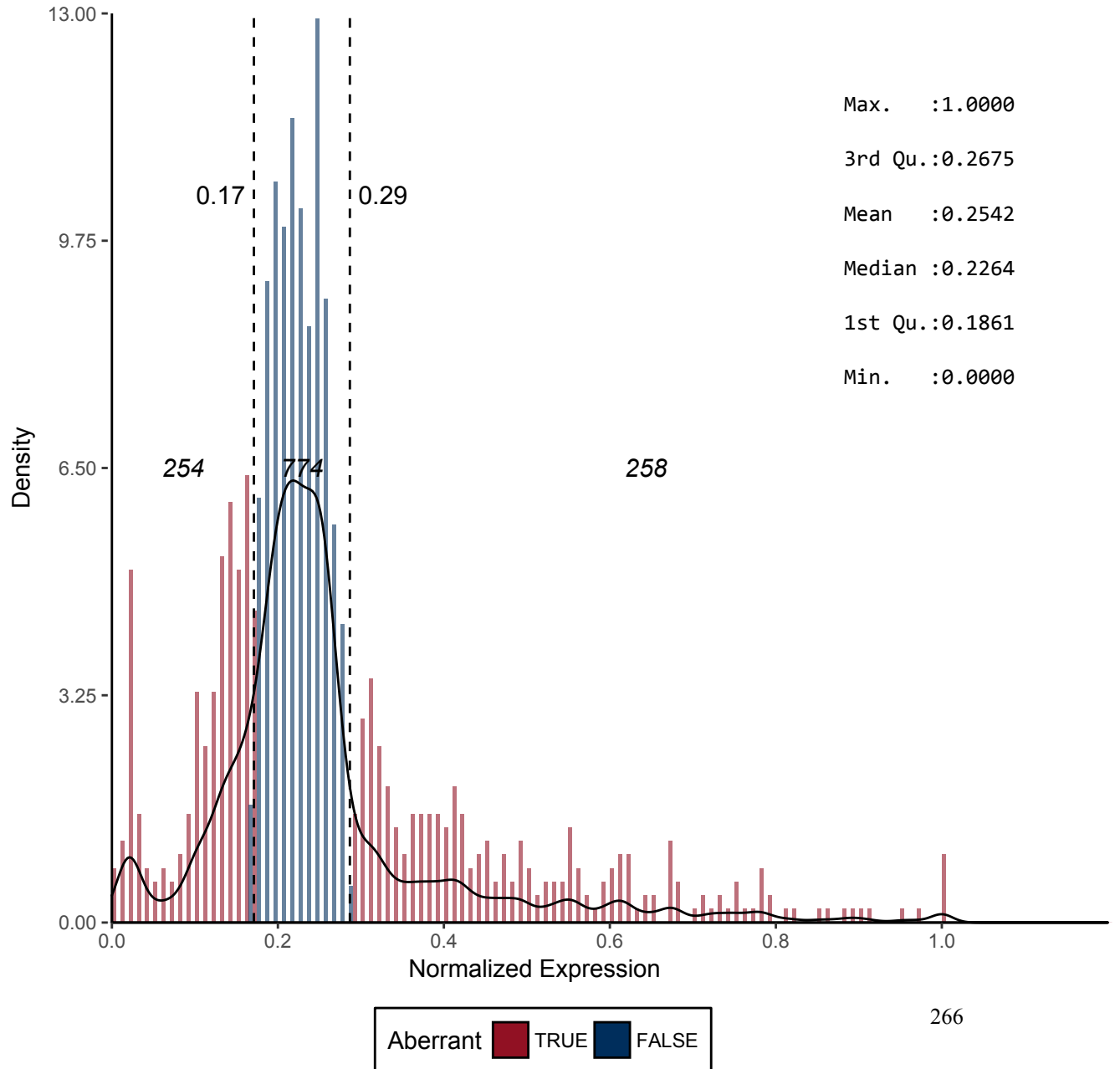


Figure 250 - CD240D*

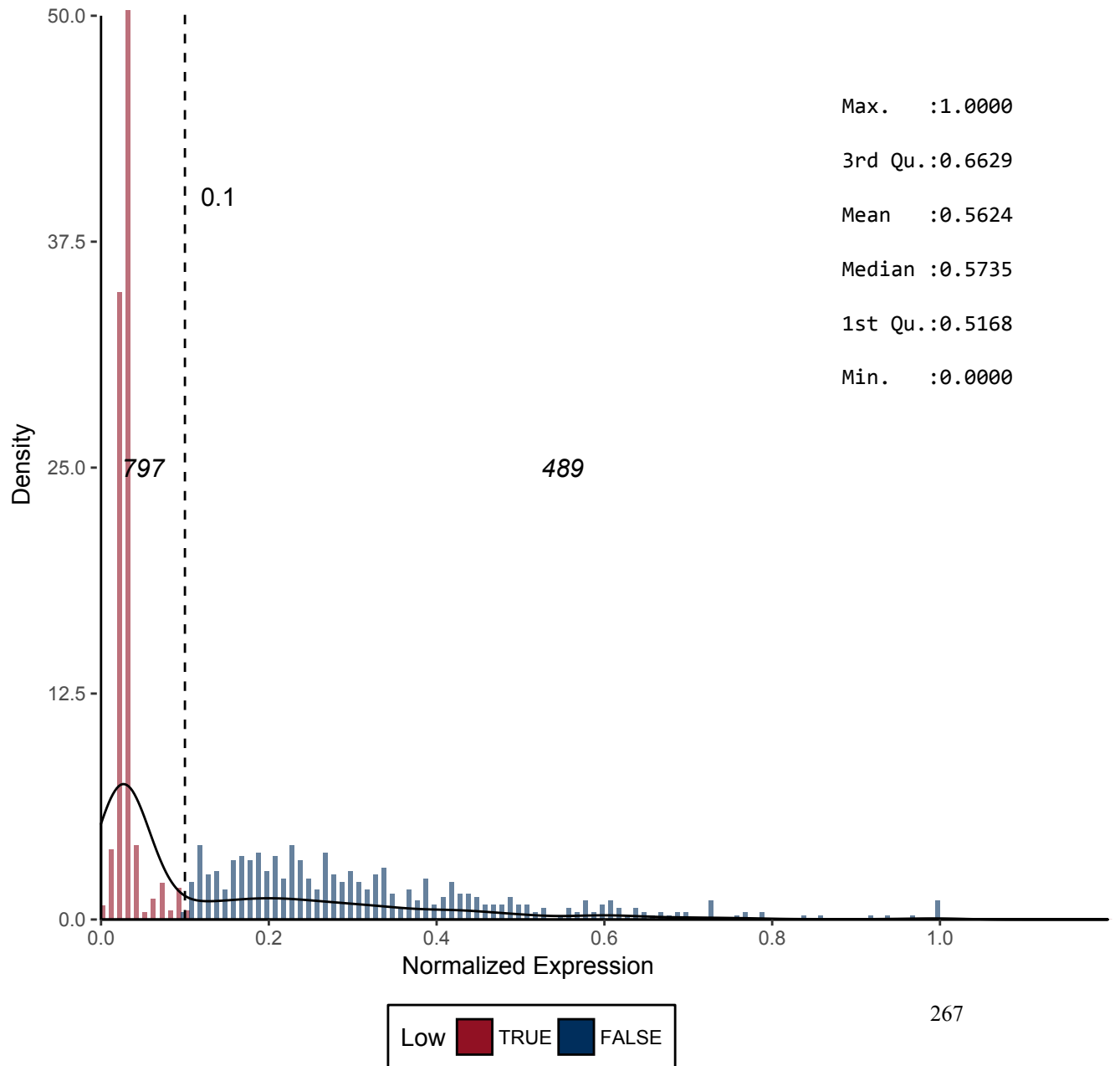


Figure 251 - CD241*

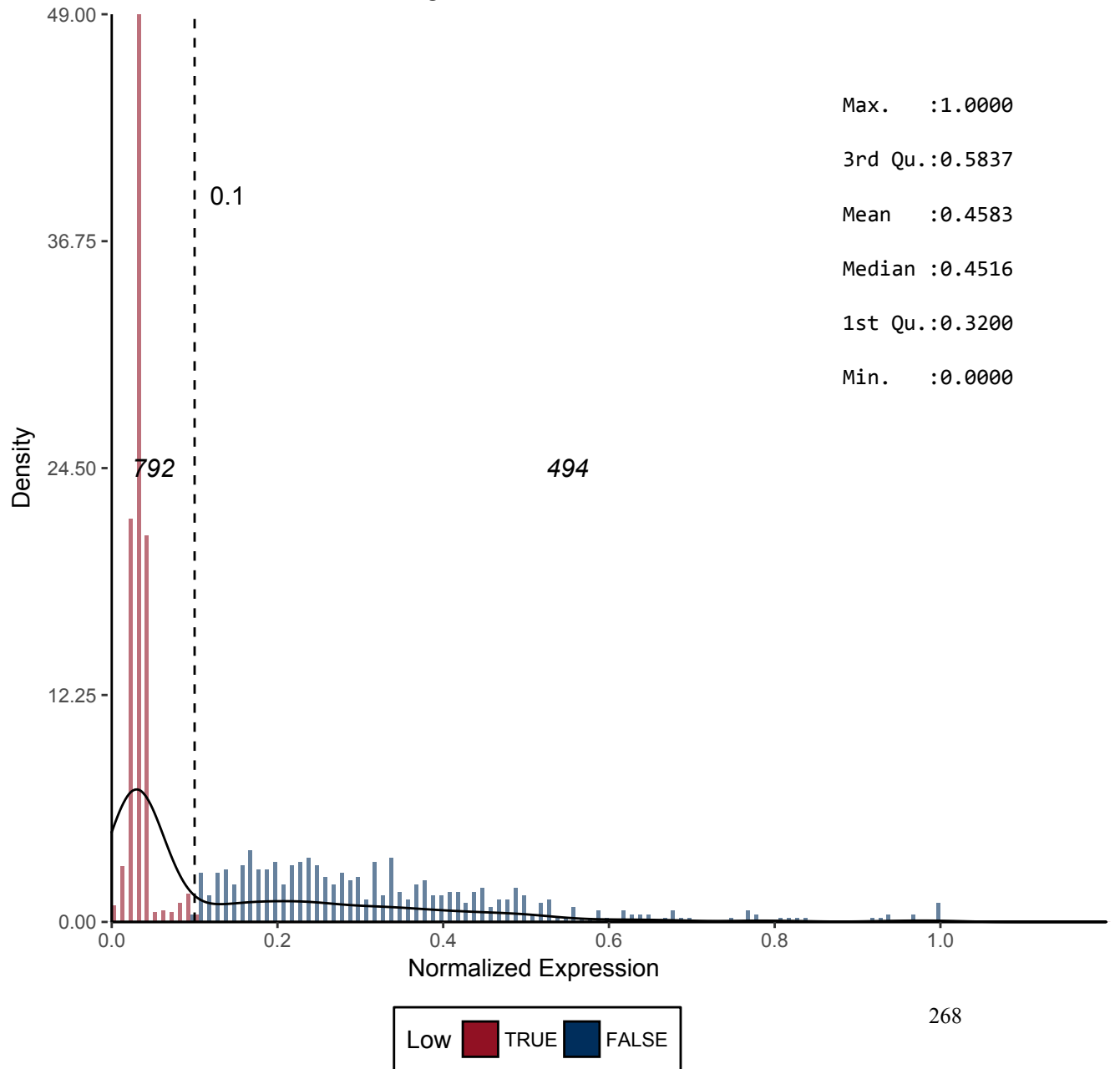


Figure 252 - CD242

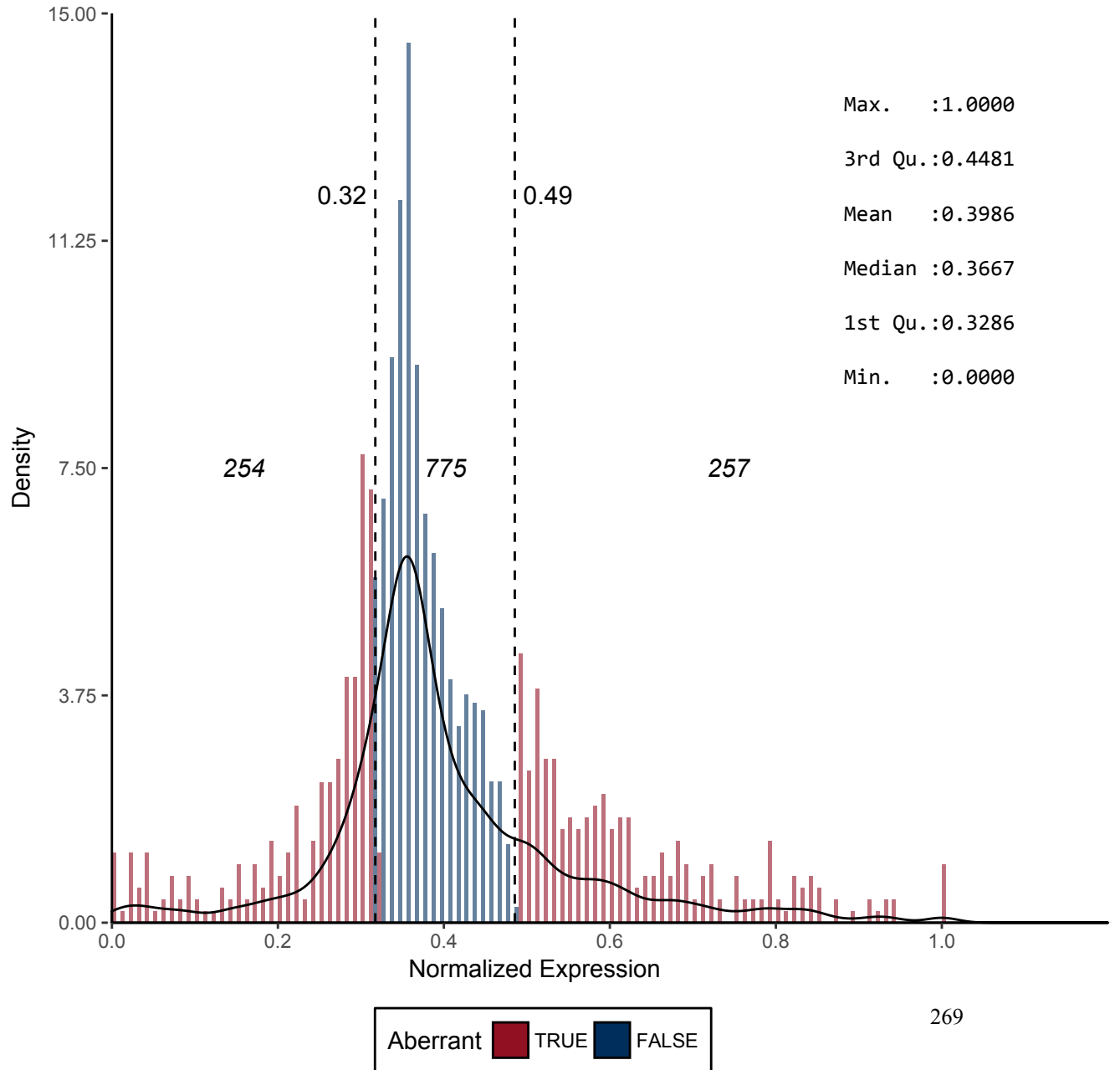


Figure 253 - CD243

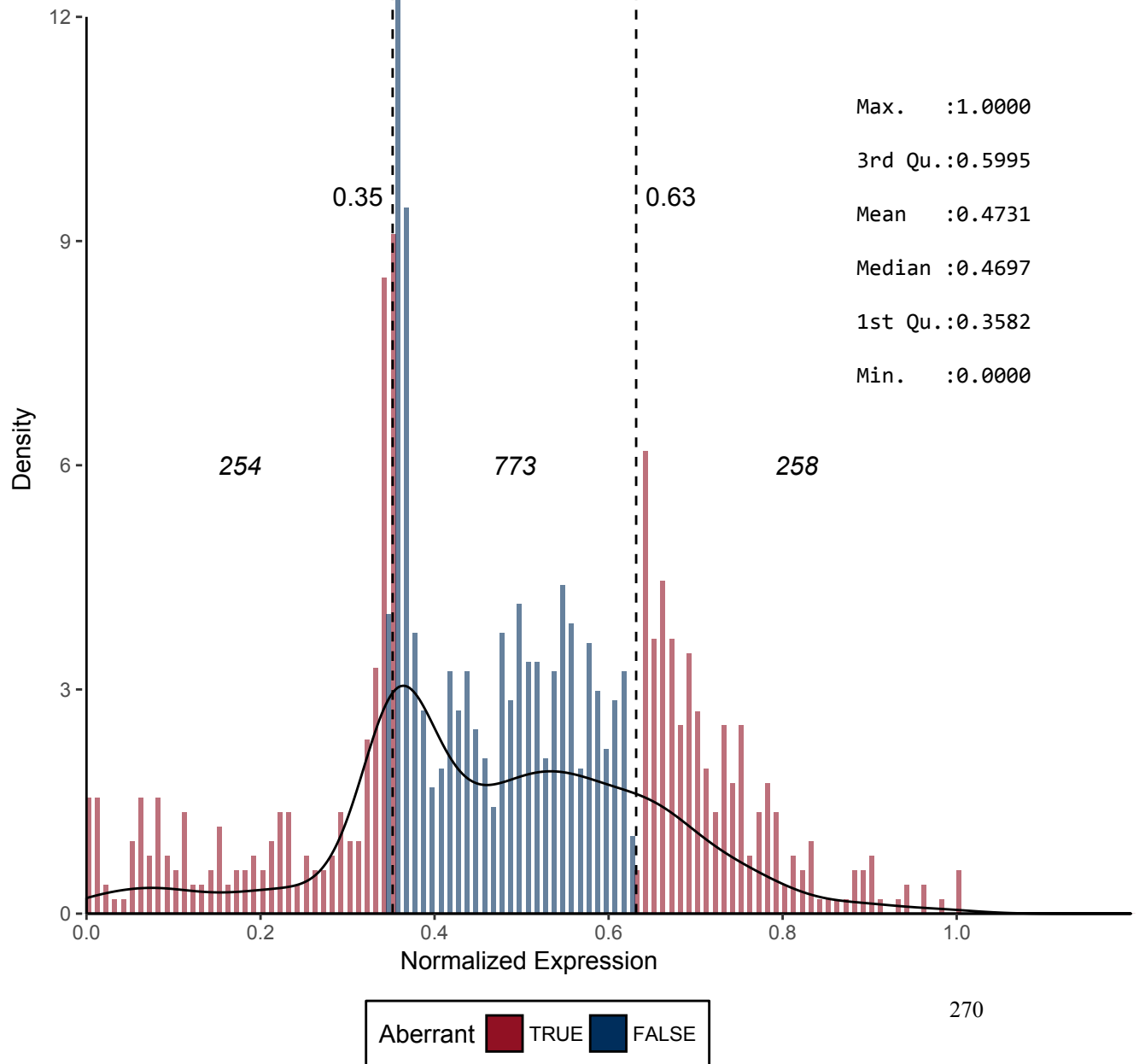


Figure 254 - CD244

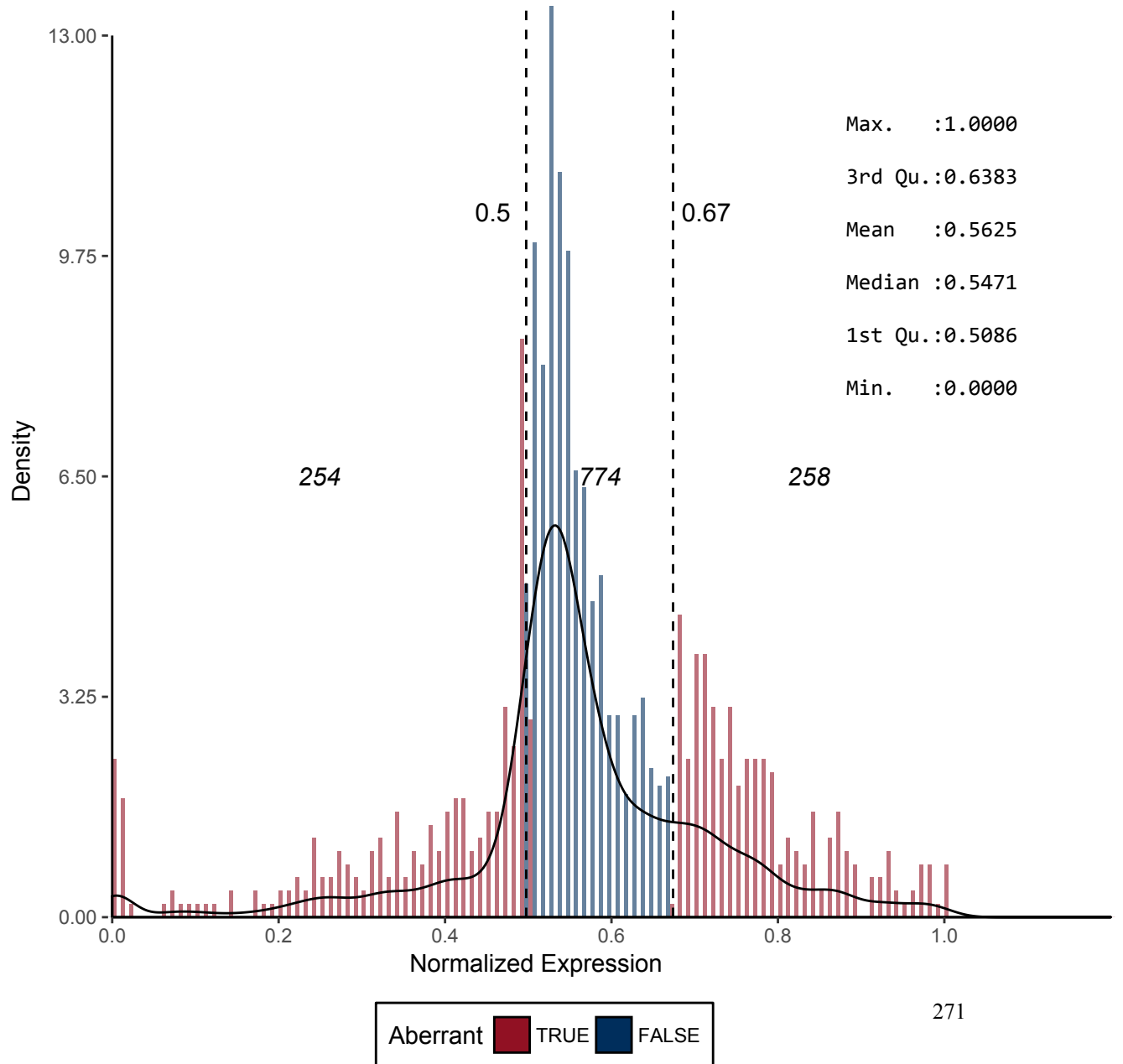


Figure 255 - CD246*

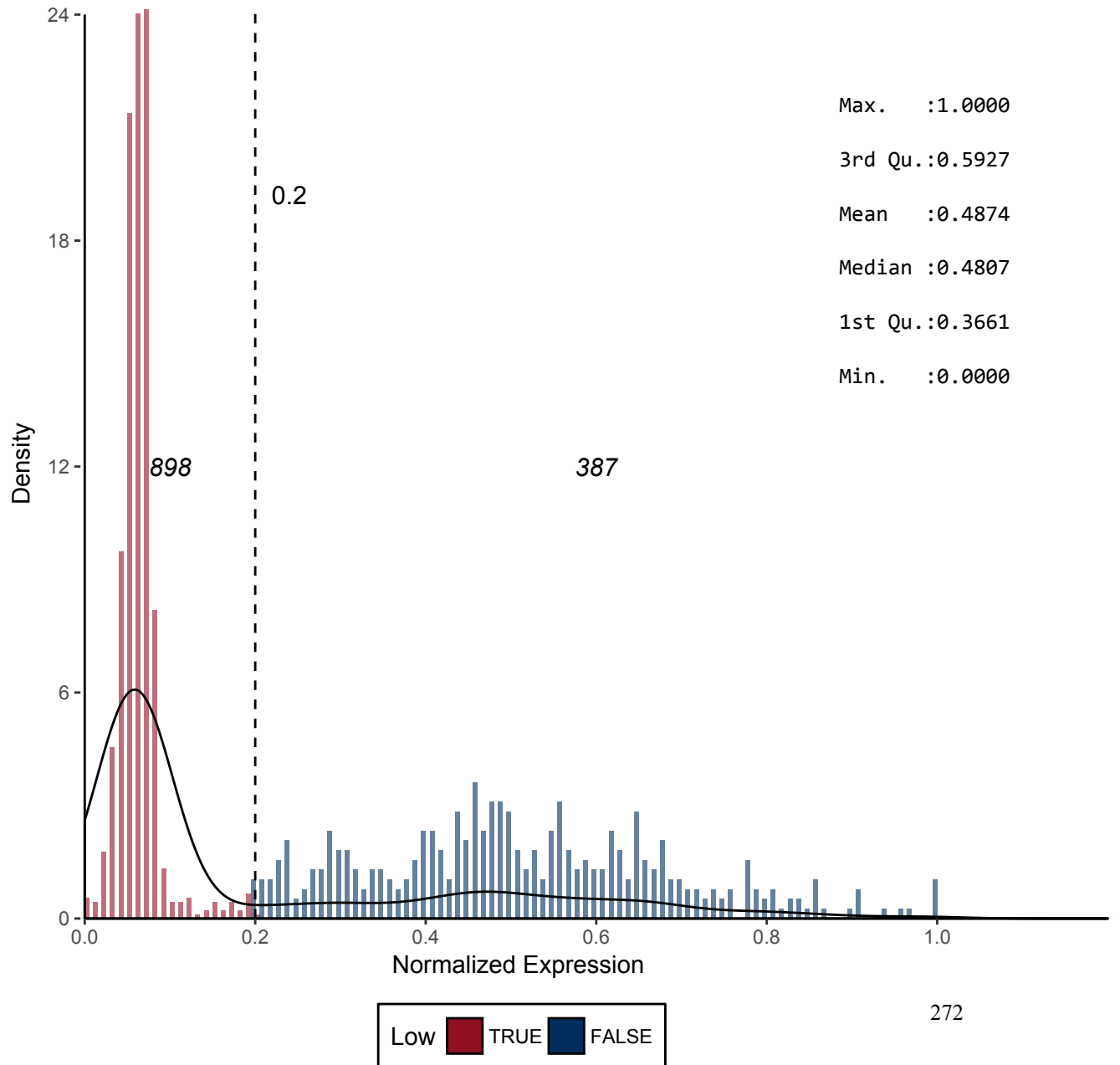
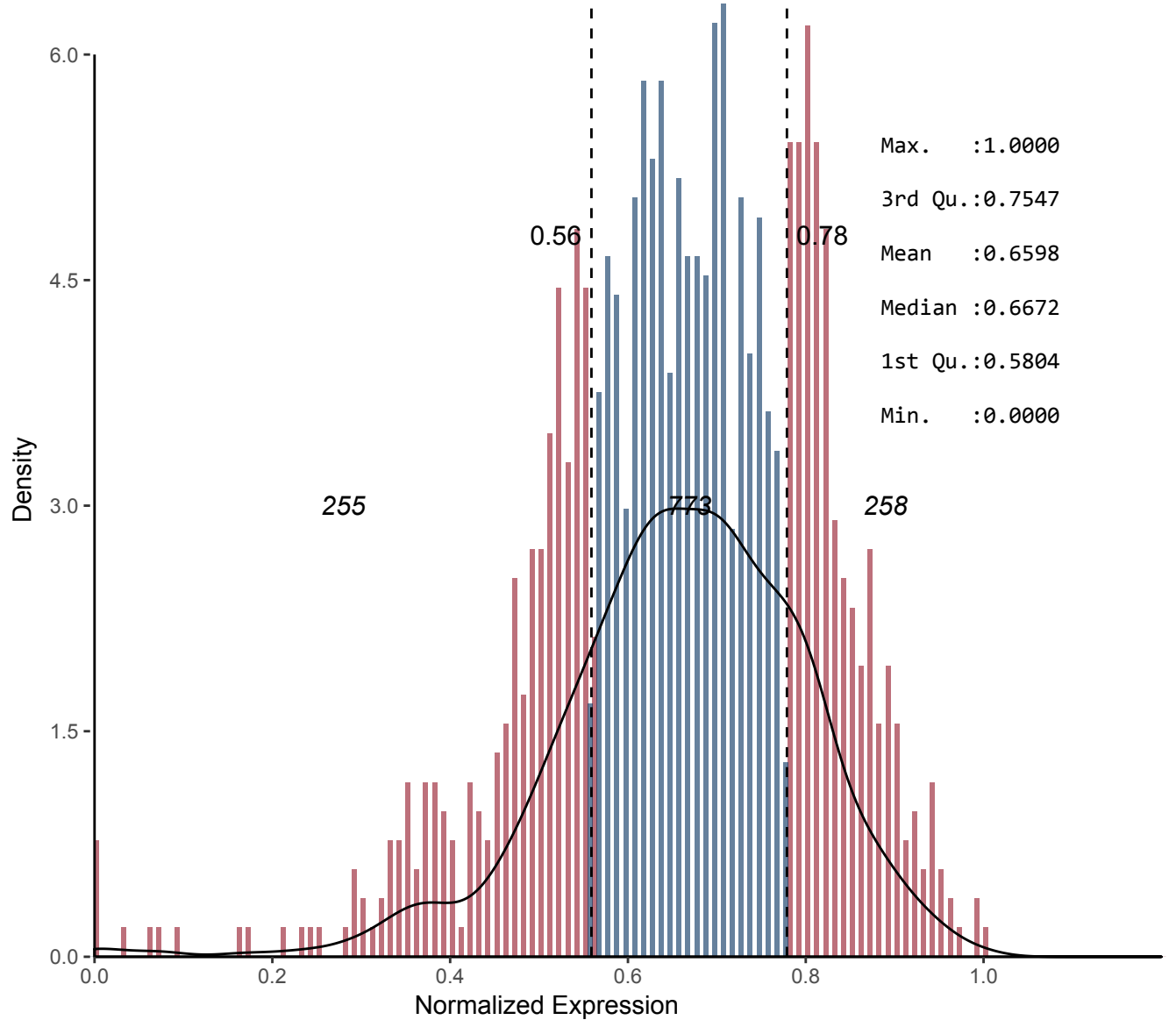


Figure 256 - CD247



Aberrant TRUE FALSE

Figure 257 - CD248

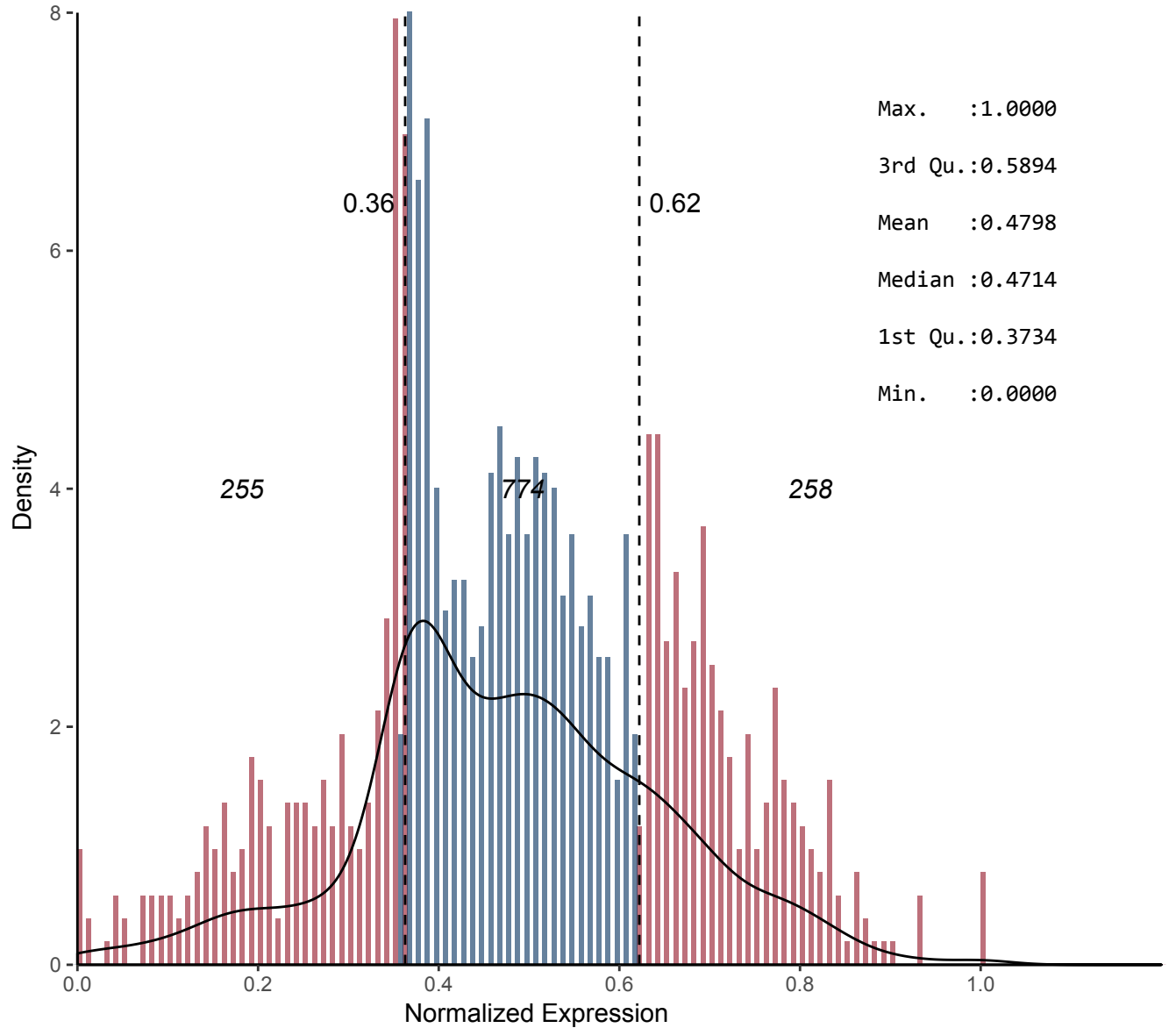


Figure 258 - CD249*

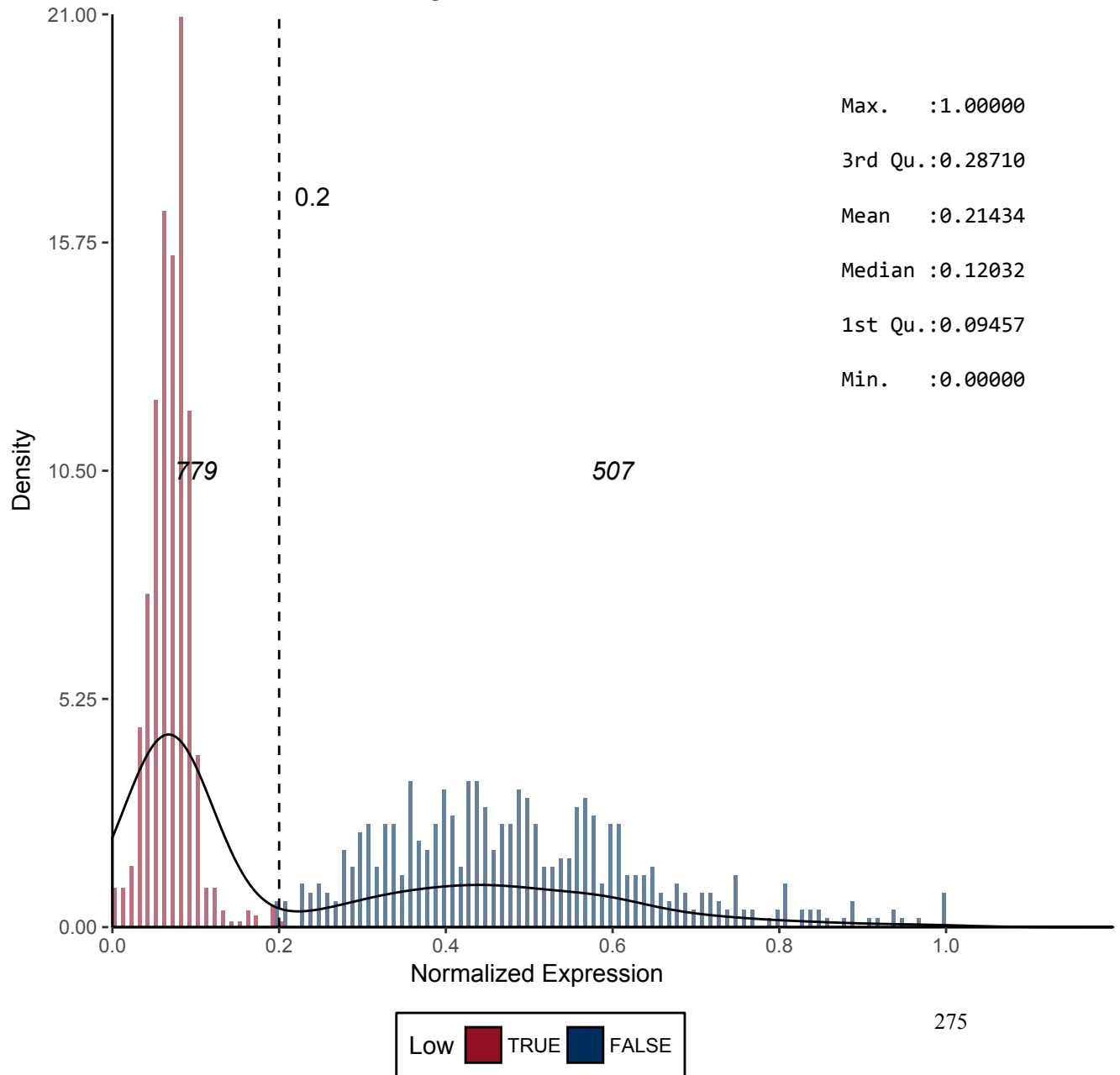


Figure 259 - CD252

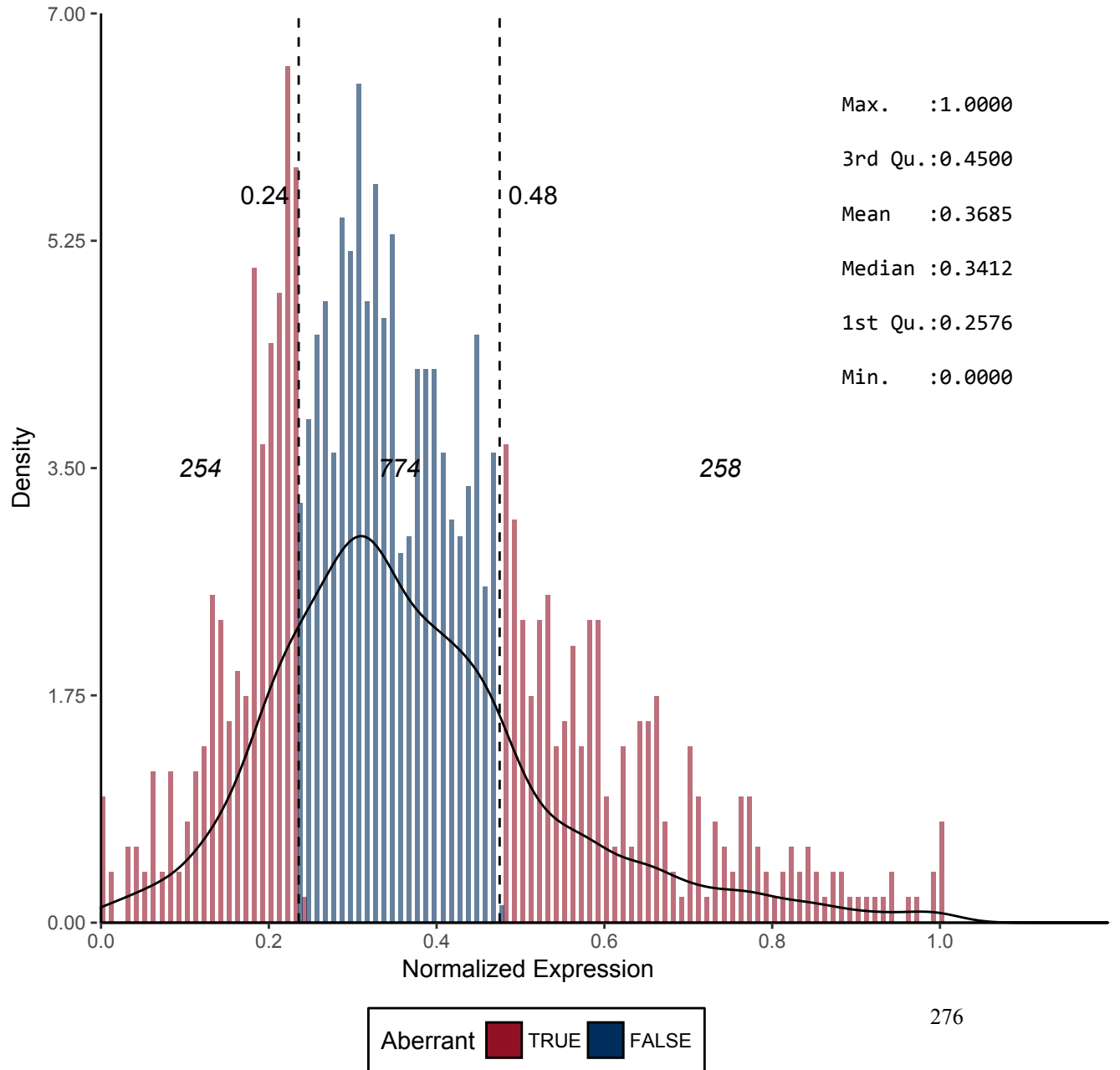


Figure 260 - CD253

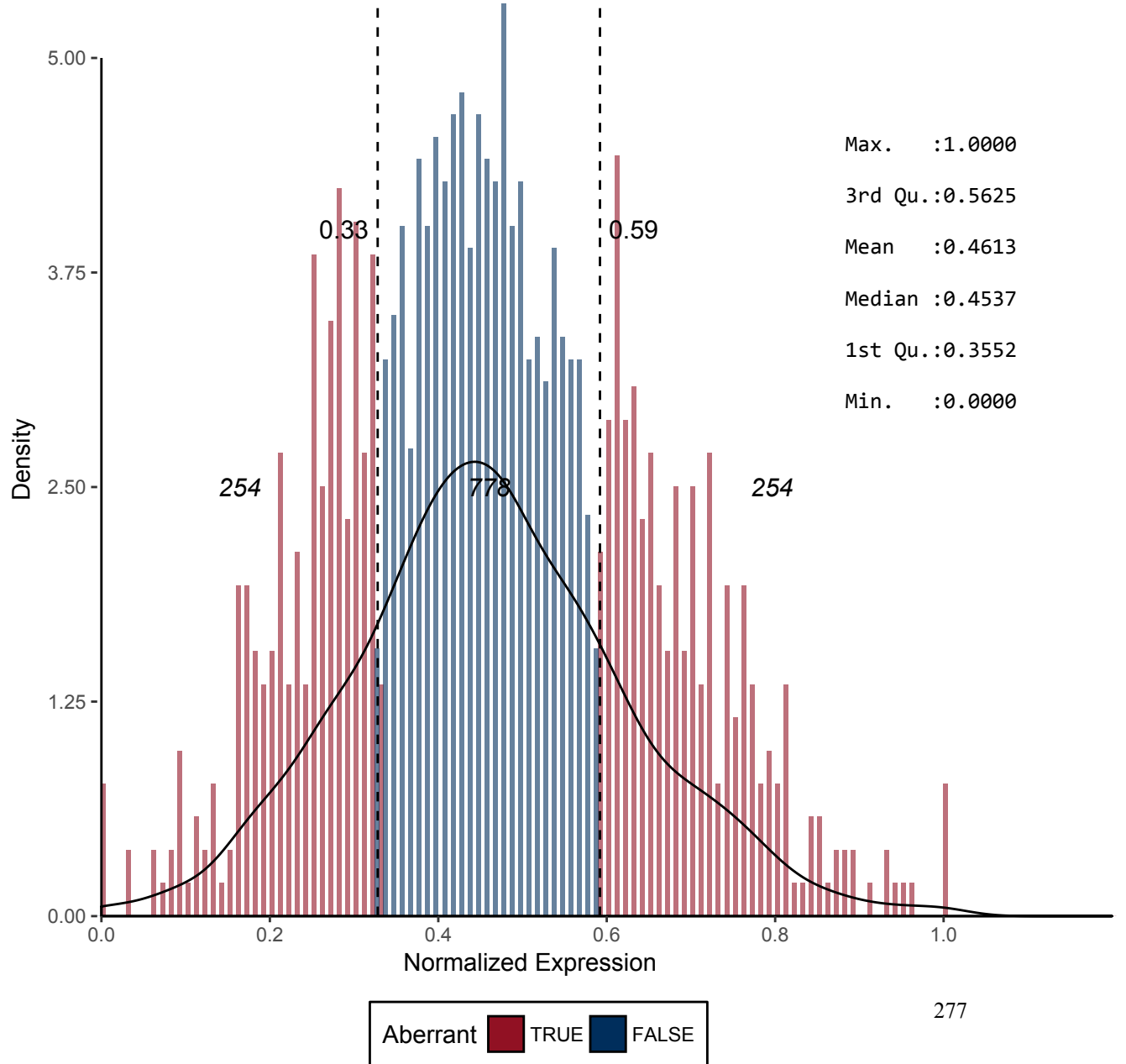


Figure 261 - CD254*

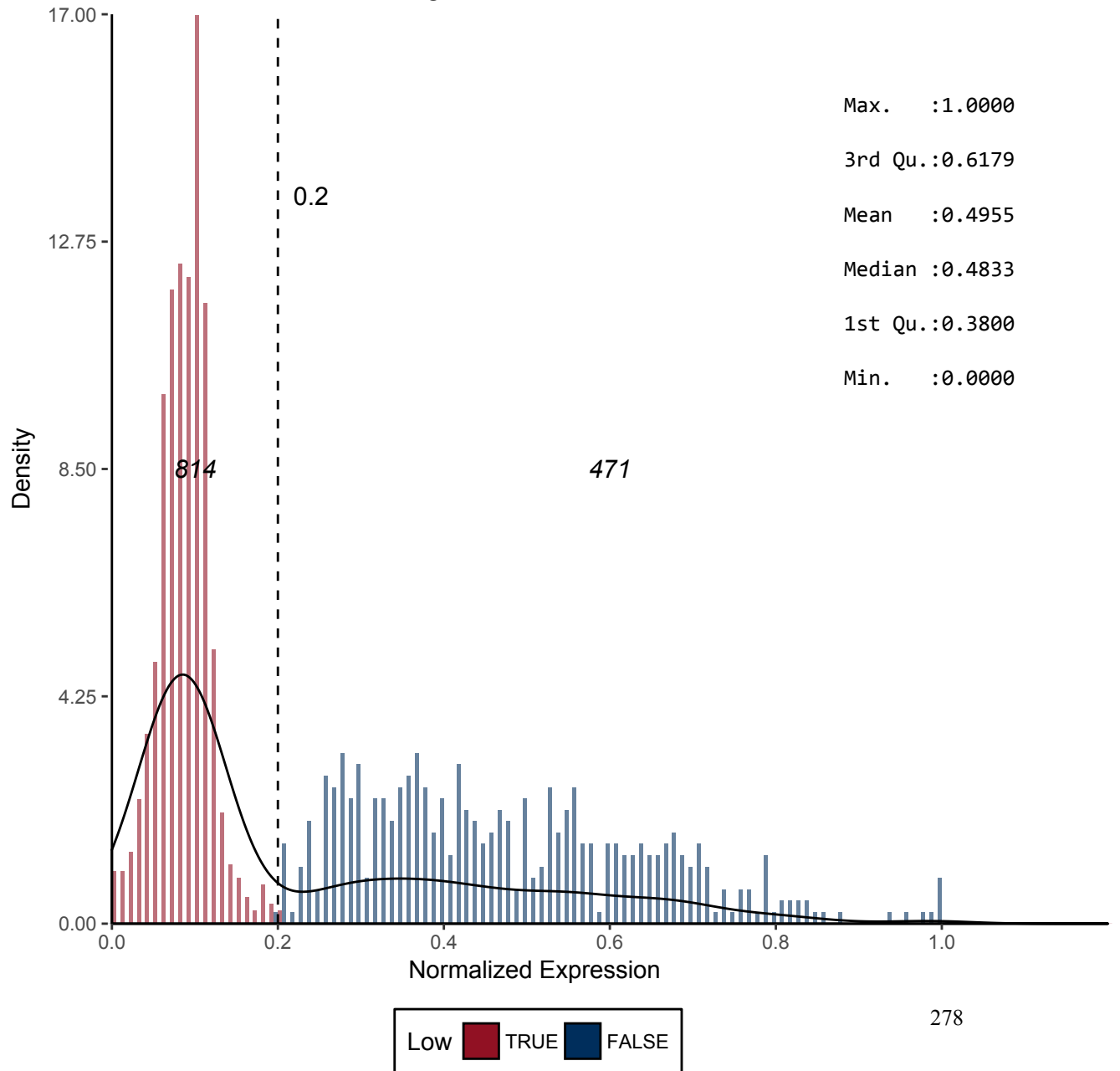


Figure 262 - CD257

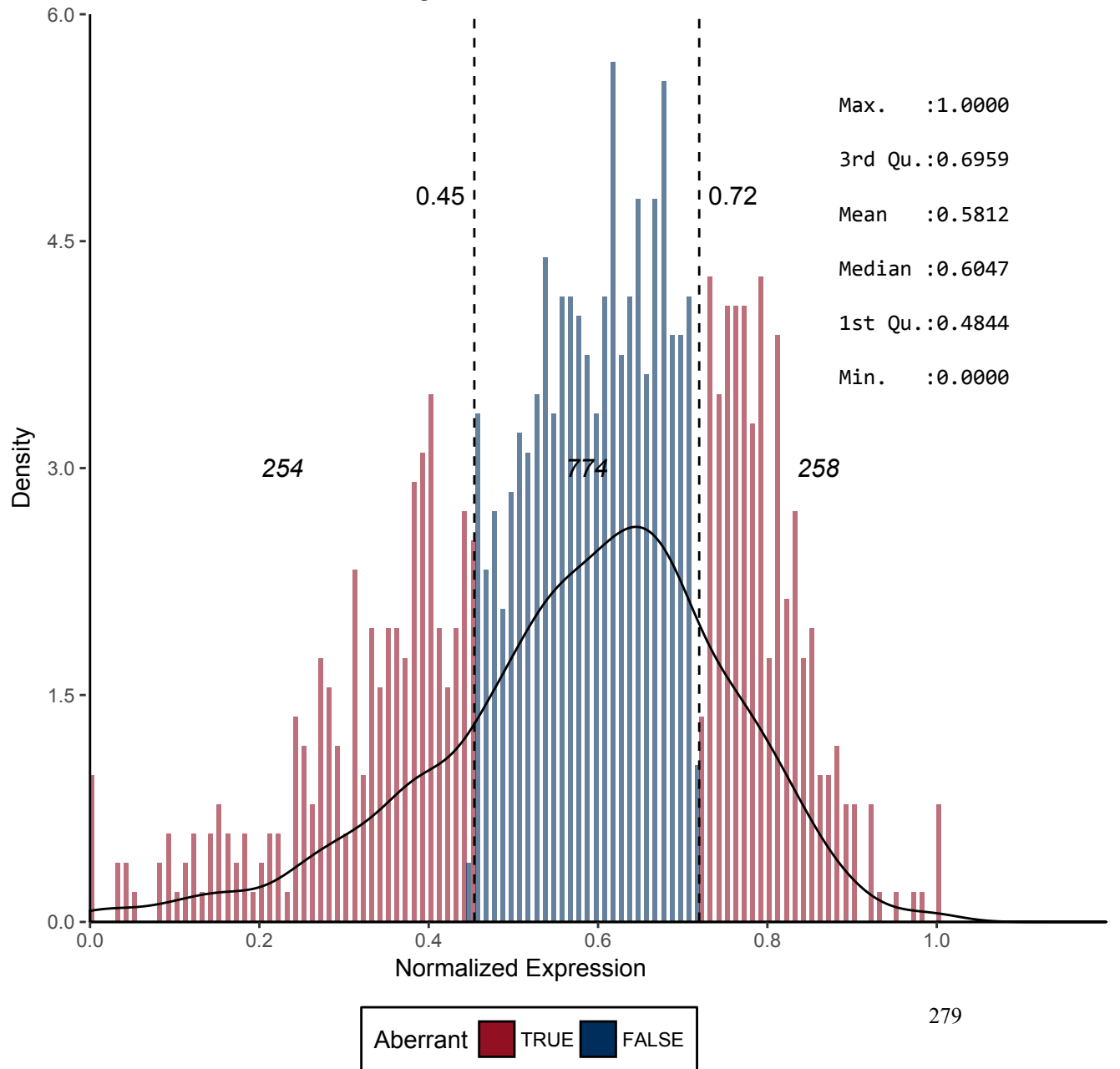


Figure 263 - CD258

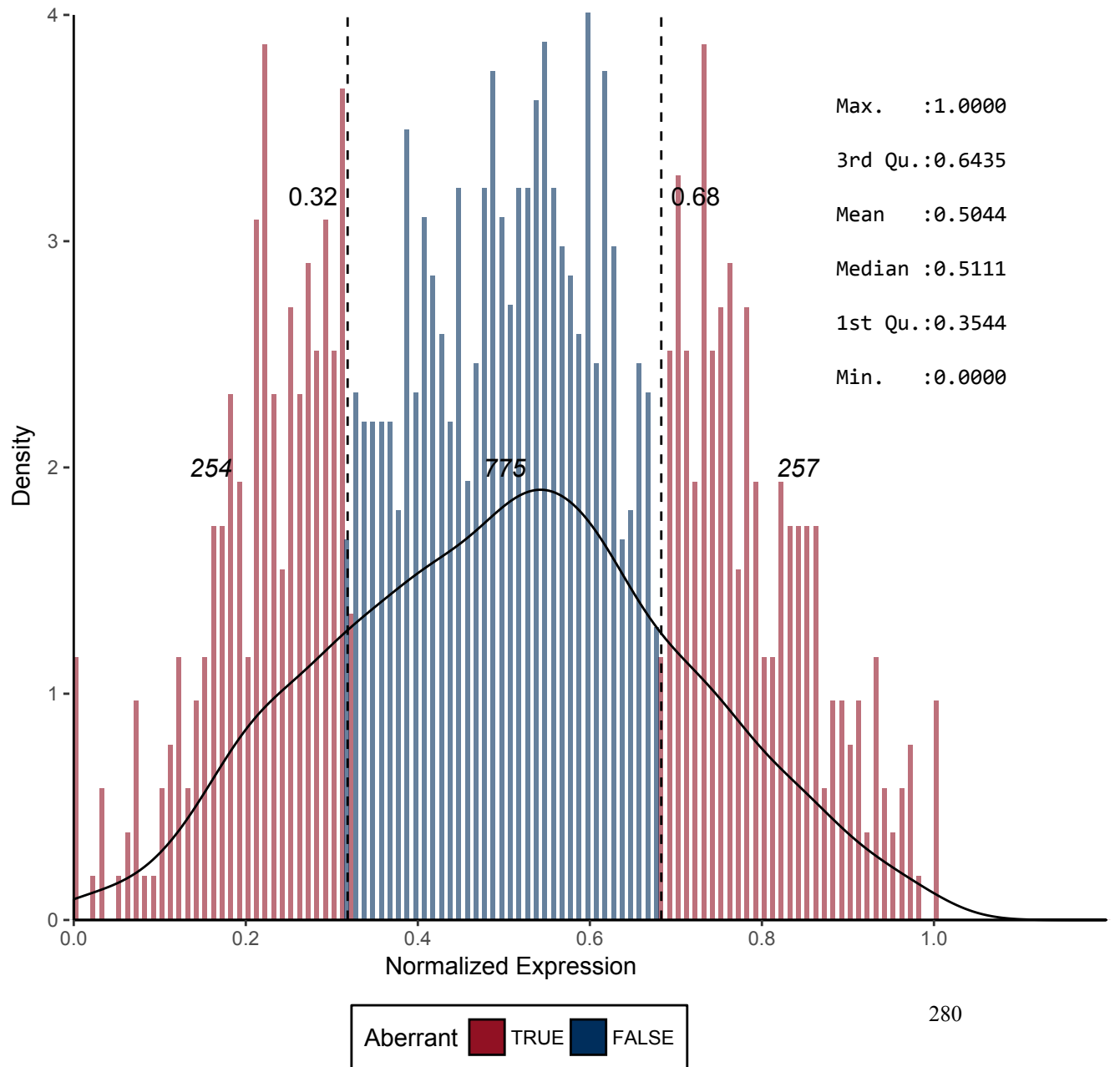


Figure 264 - CD262

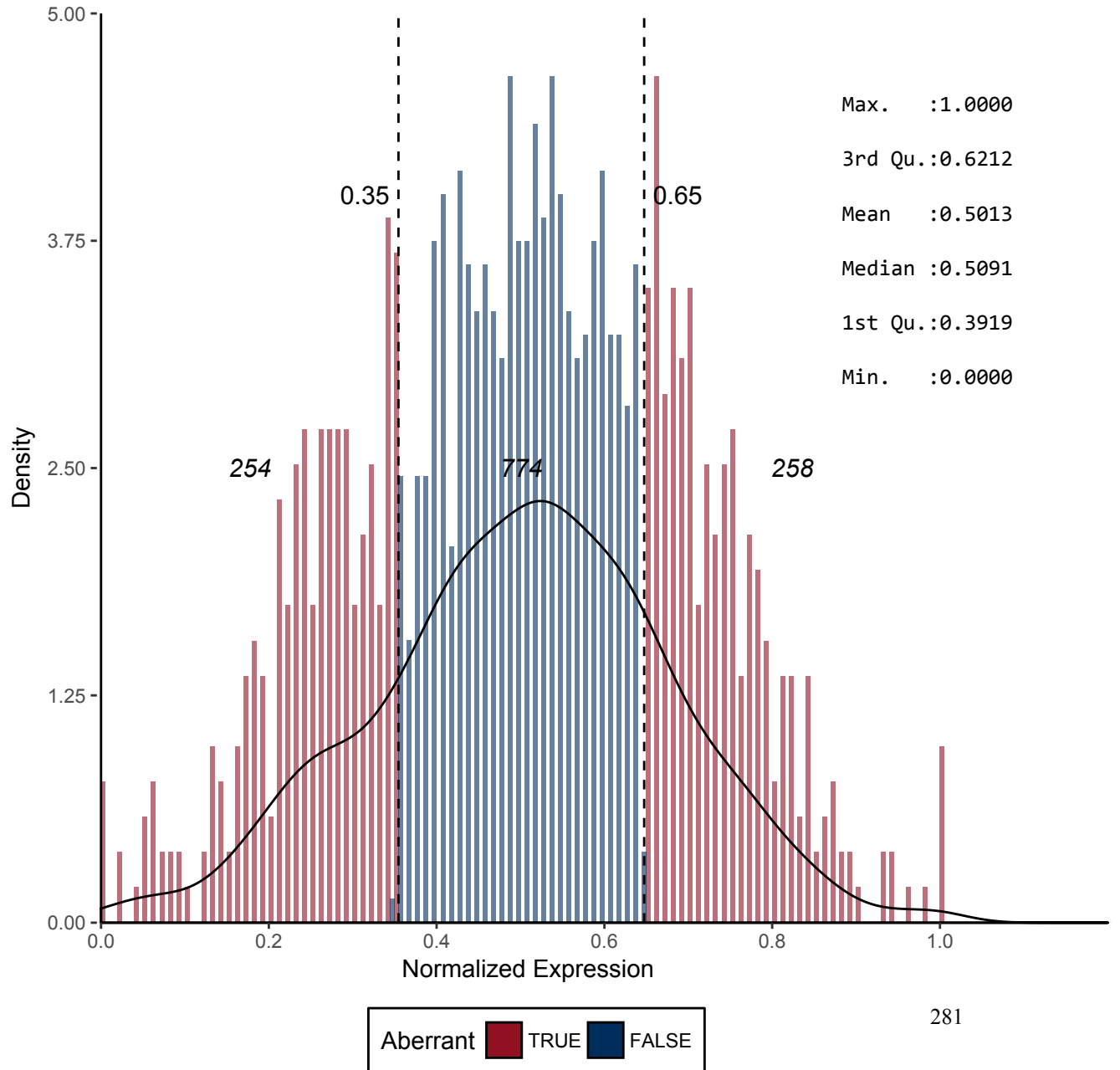
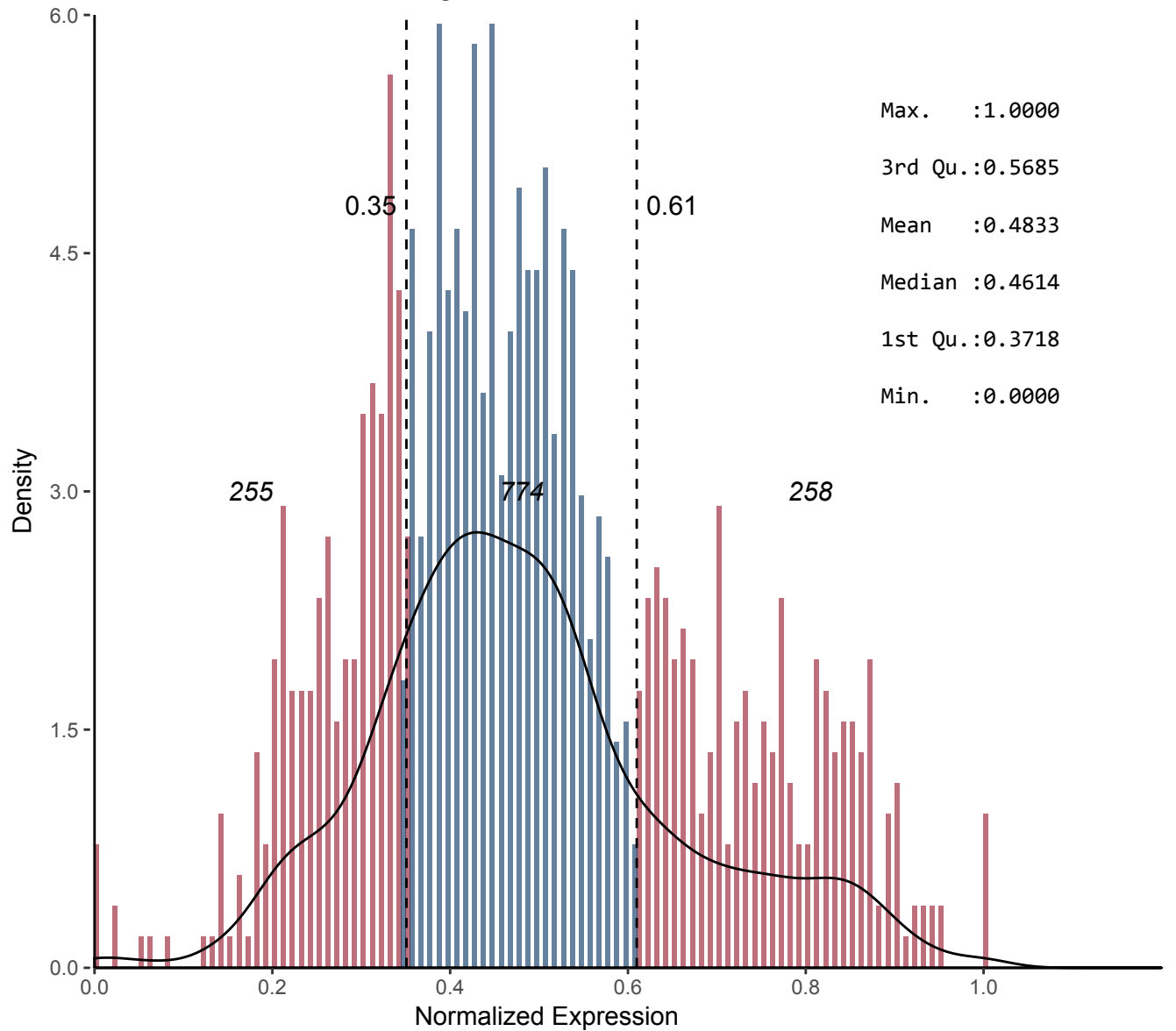


Figure 265 - CD263



Aberrant TRUE FALSE

Figure 266 - CD264*

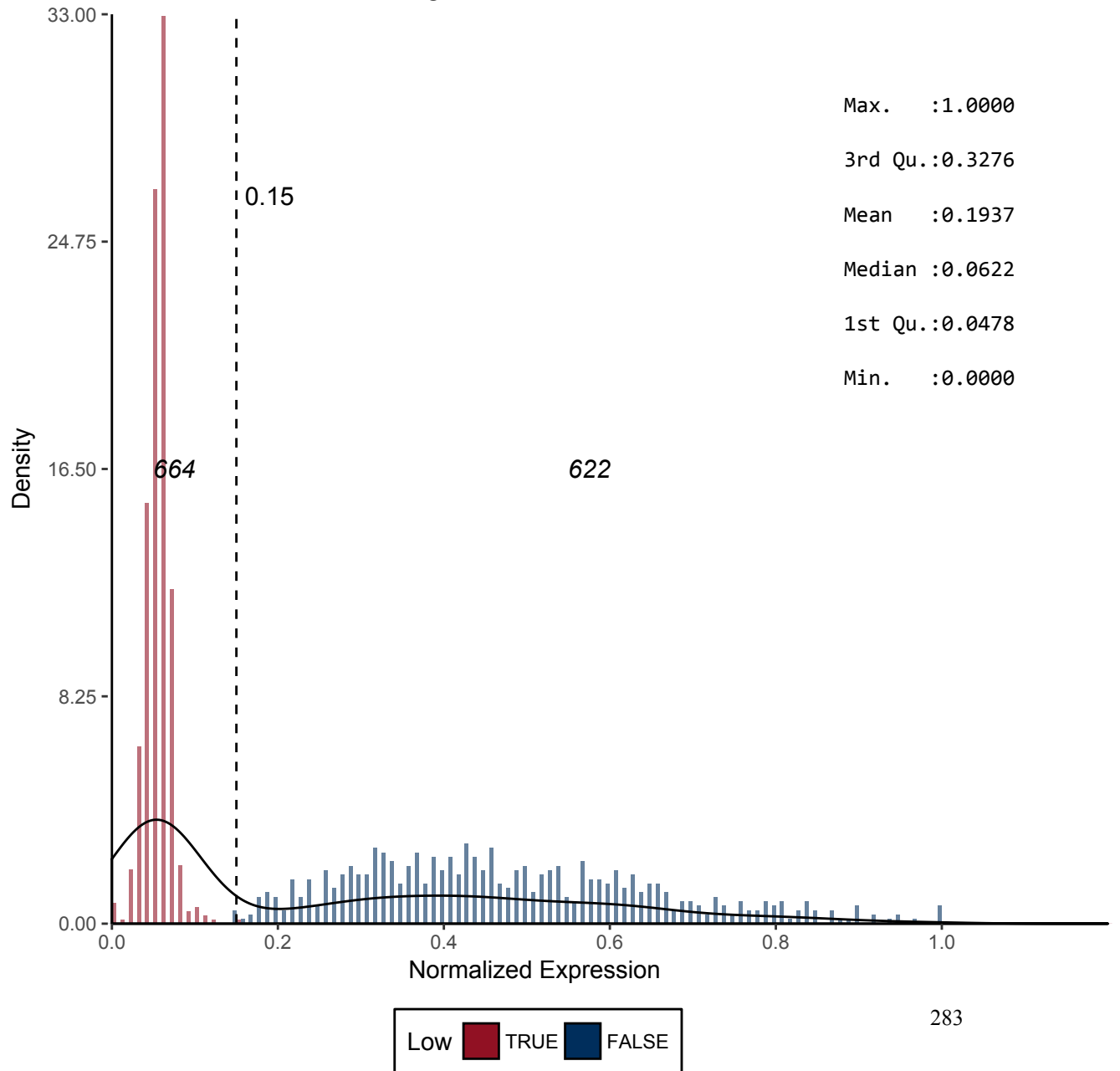


Figure 267 - CD265*

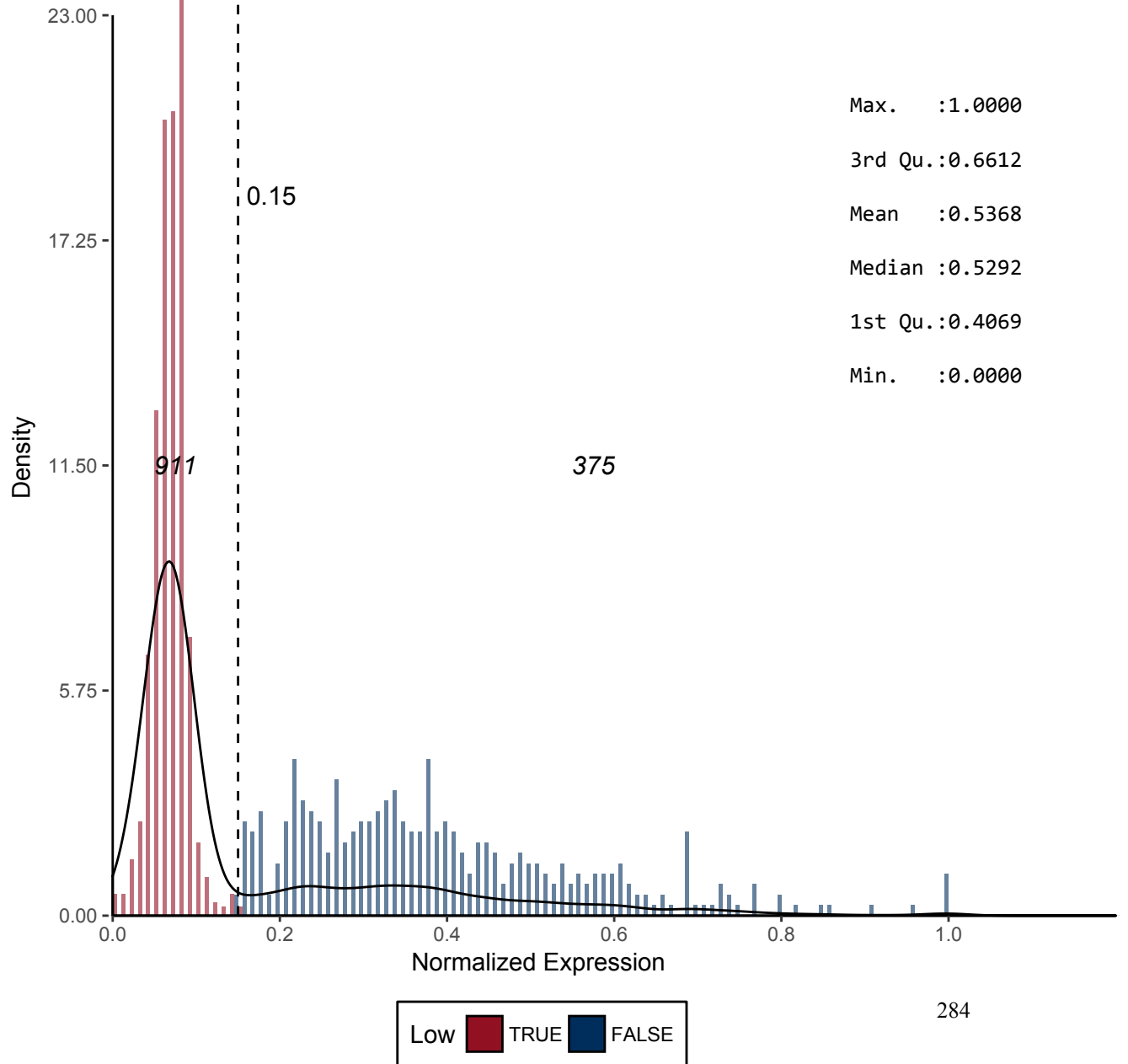


Figure 268 - CD266

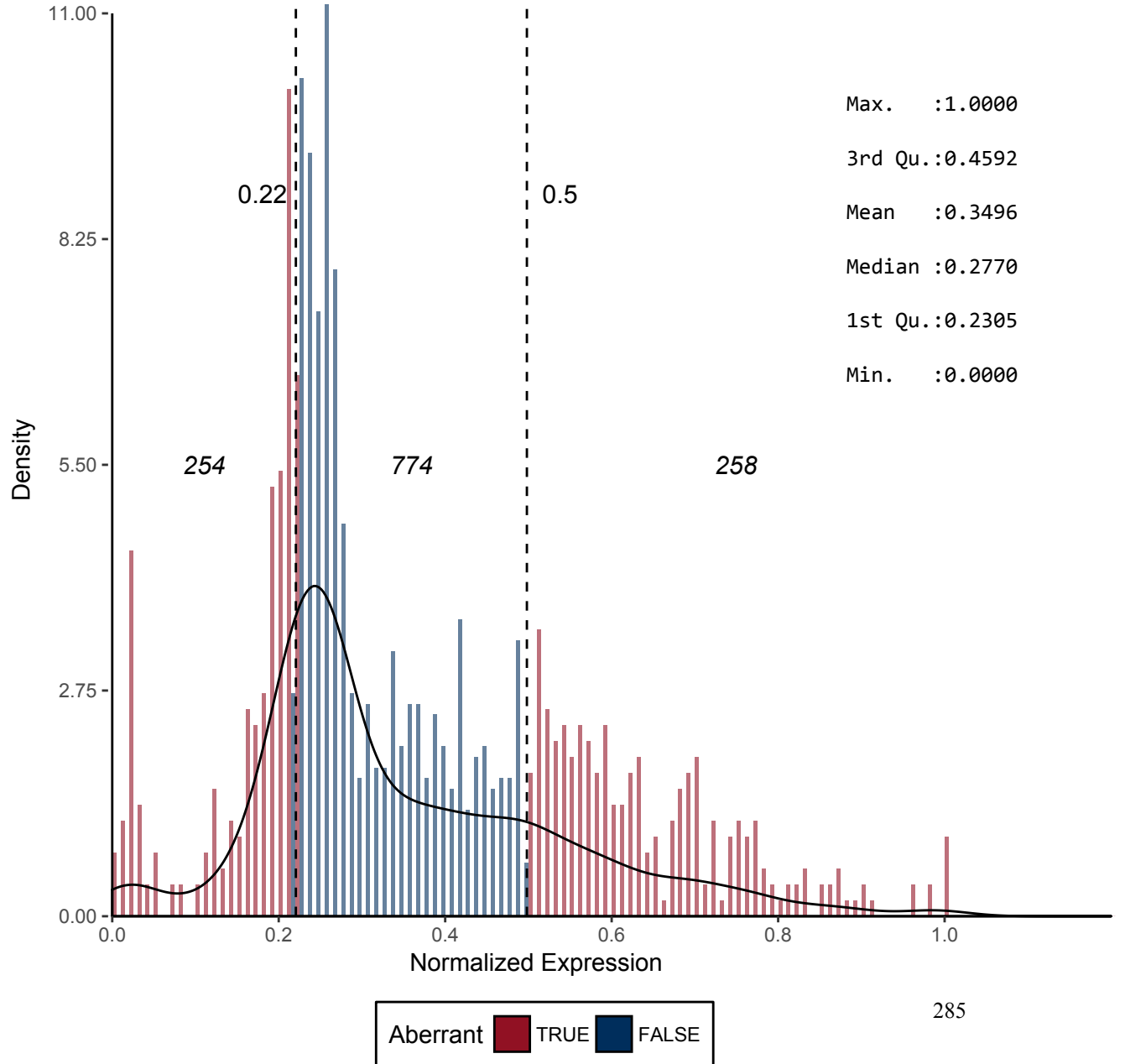


Figure 269 - CD267

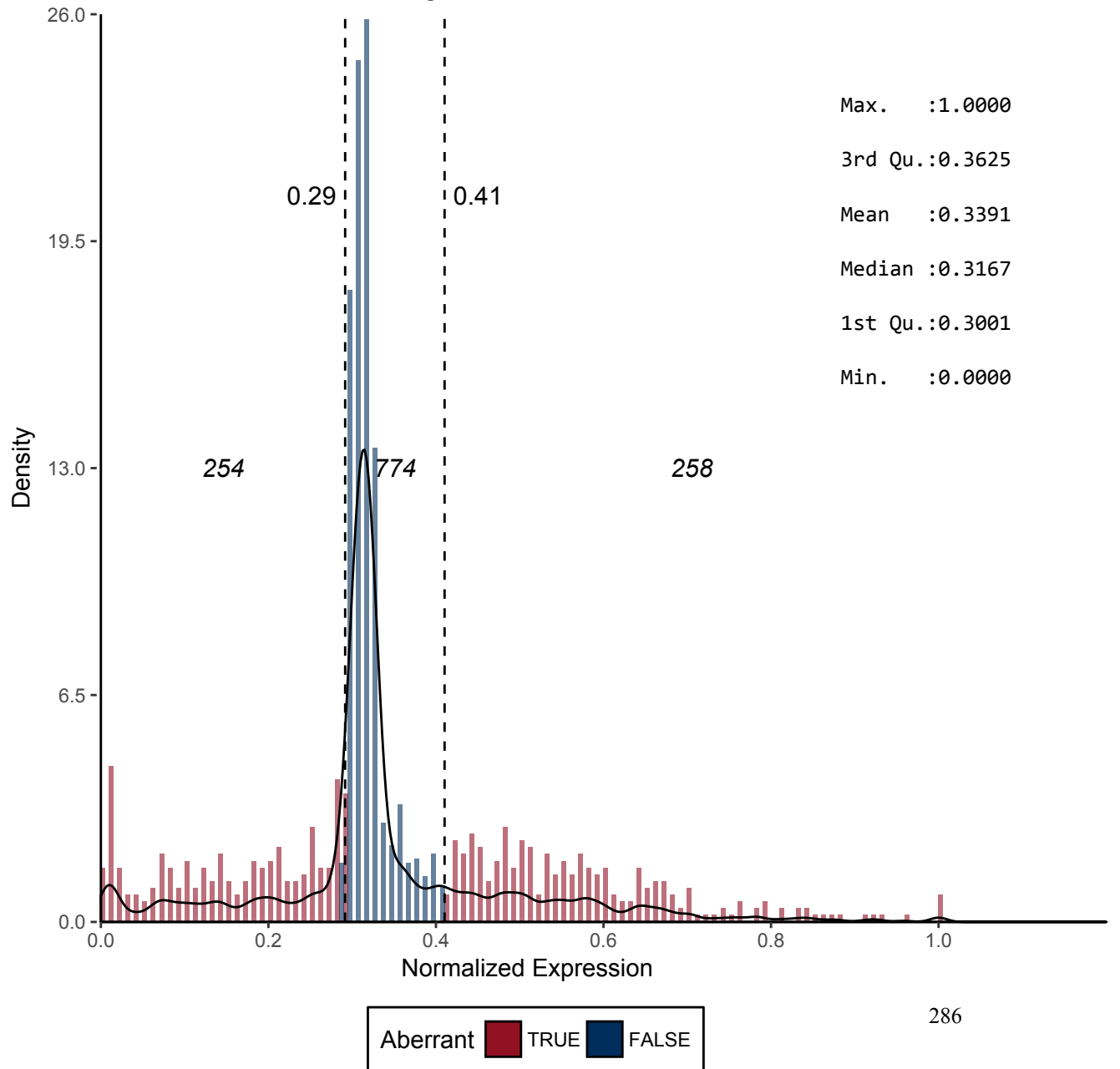


Figure 270 - CD269

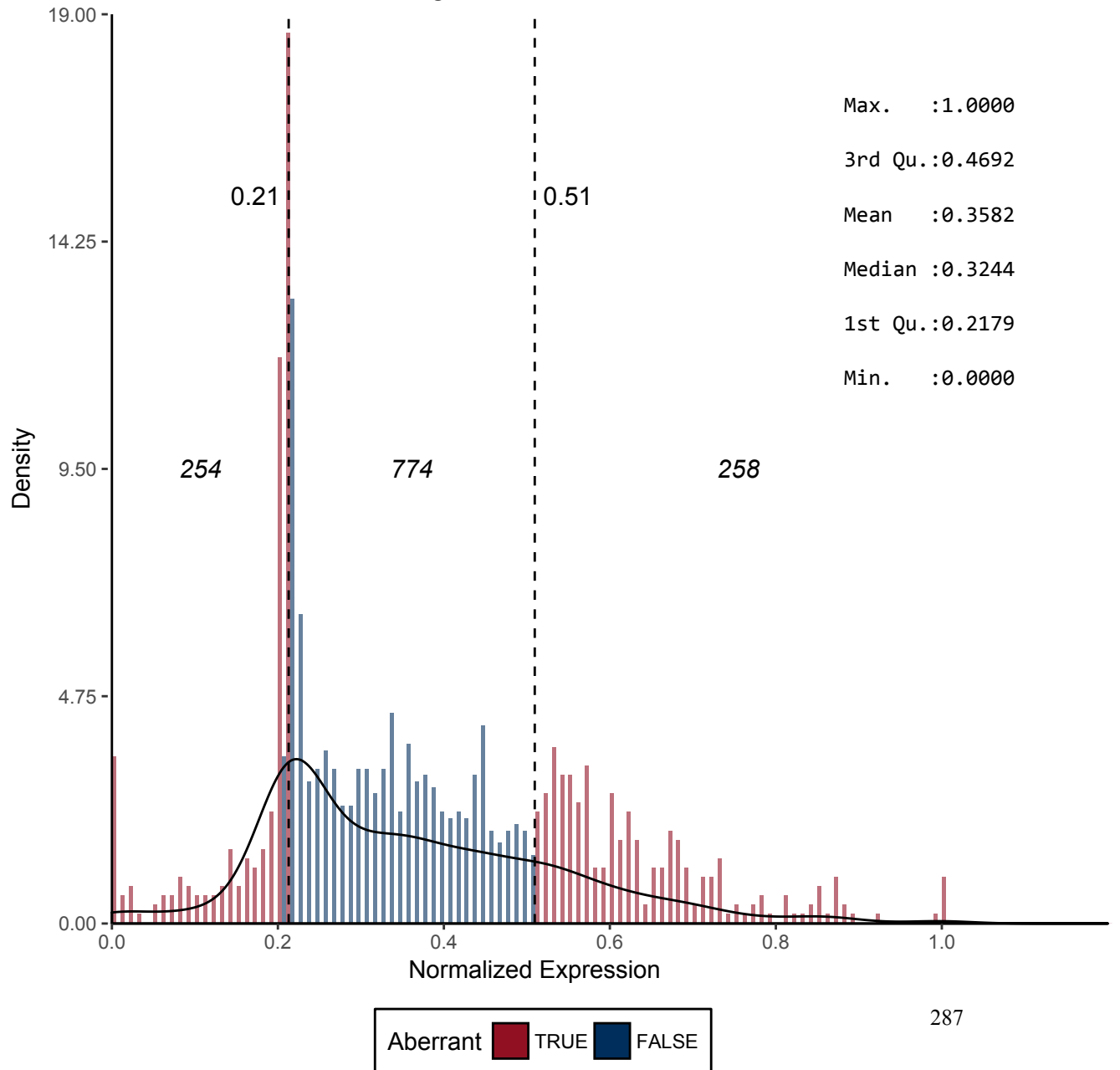


Figure 271 - CD270

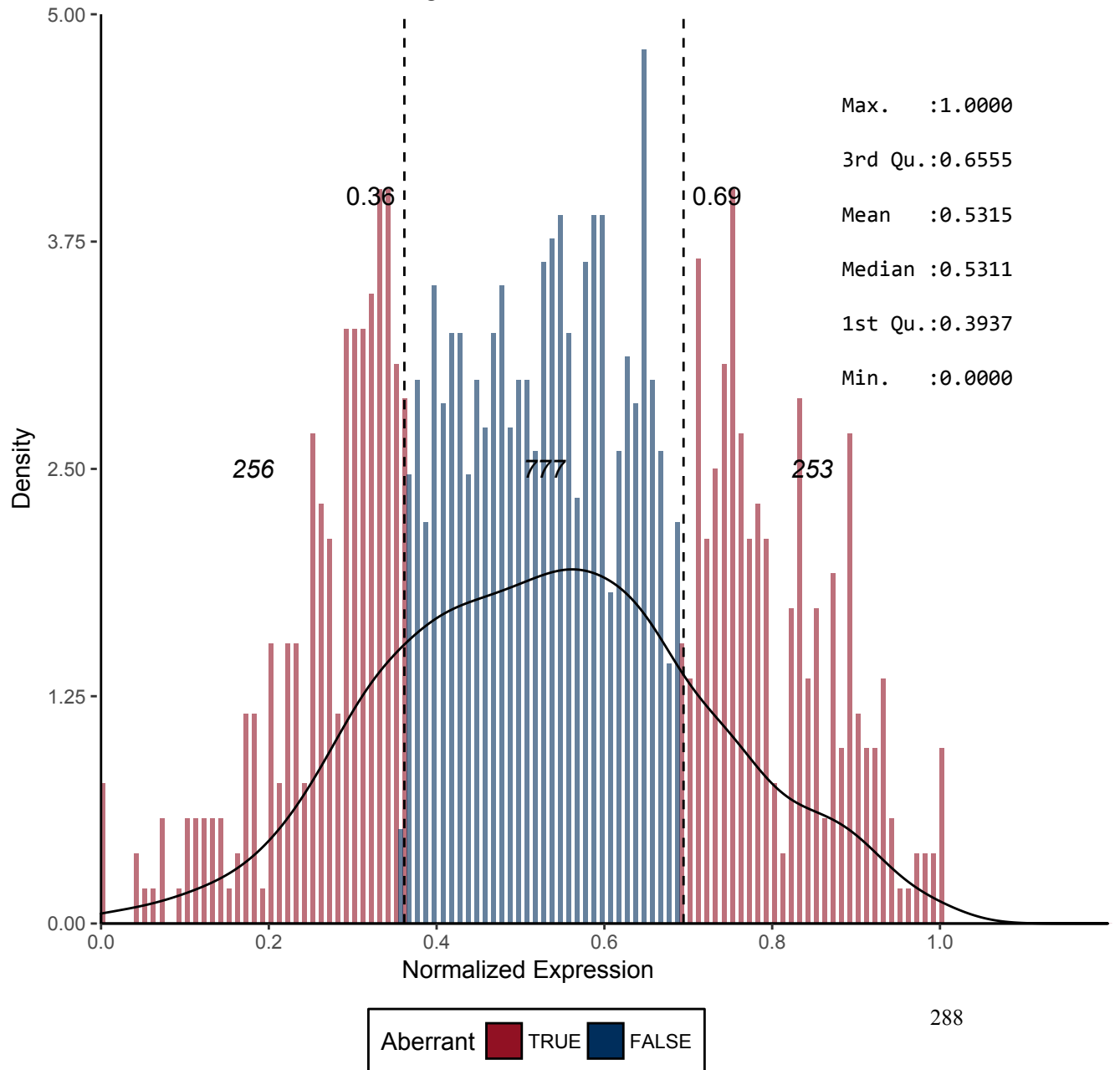


Figure 272 - CD271*

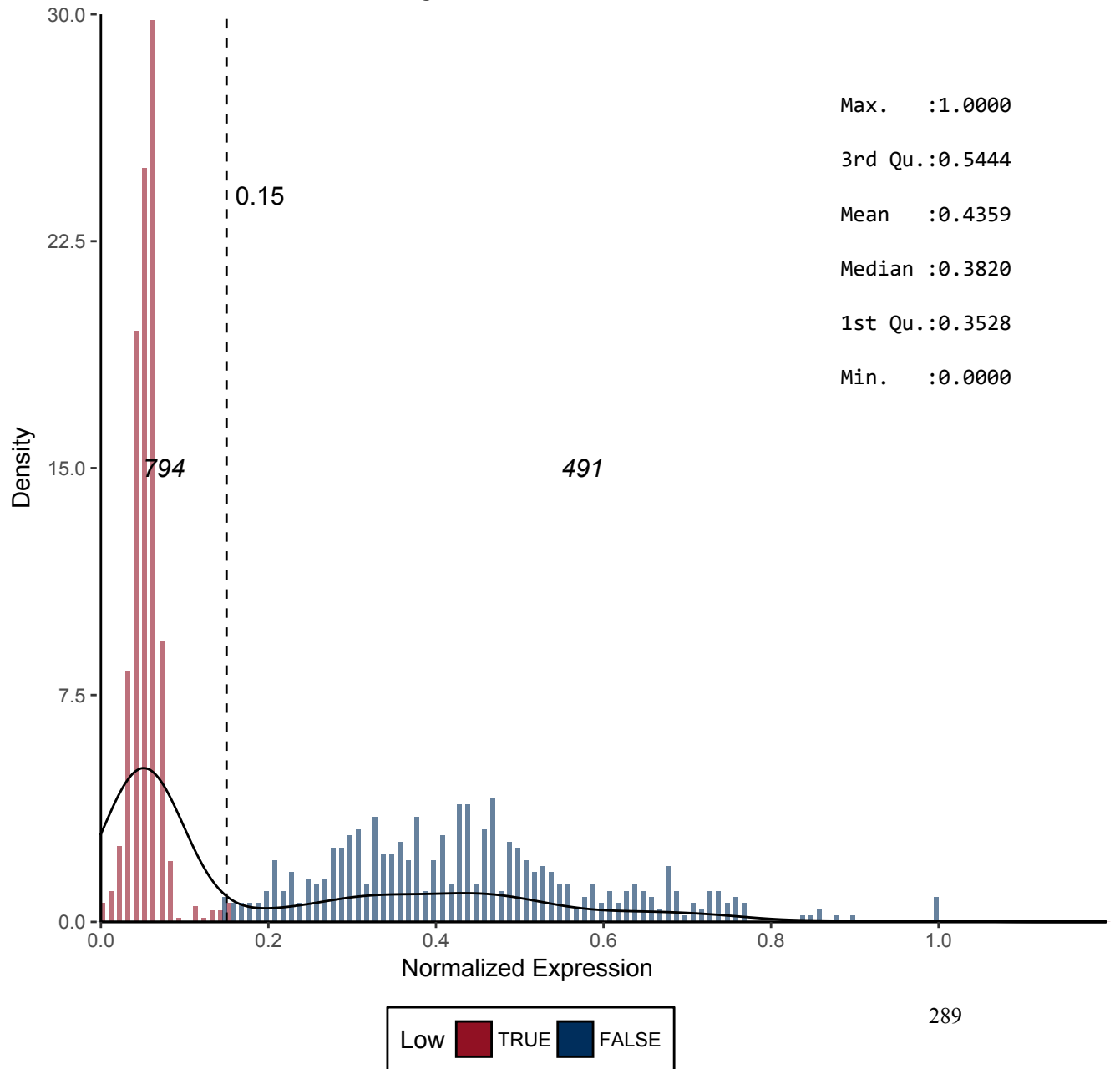


Figure 273 - CD272

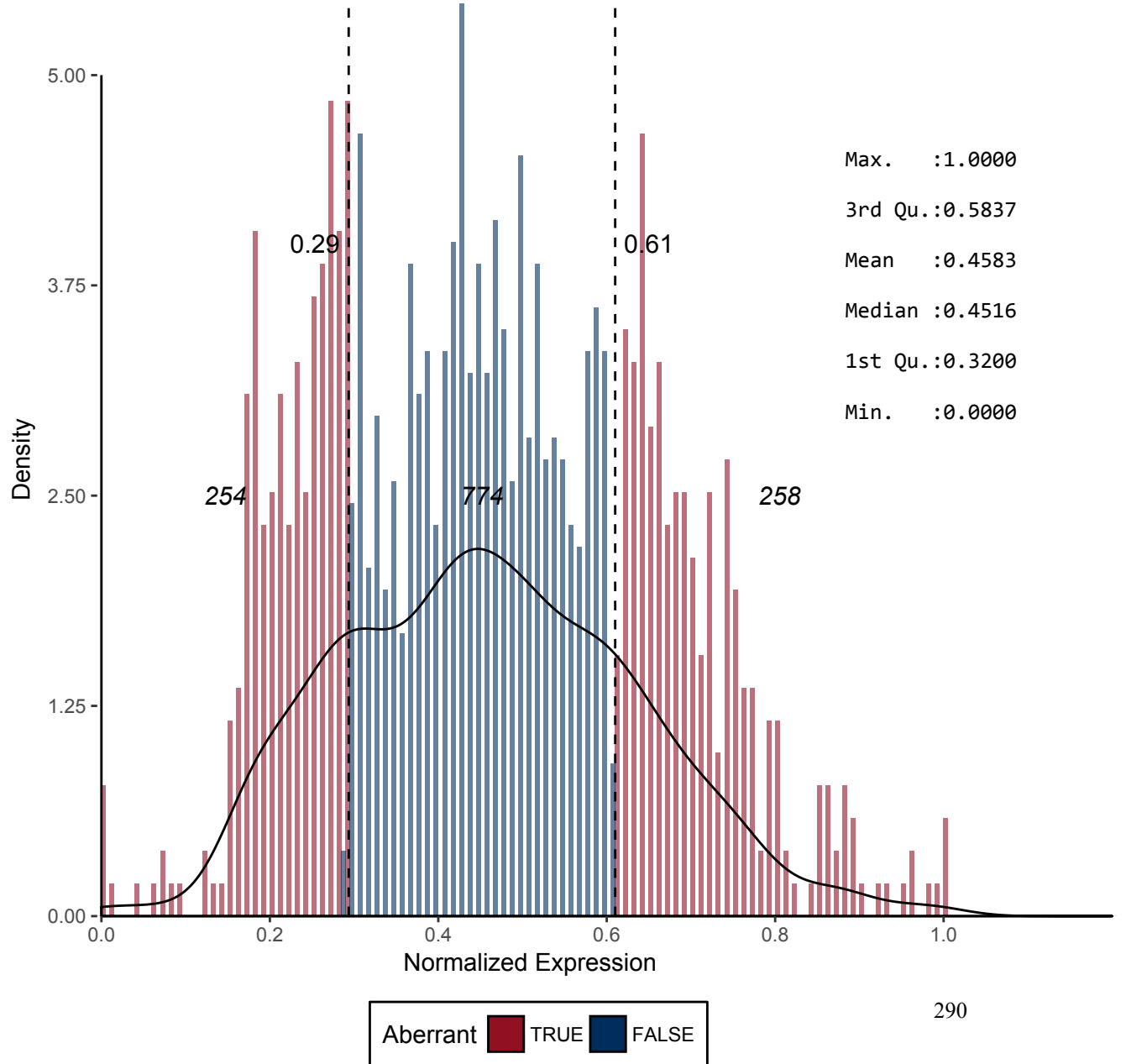
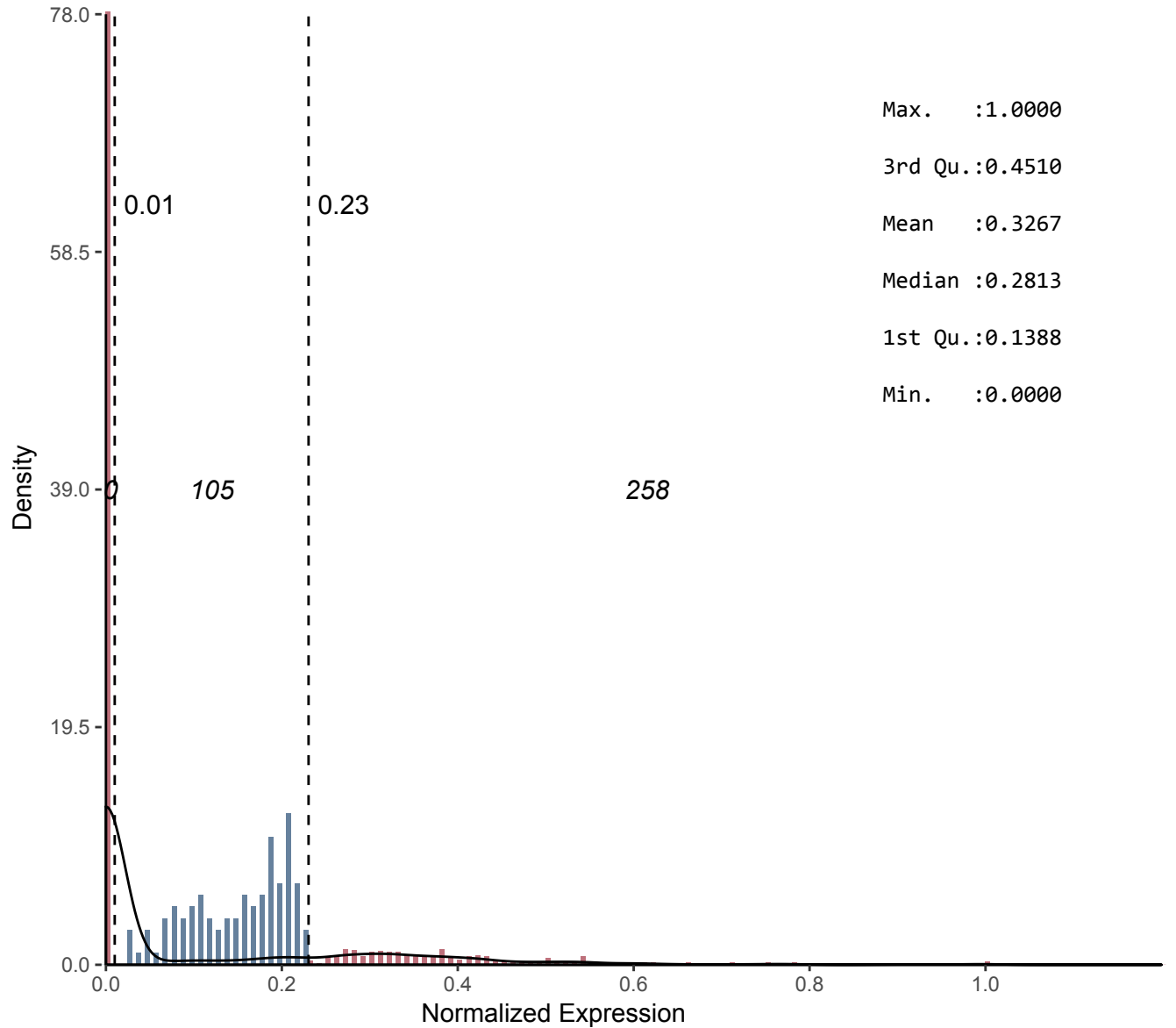


Figure 274 - CD273*



Aberrant TRUE FALSE

Figure 275 - CD274*

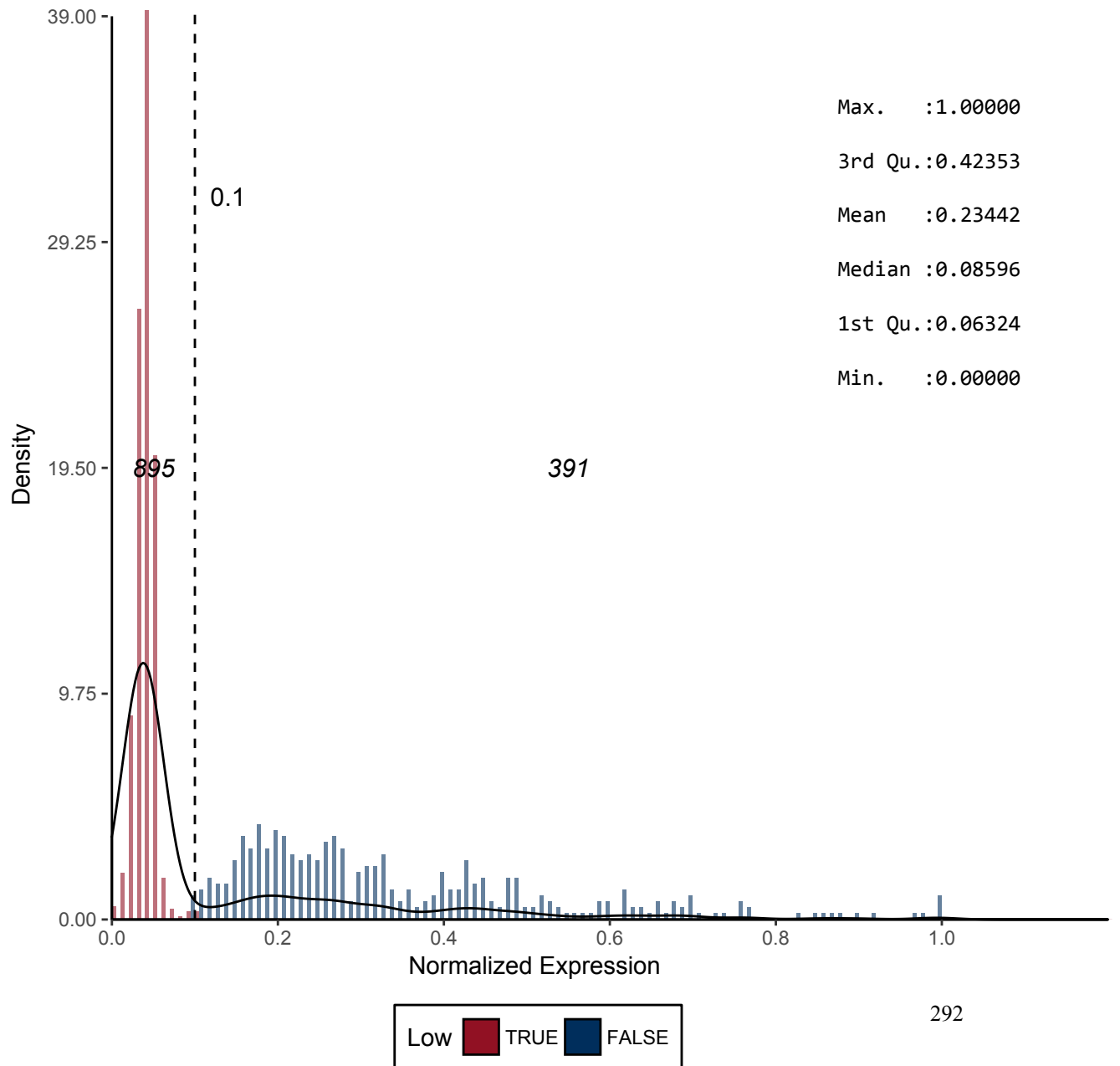


Figure 276 - CD276*

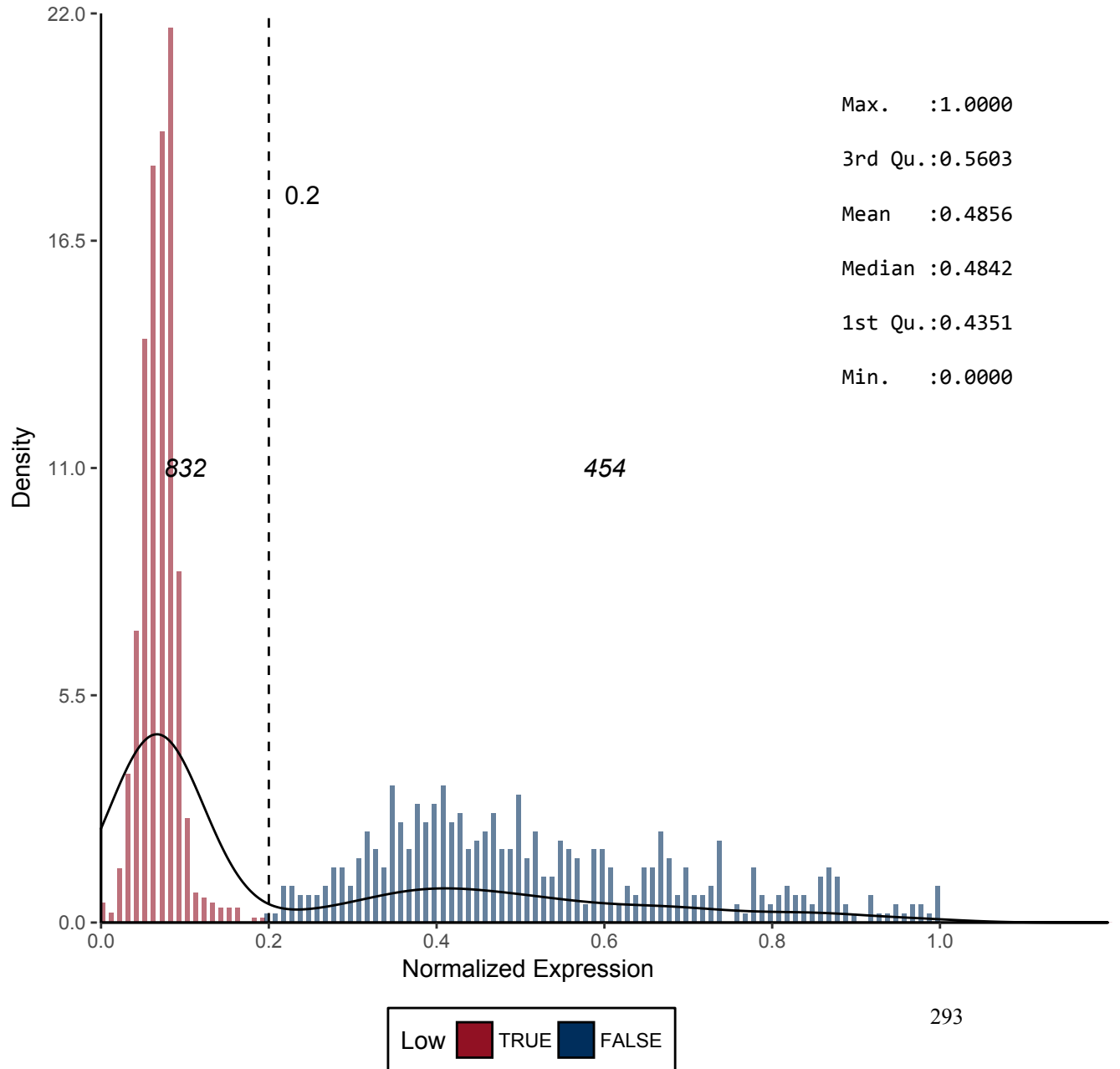
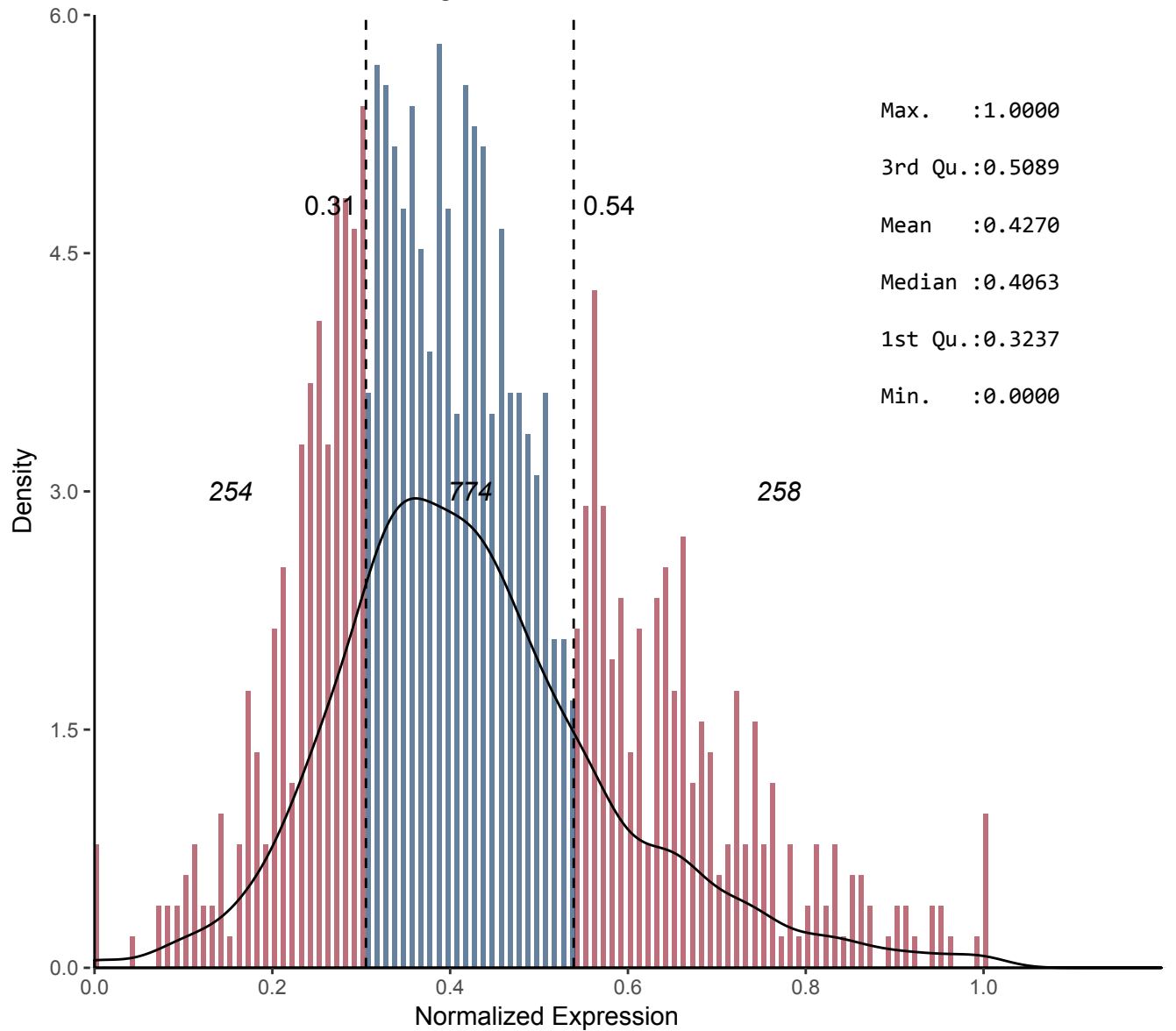


Figure 277 - CD277



Aberrant TRUE FALSE

Figure 278 - CD278

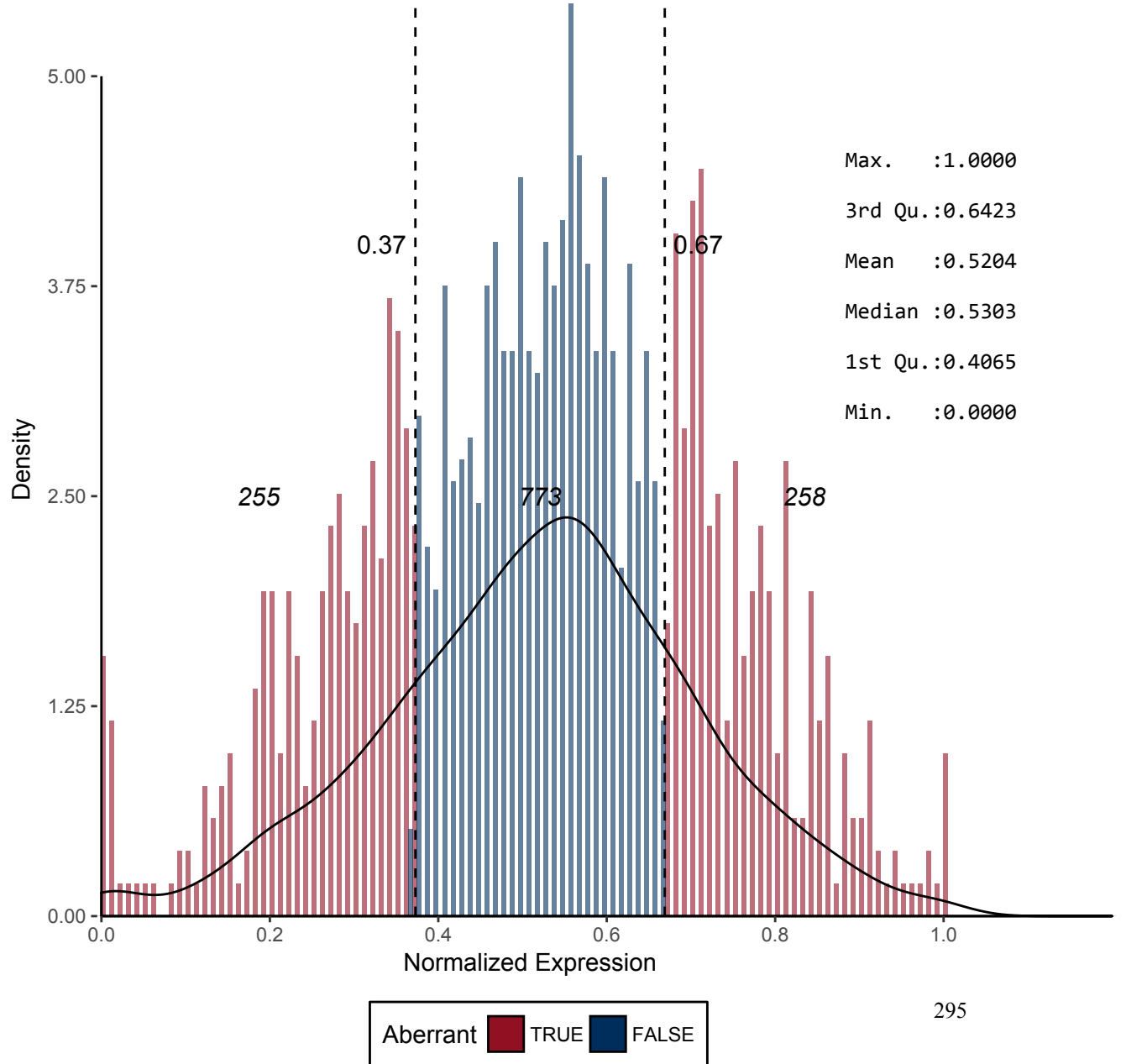


Figure 279 - CD279*

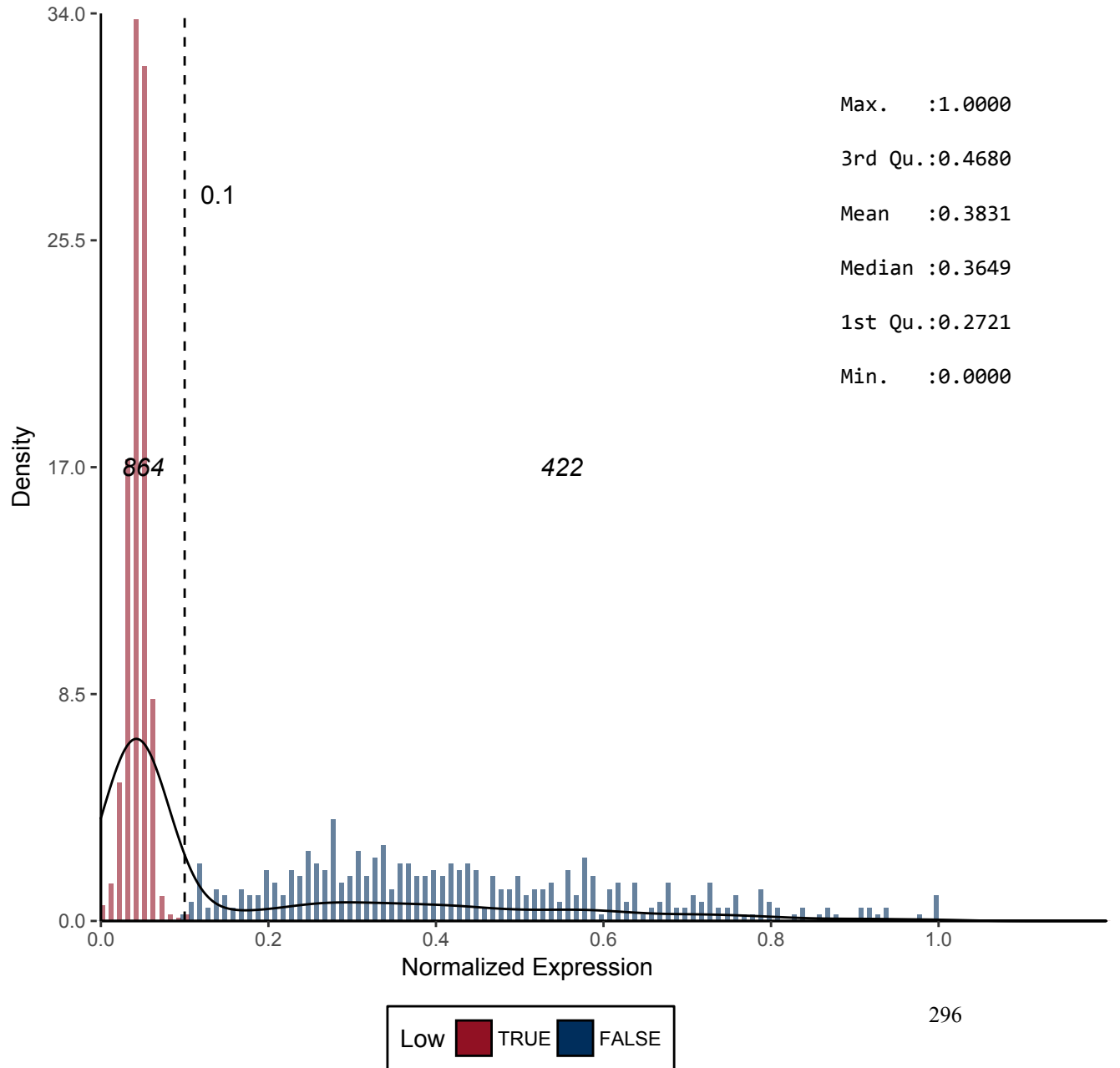


Figure 280 - CD280*

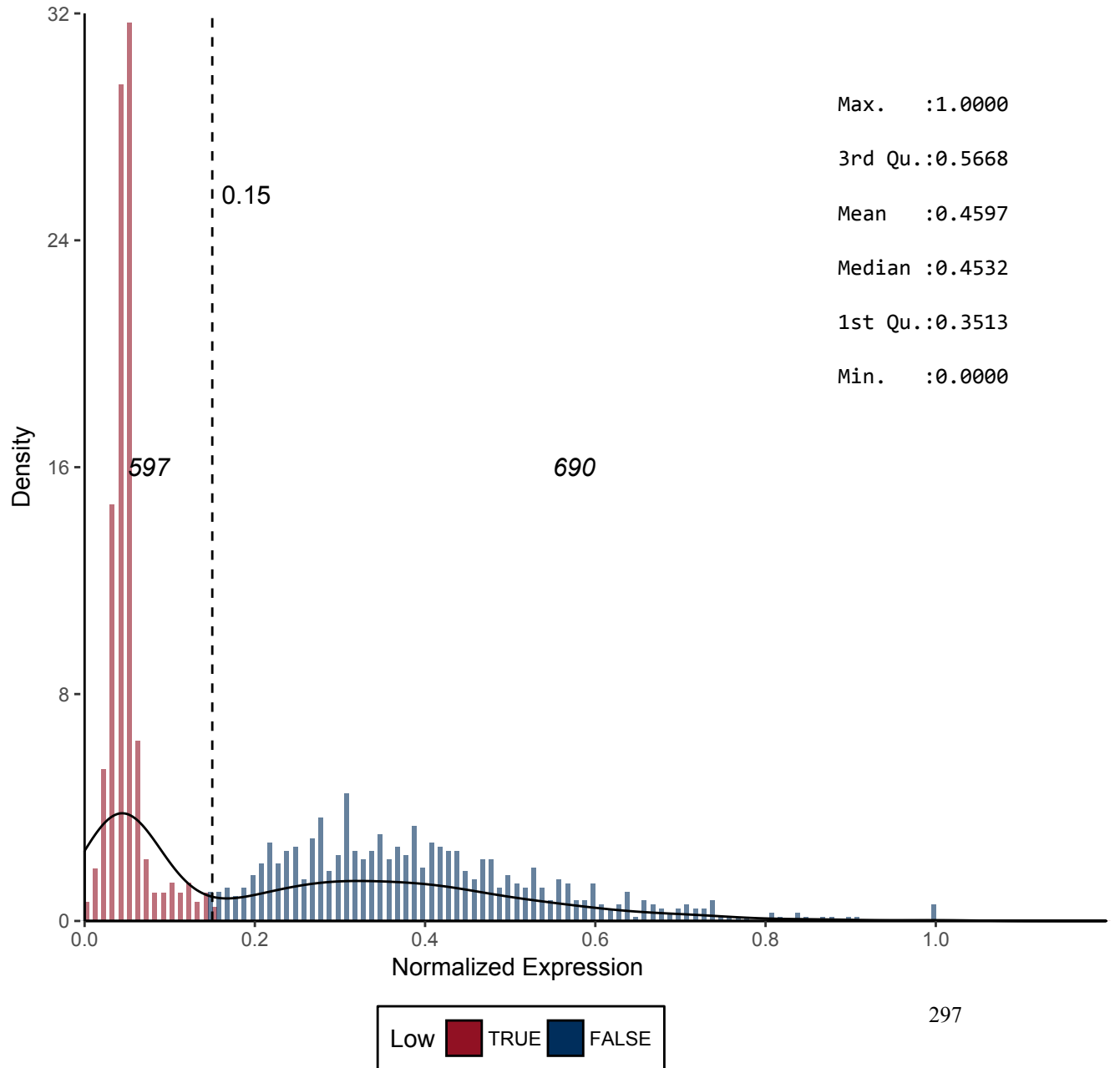


Figure 281 - CD281

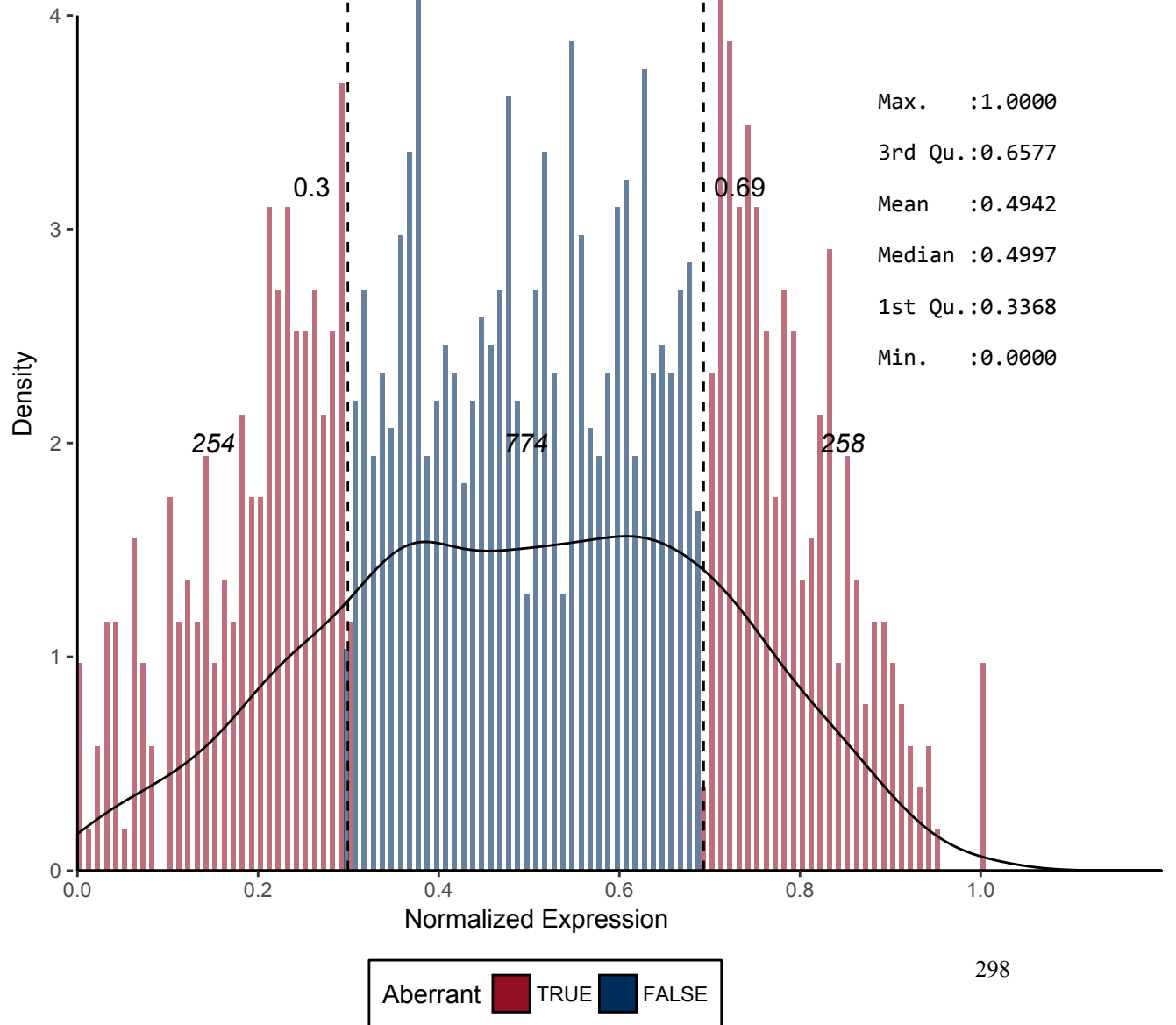


Figure 282 - CD282

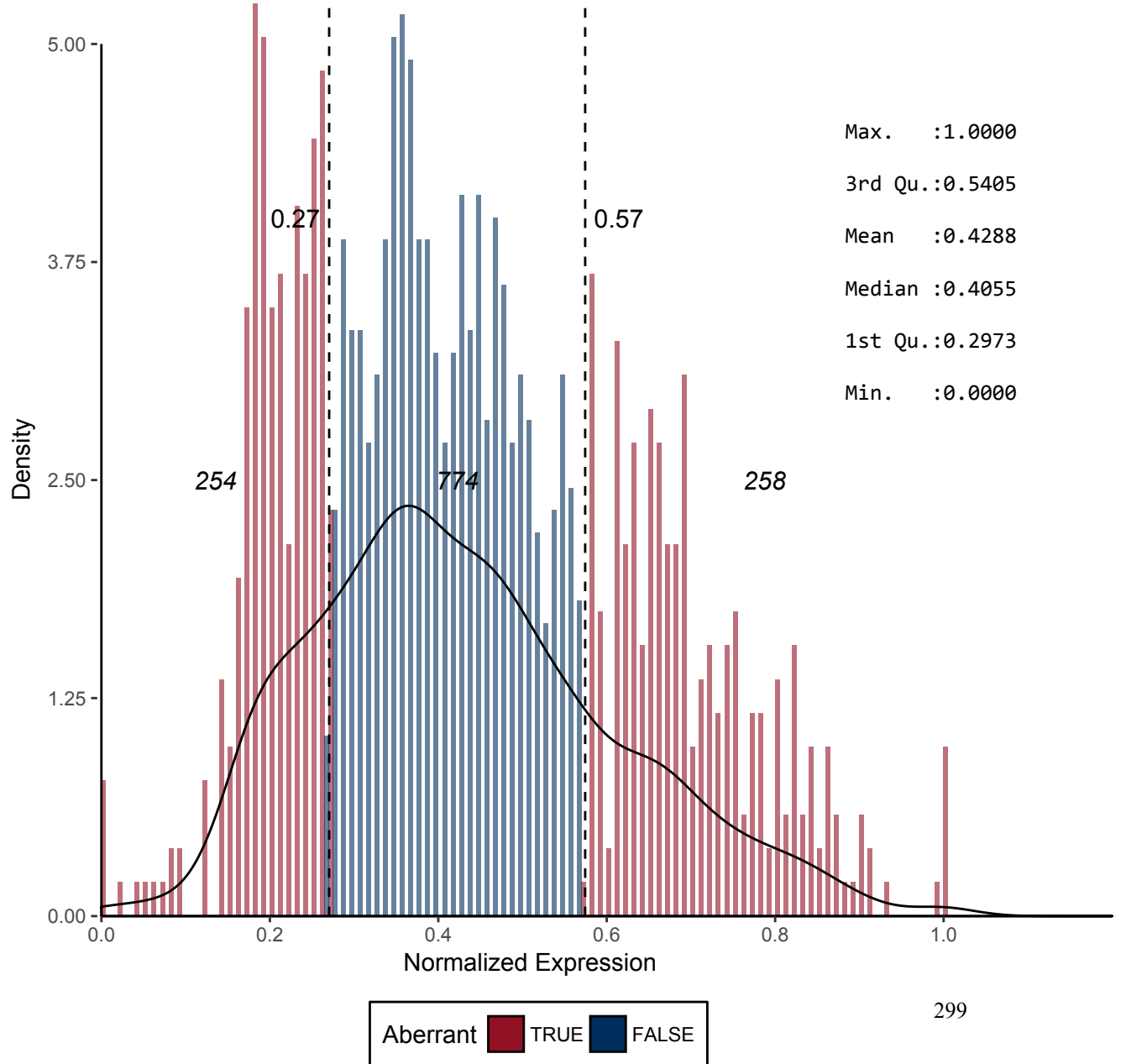


Figure 283 - CD283*

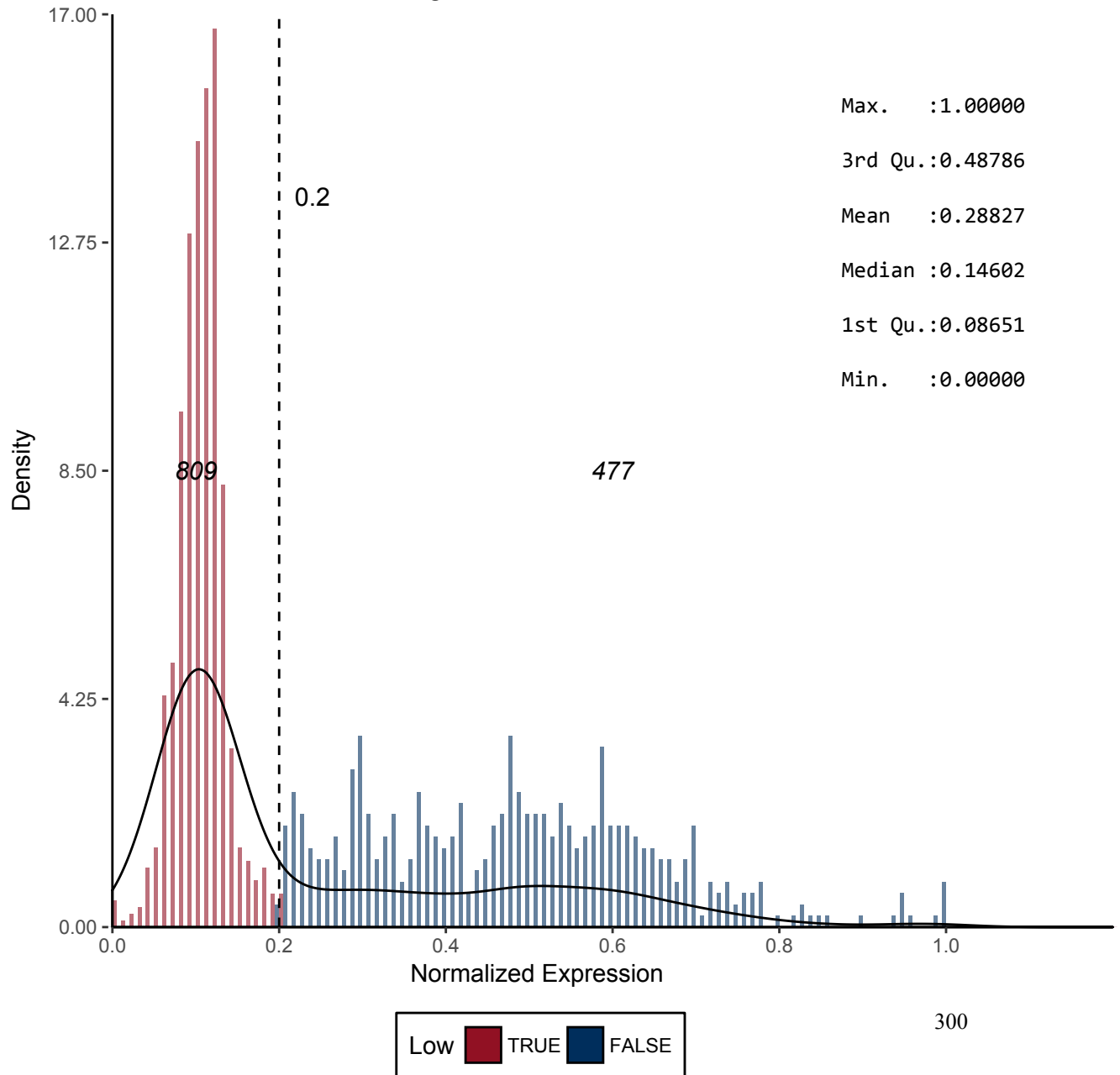
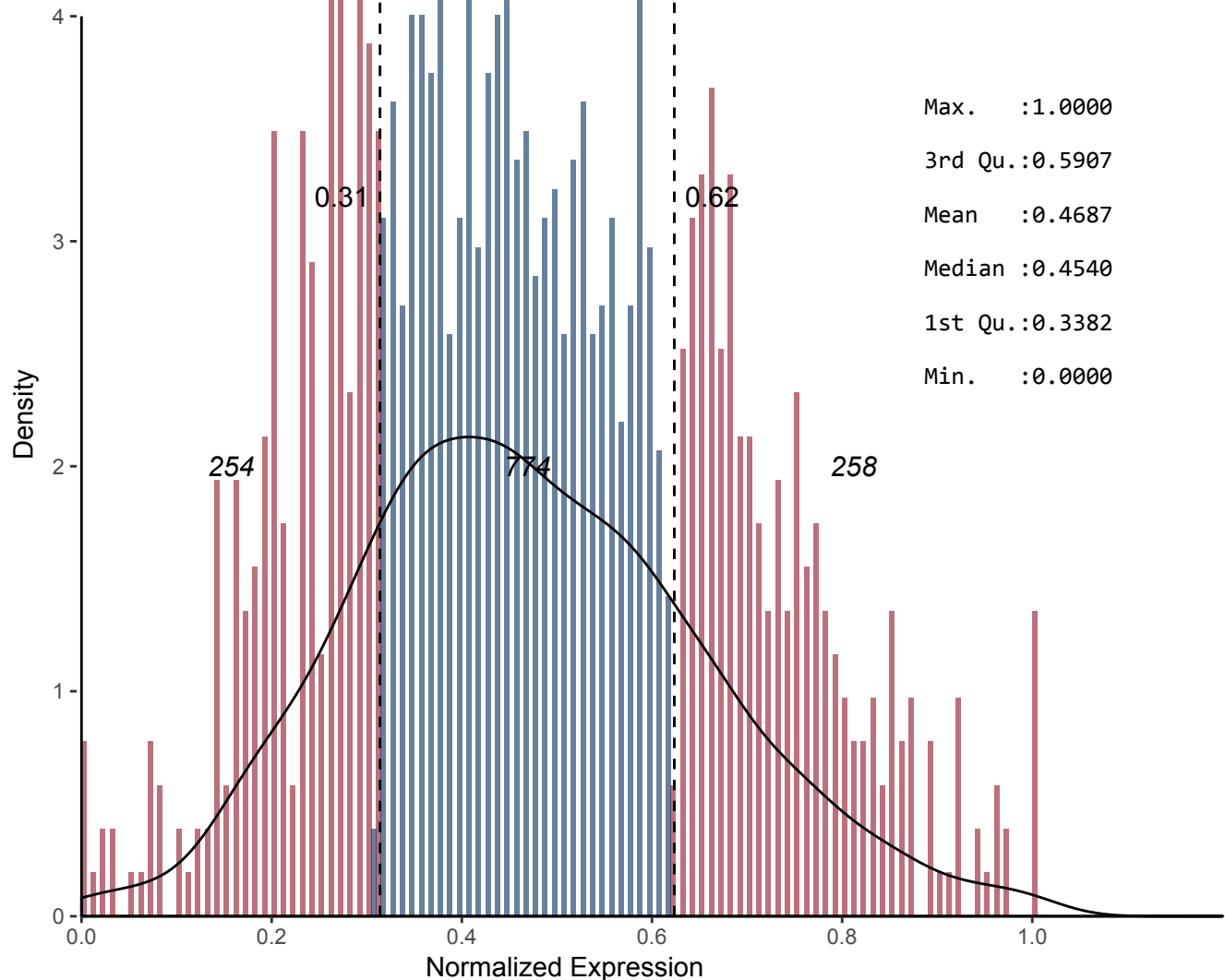


Figure 284 - CD284



Aberrant TRUE FALSE

Figure 285 - CD286

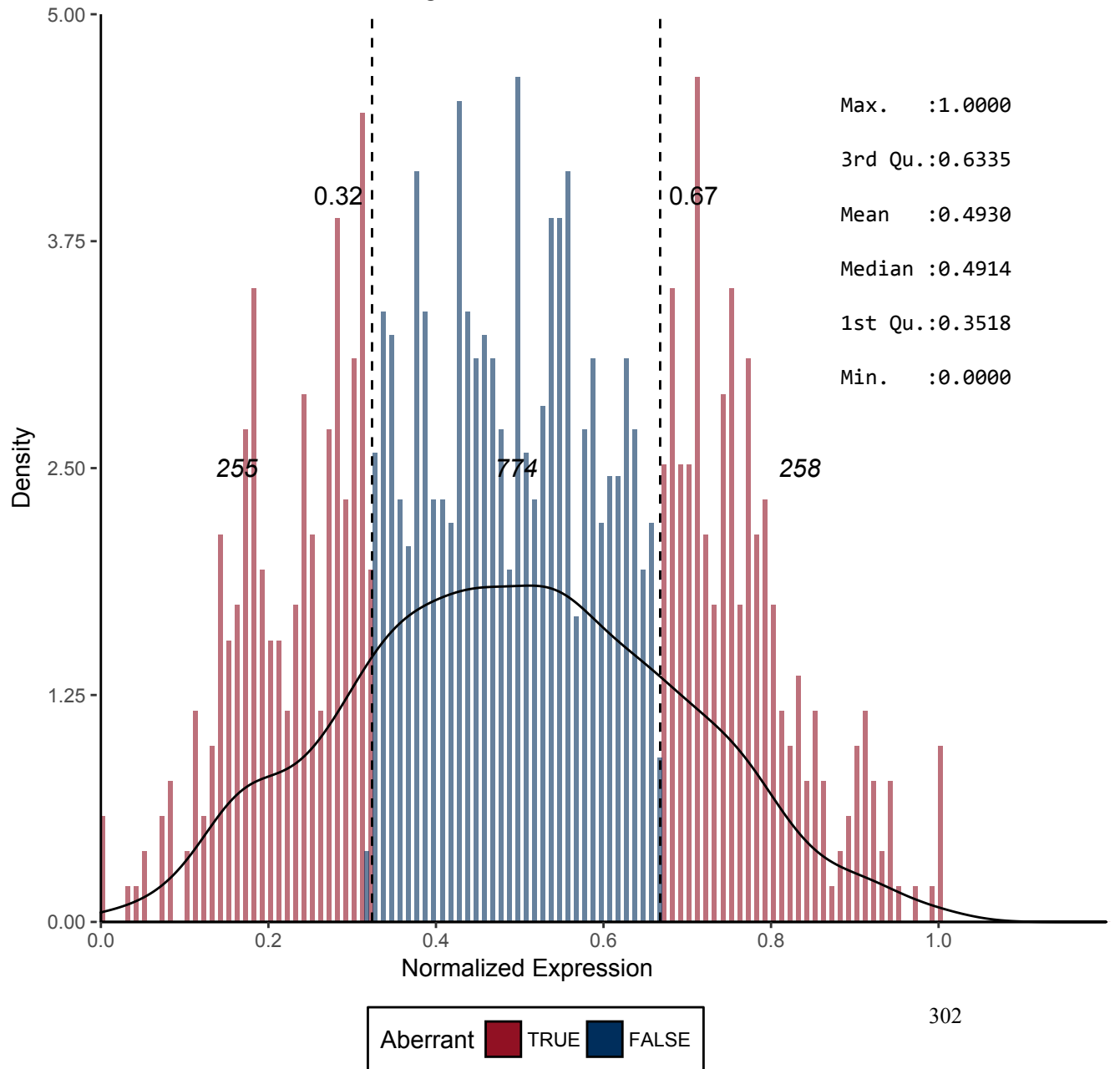


Figure 286 - CD288

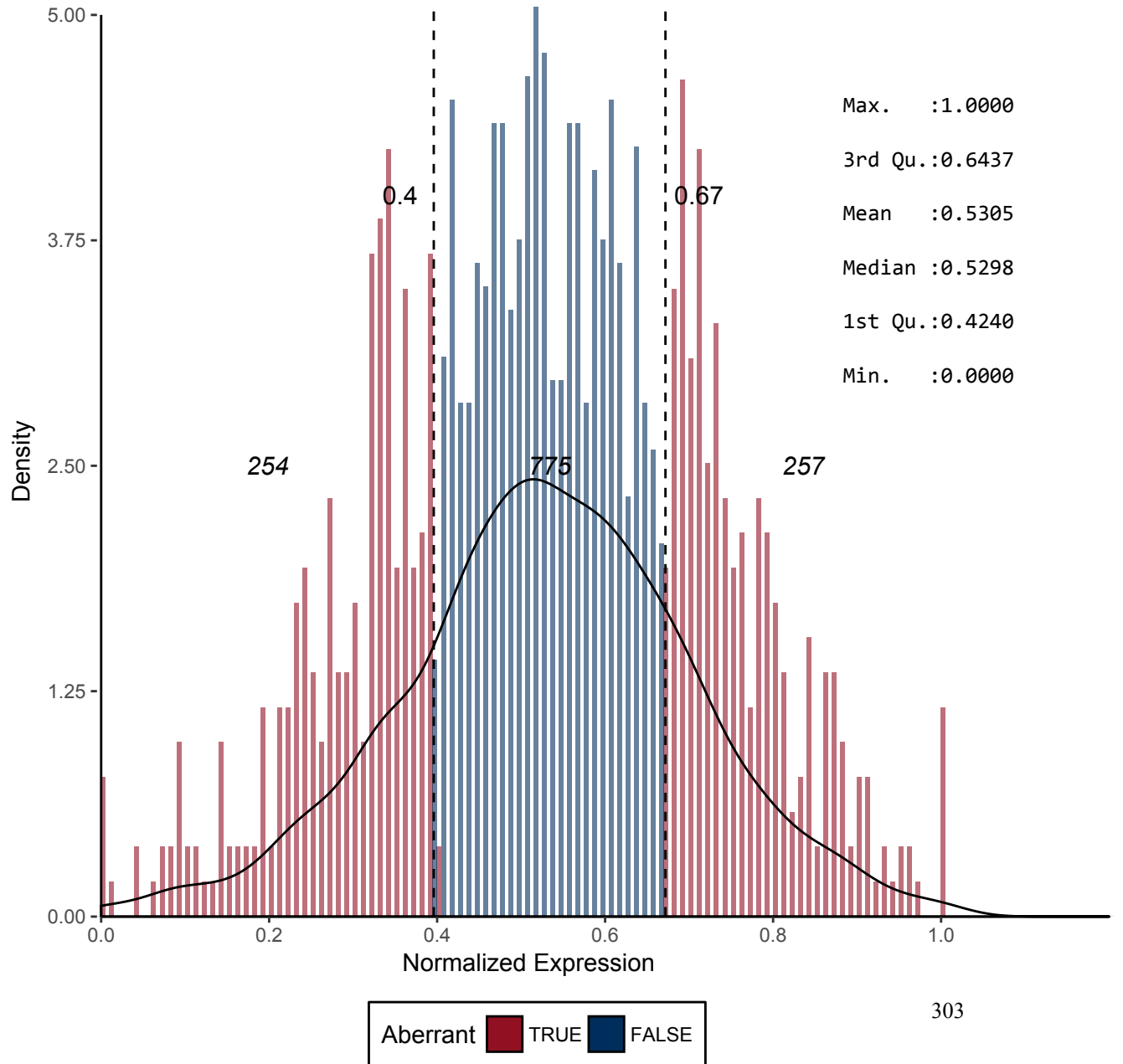


Figure 287 - CD289

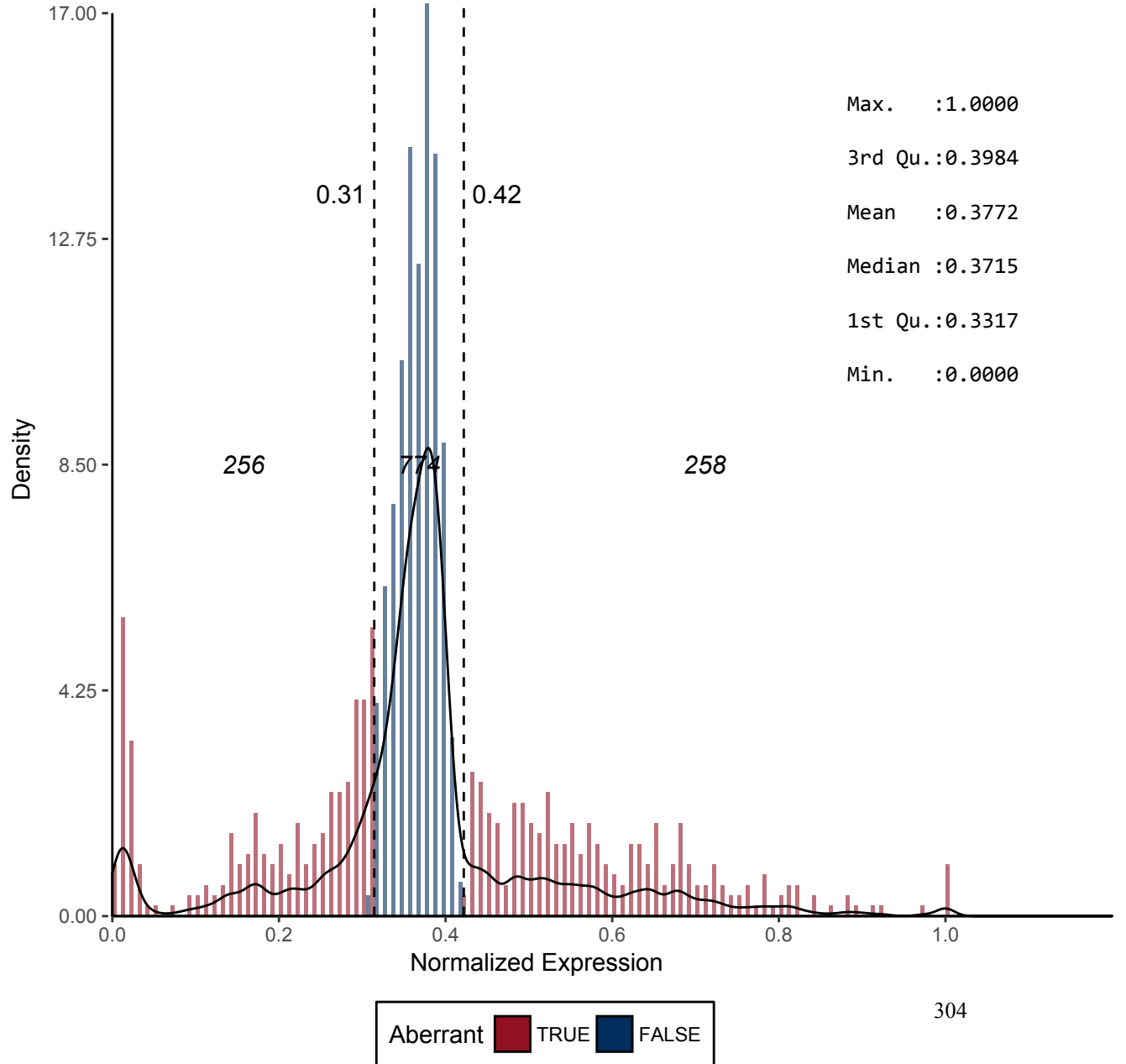


Figure 288 - CD290

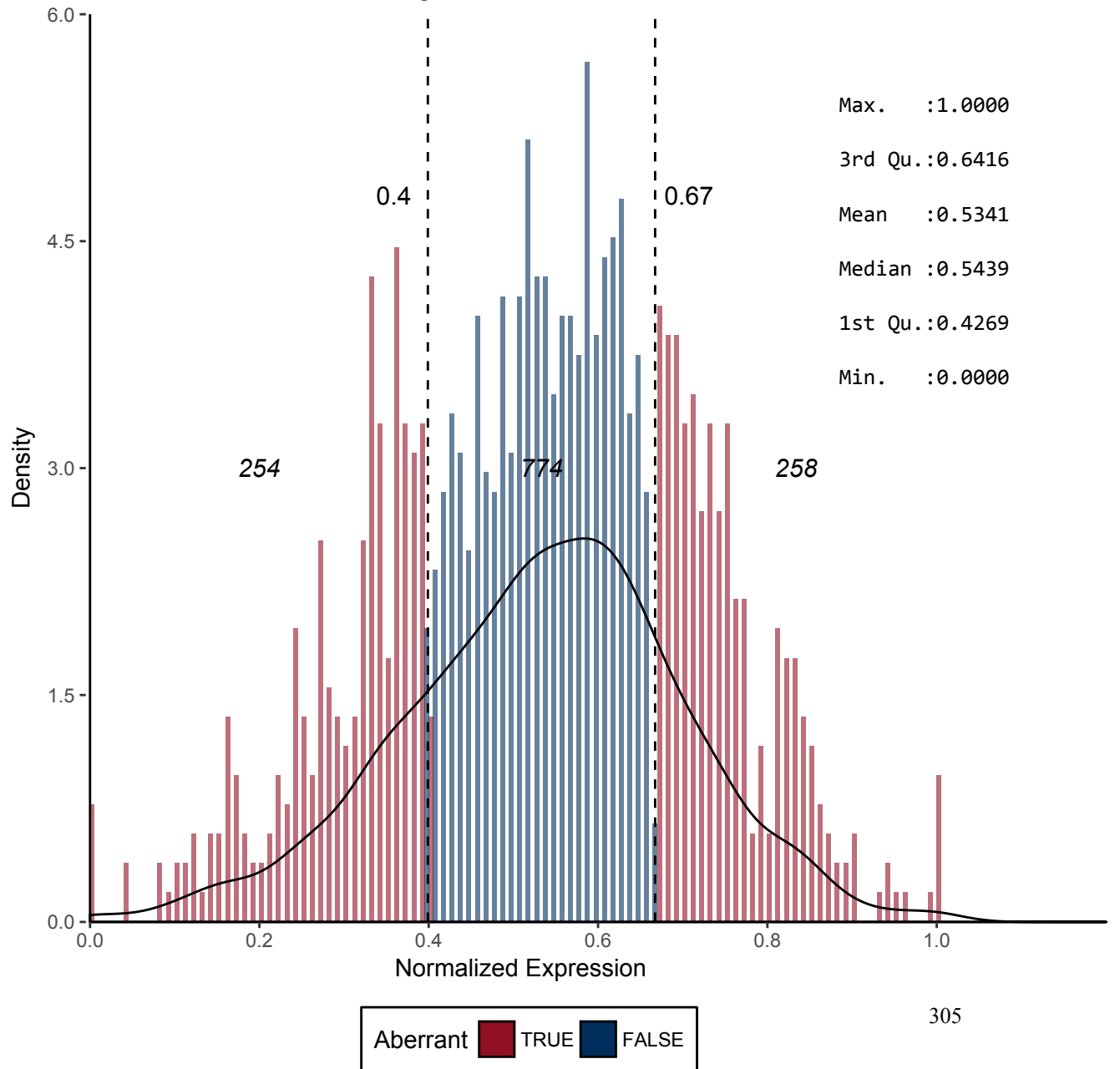


Figure 289 - CD292*

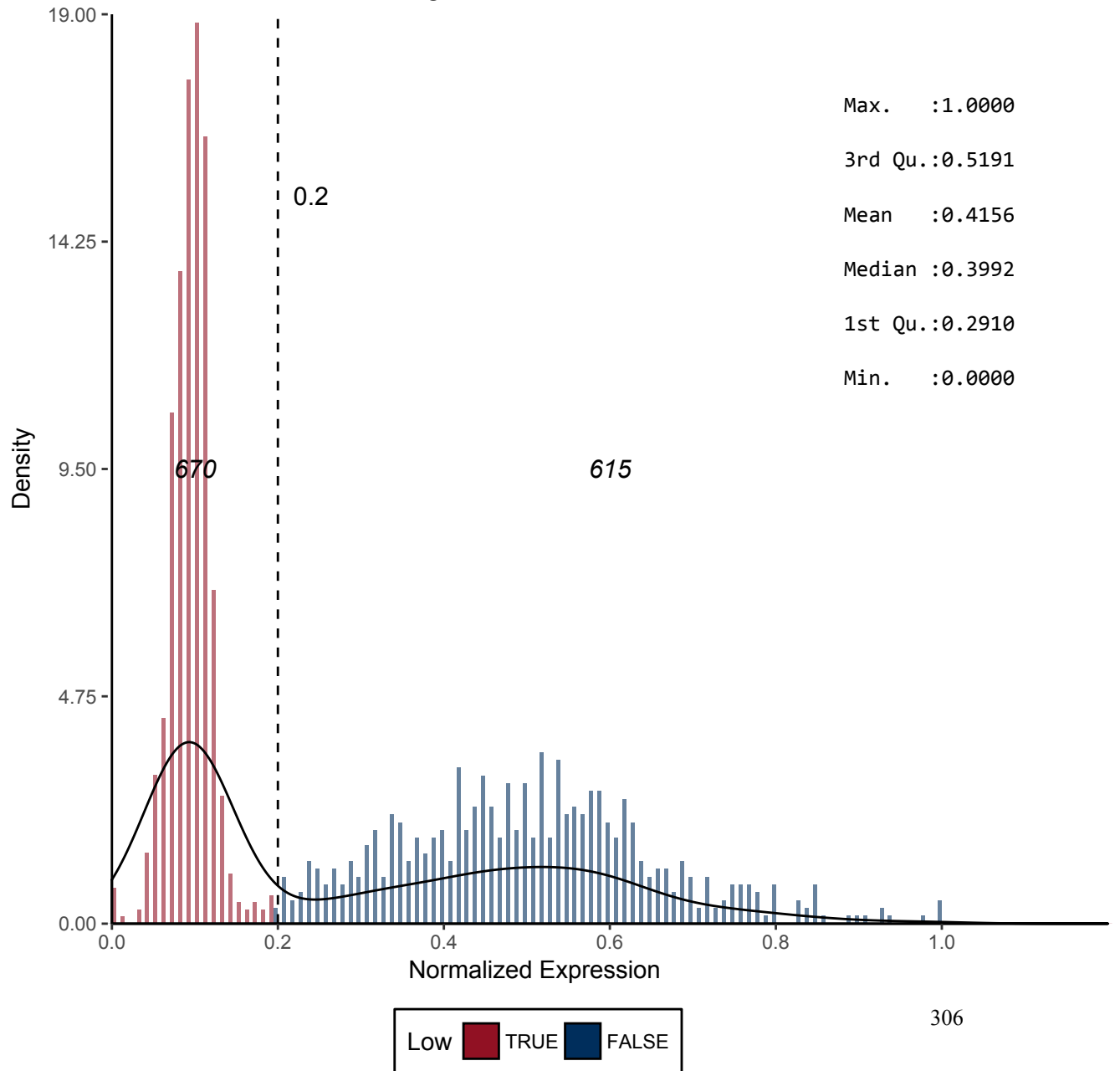


Figure 290 - CDW293*

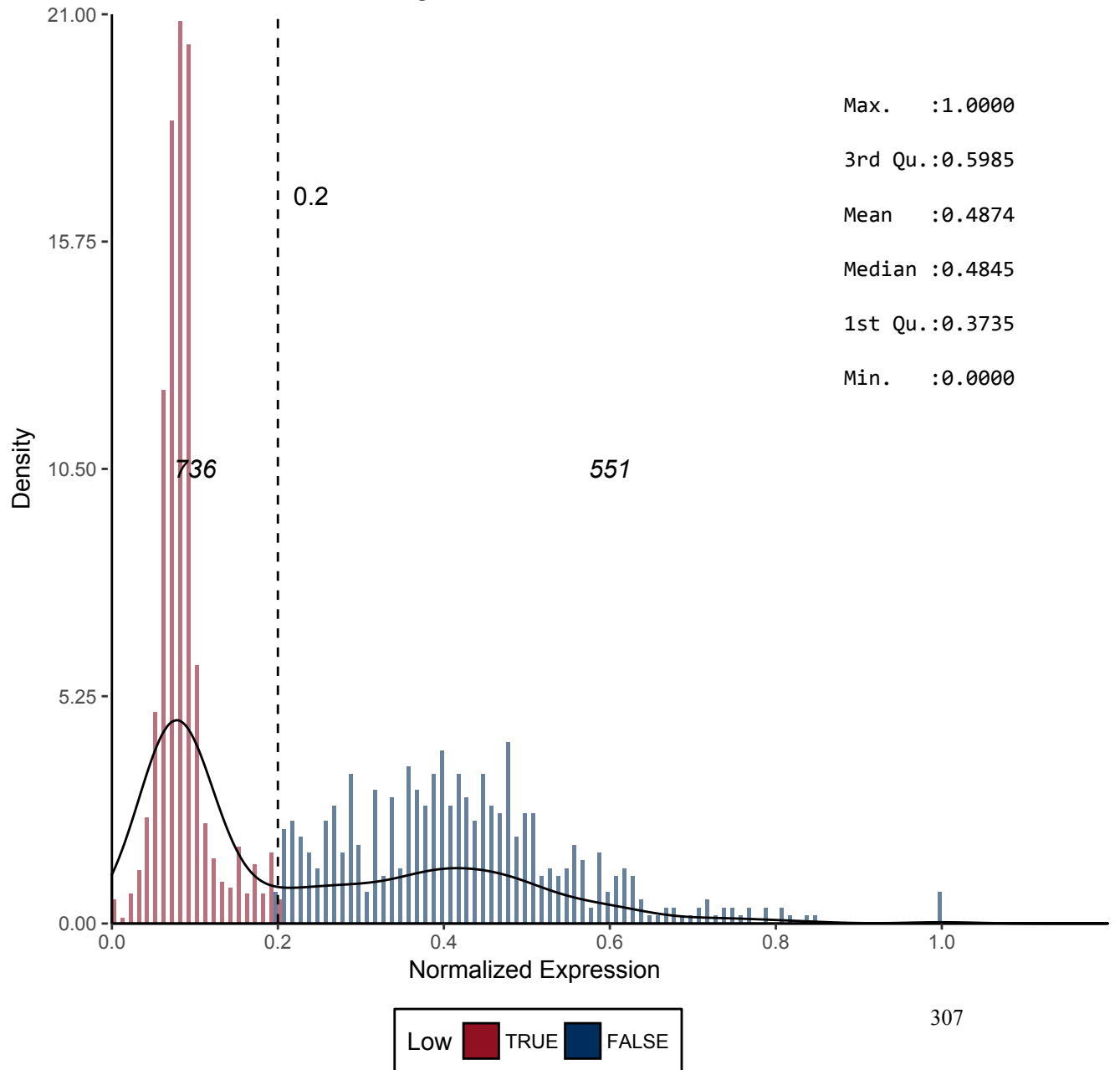


Figure 291 - CD294

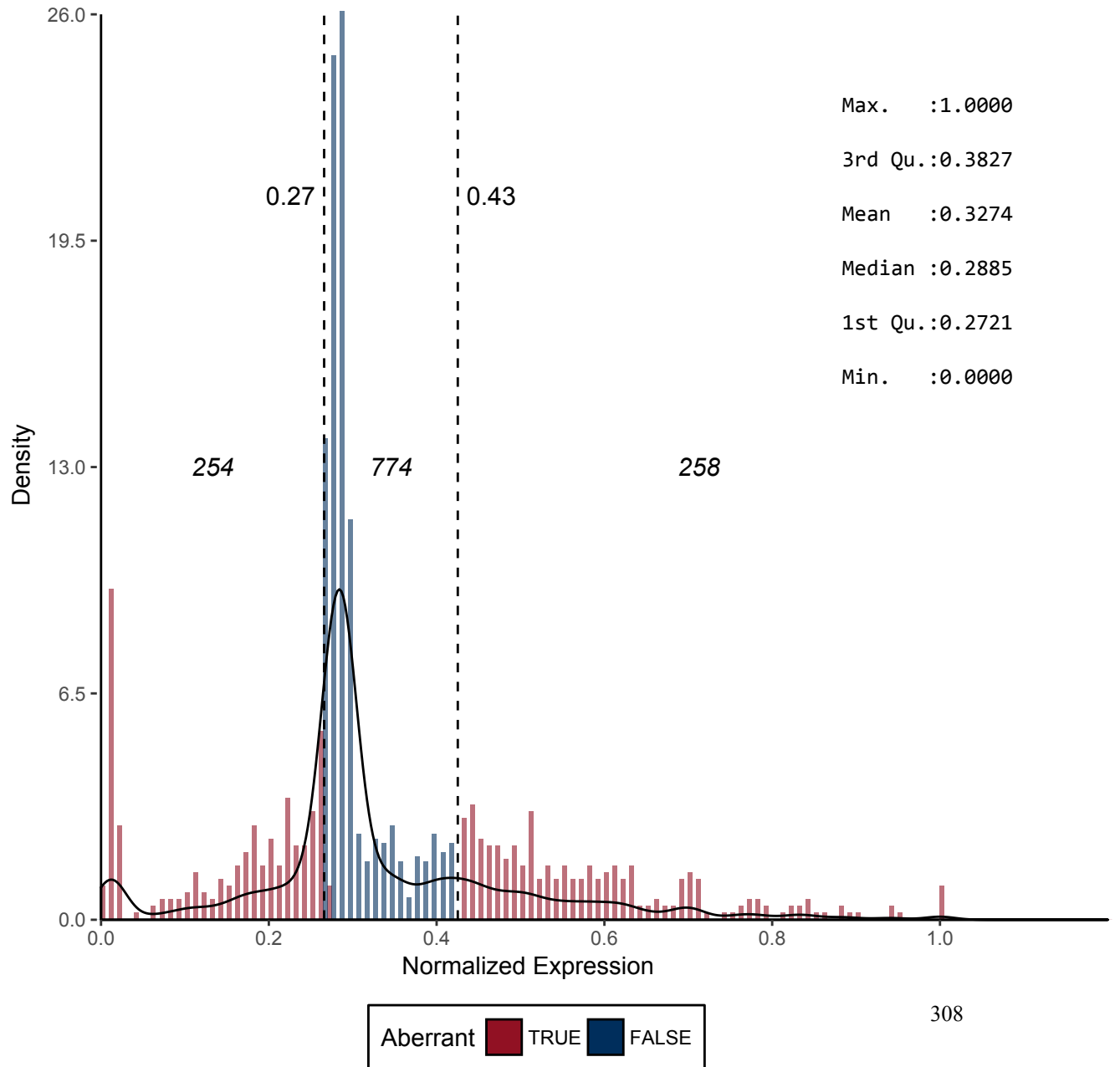


Figure 292 - CD295

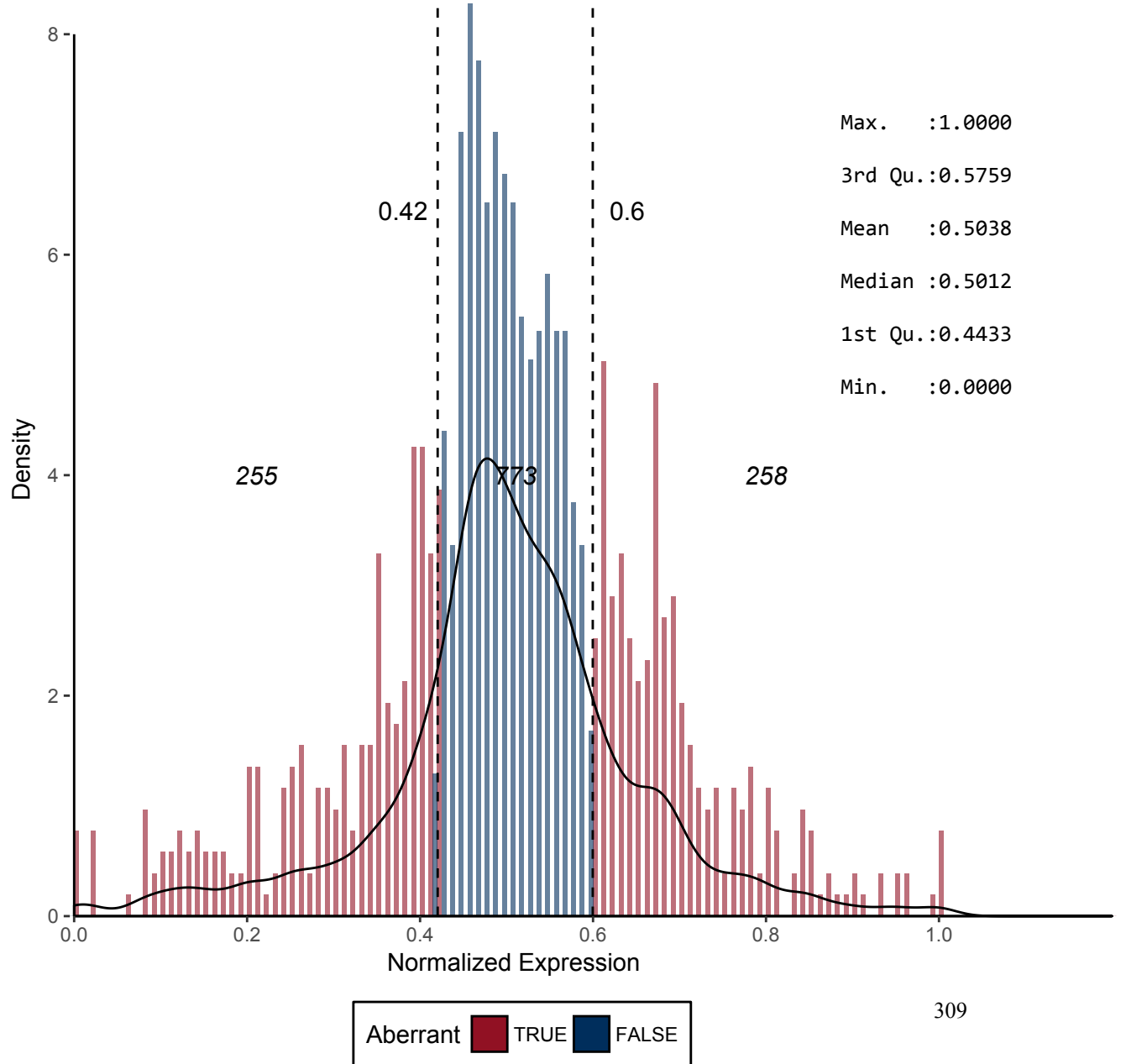


Figure 293 - CD296

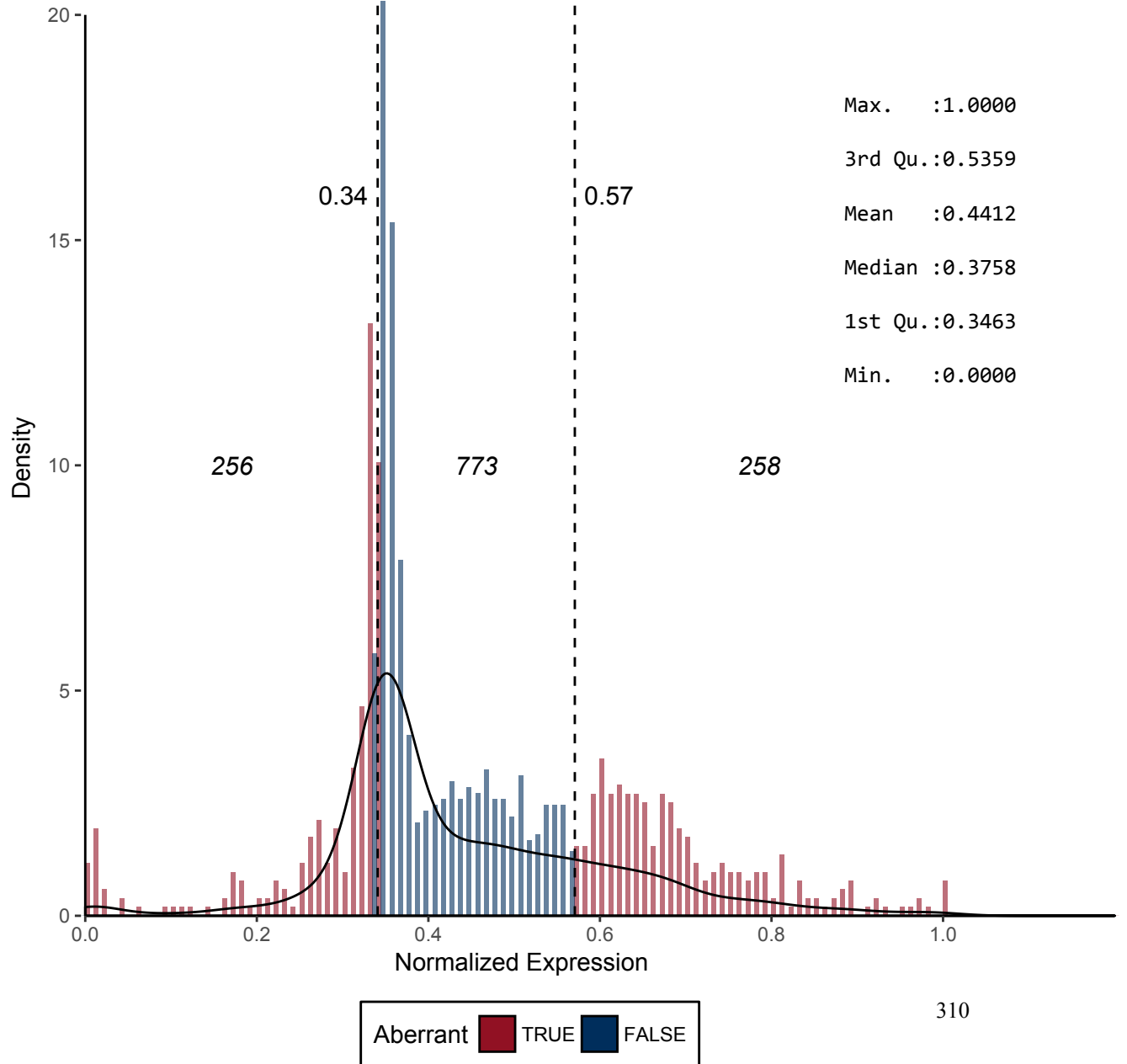


Figure 294 - CD297*

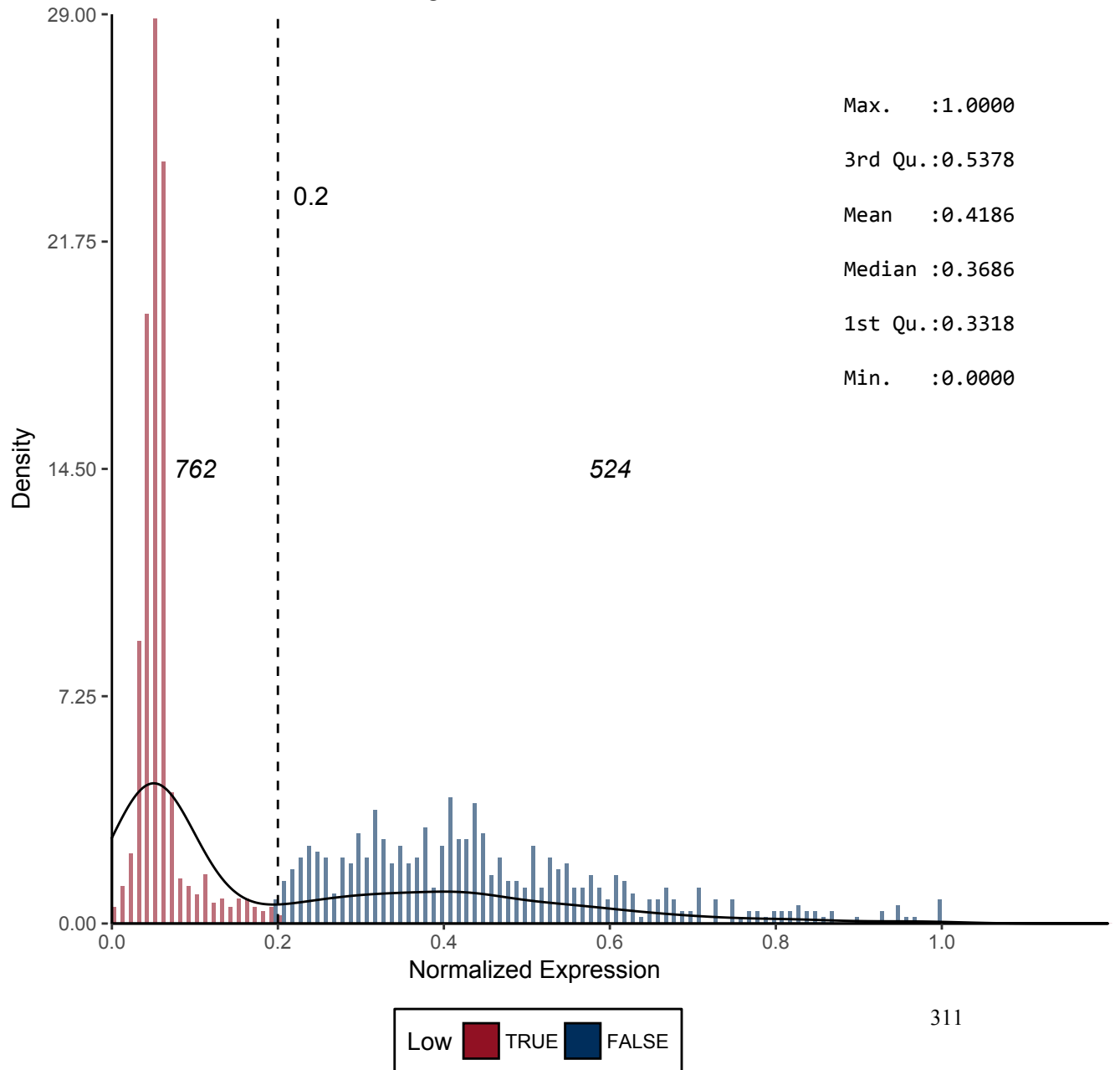
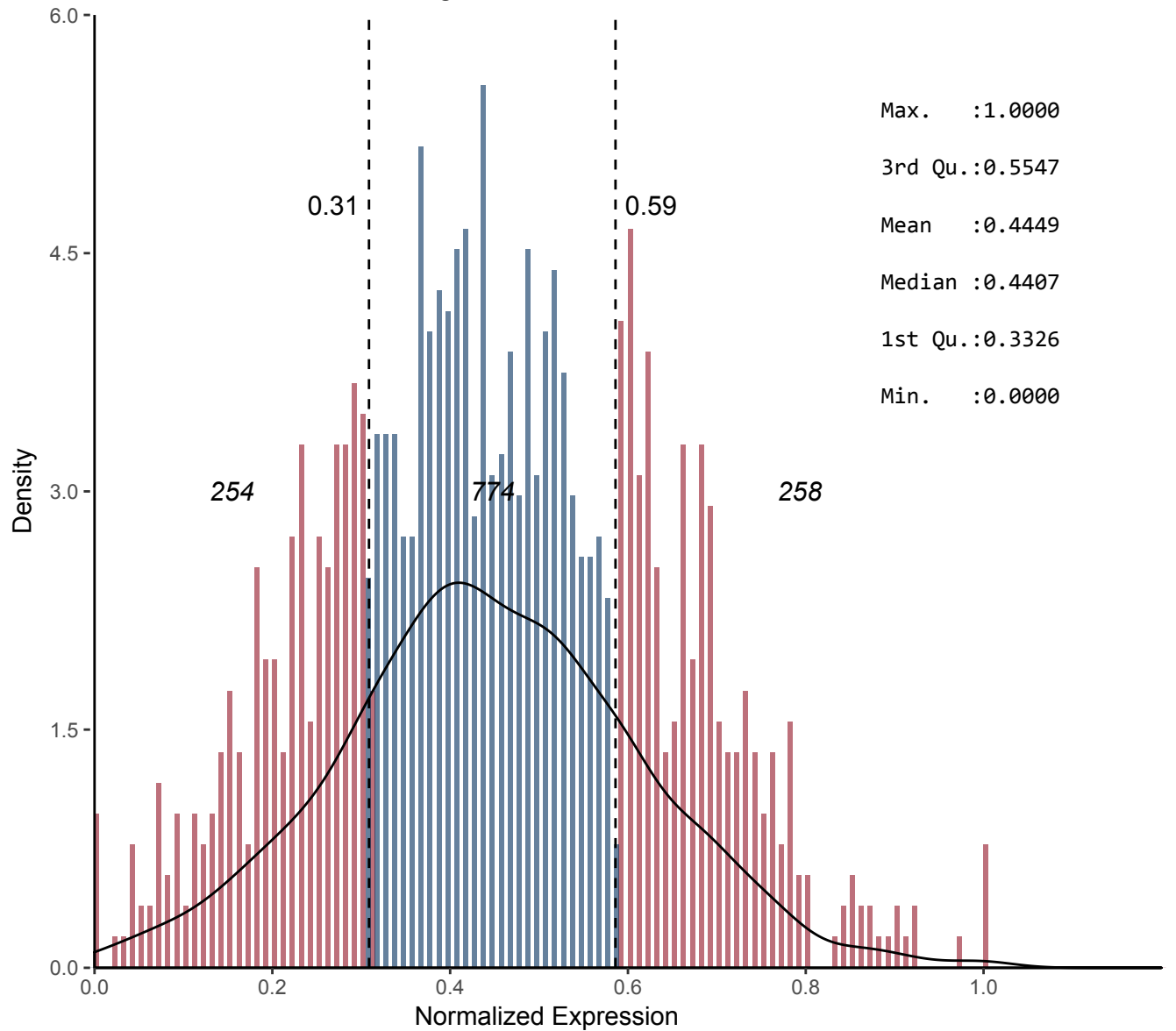


Figure 295 - CD298



Aberrant TRUE FALSE

Figure 296 - CD299*

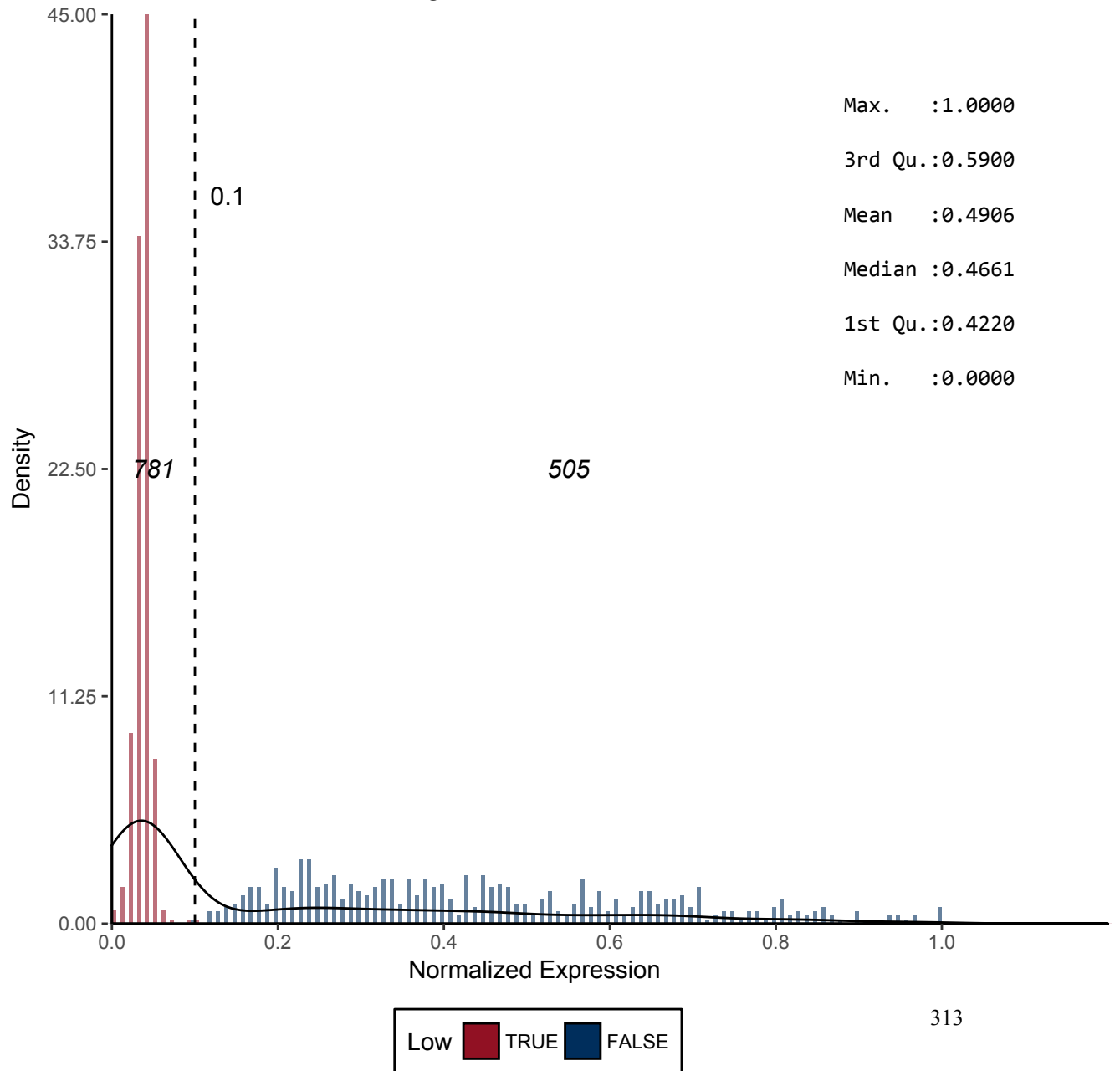


Figure 297 - CD300A

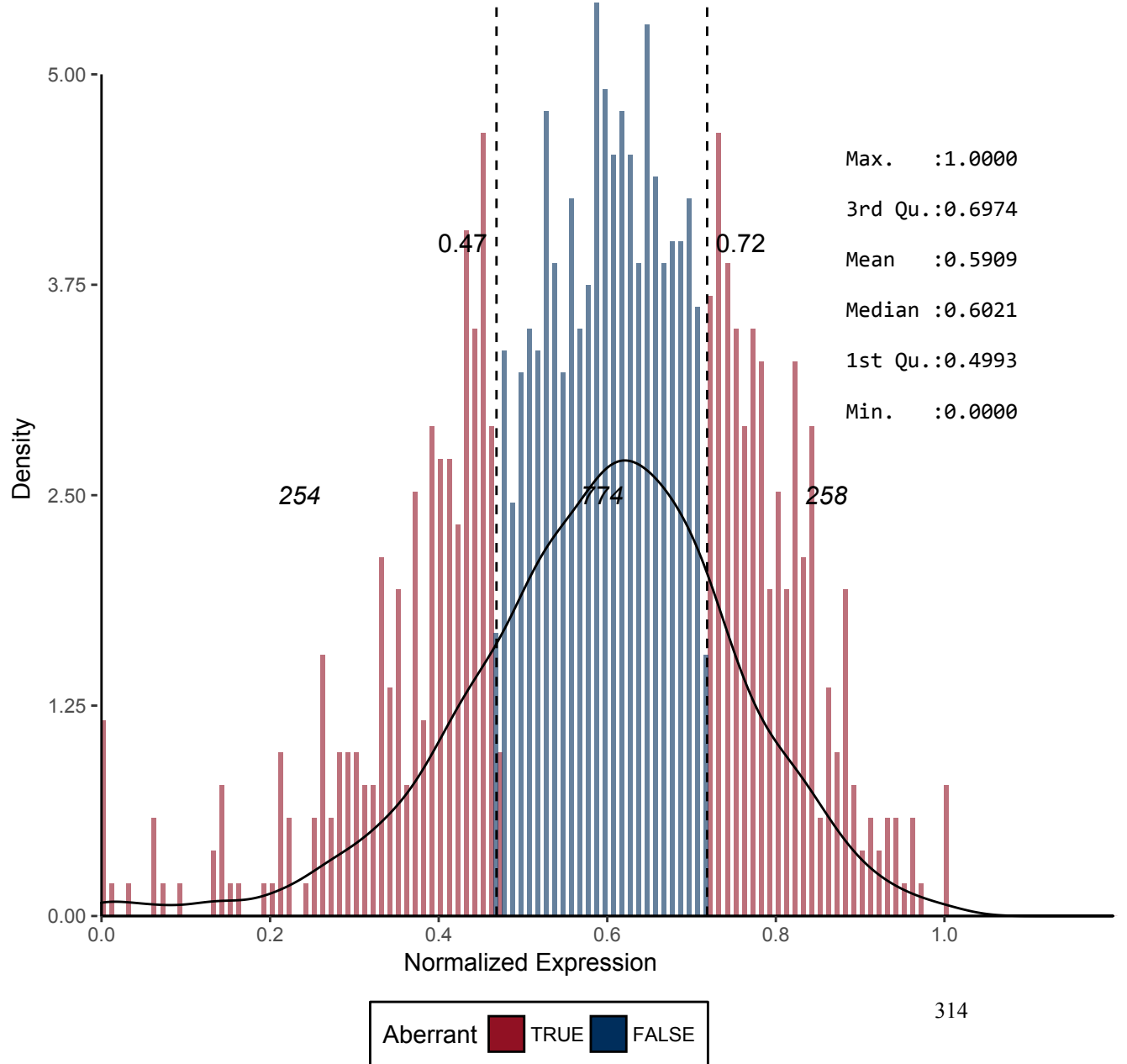
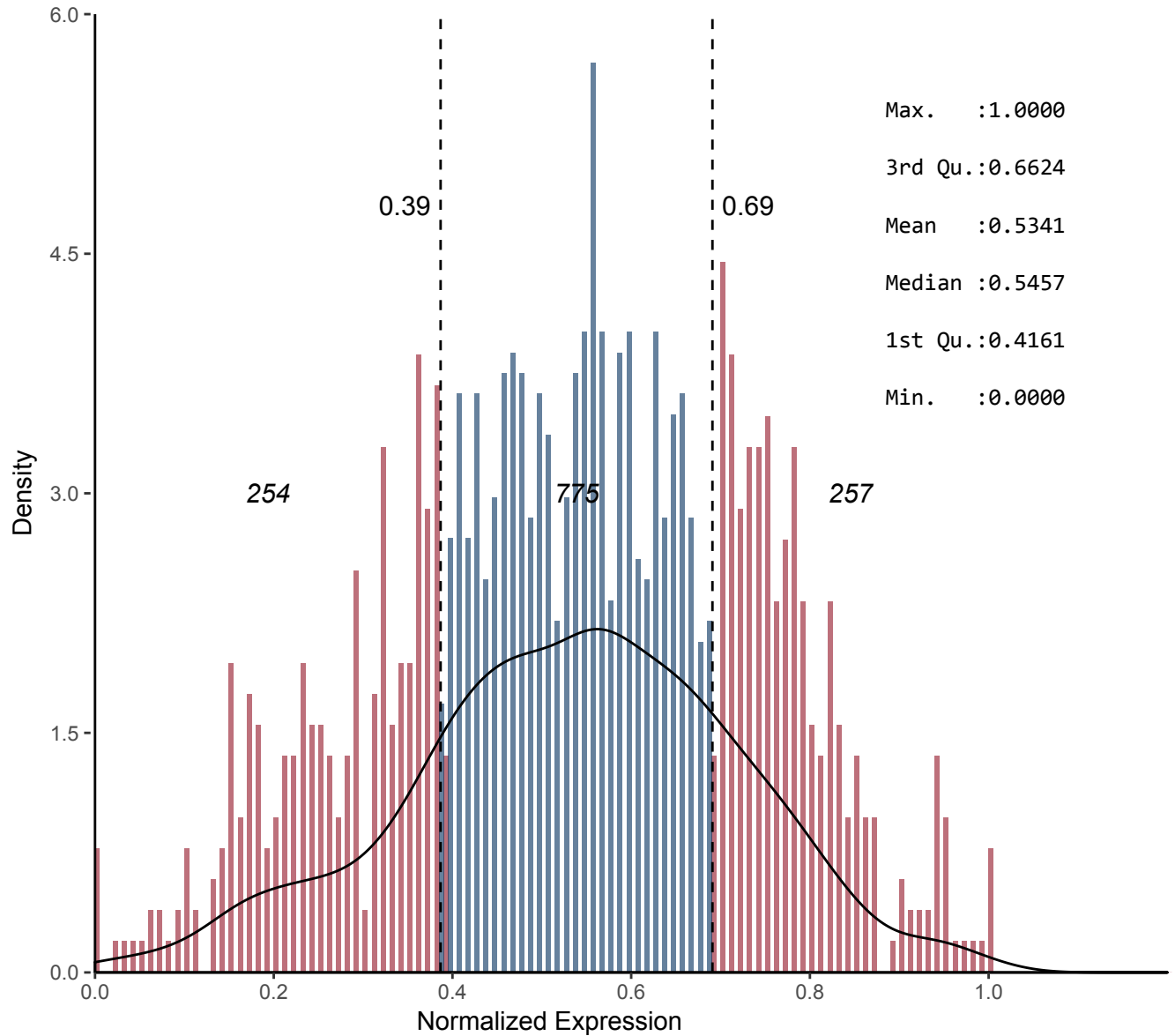


Figure 298 - CD300C



Aberrant TRUE FALSE

Figure 299 - CD301

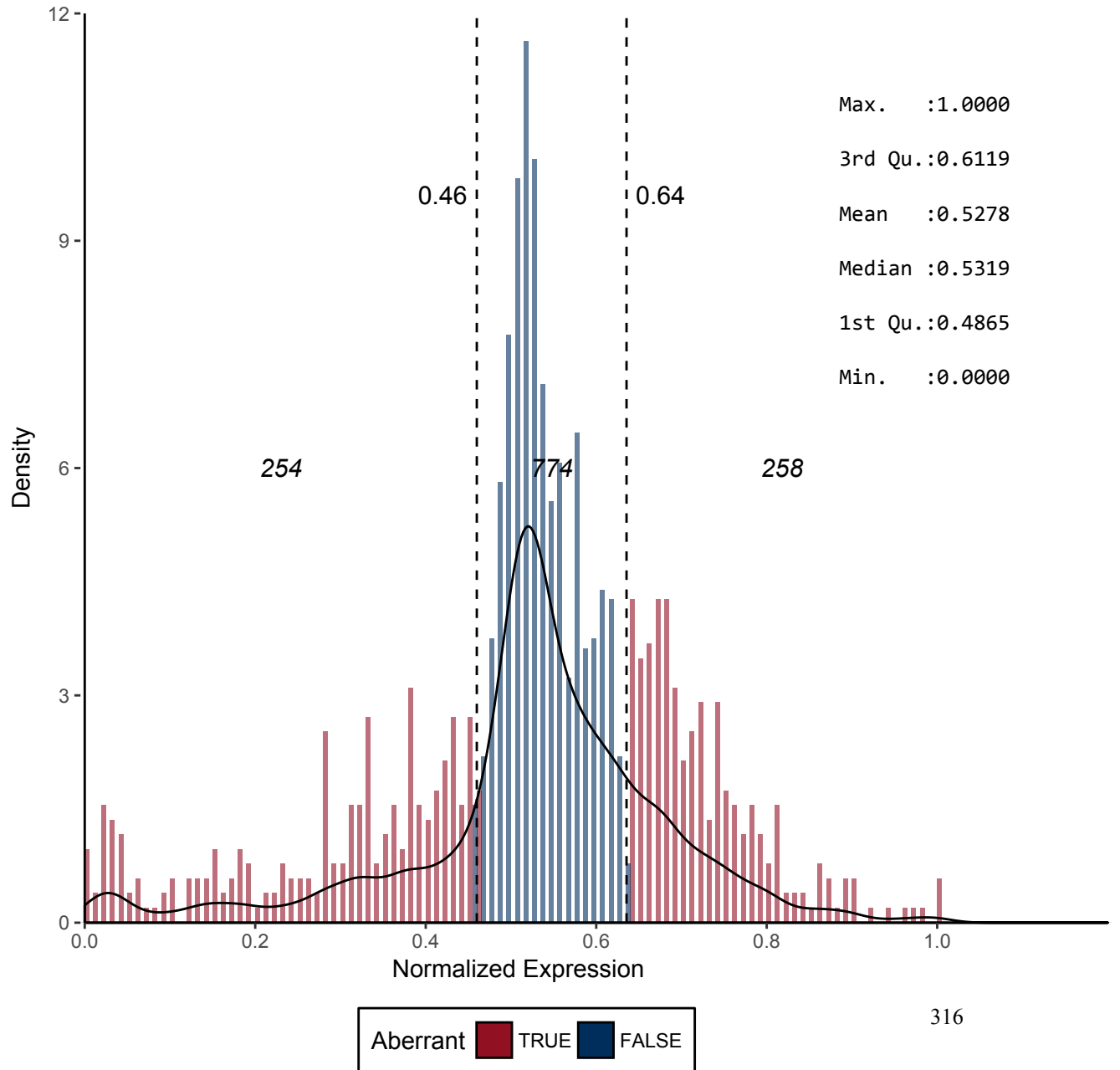


Figure 300 - CD304*

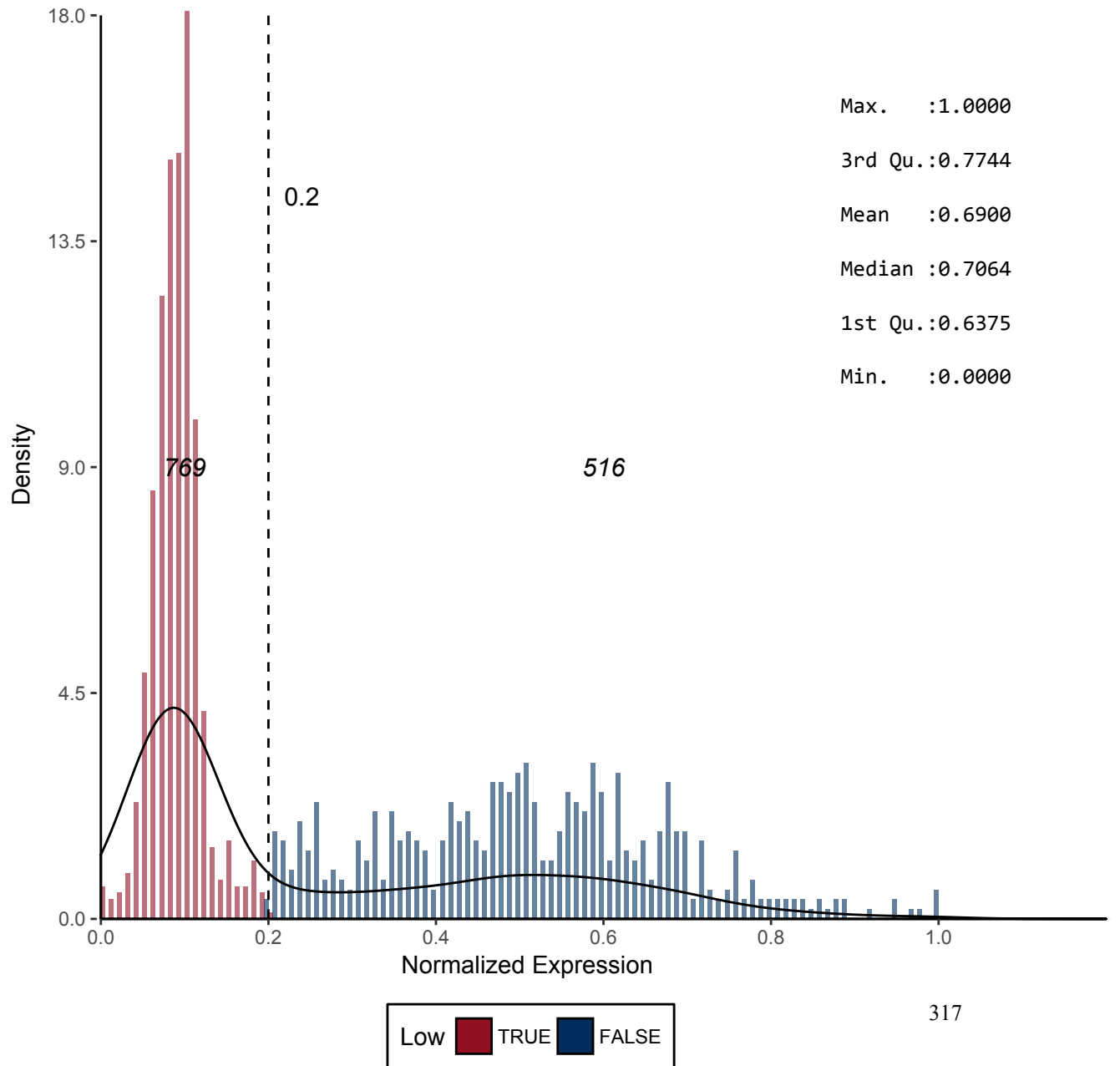
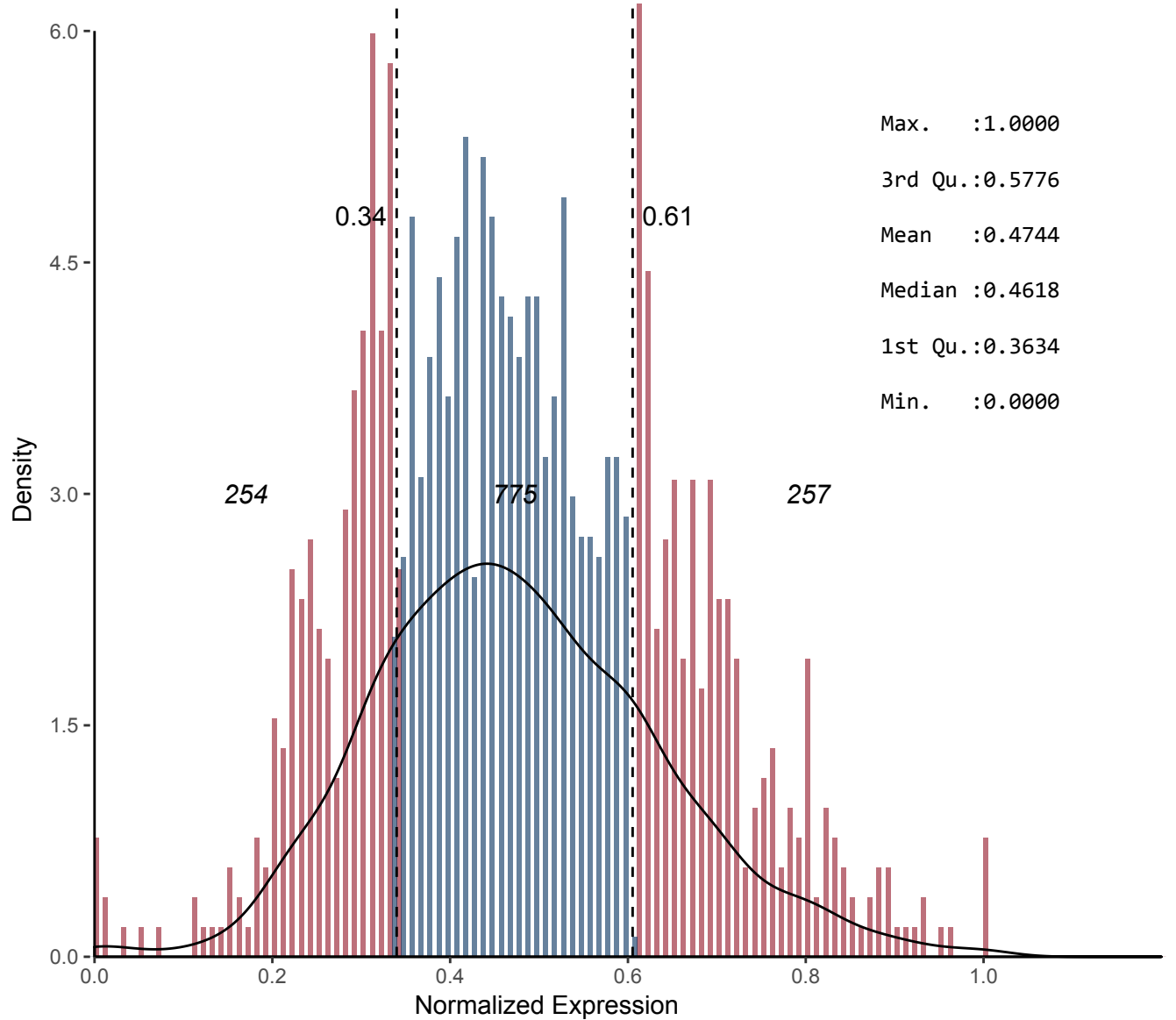
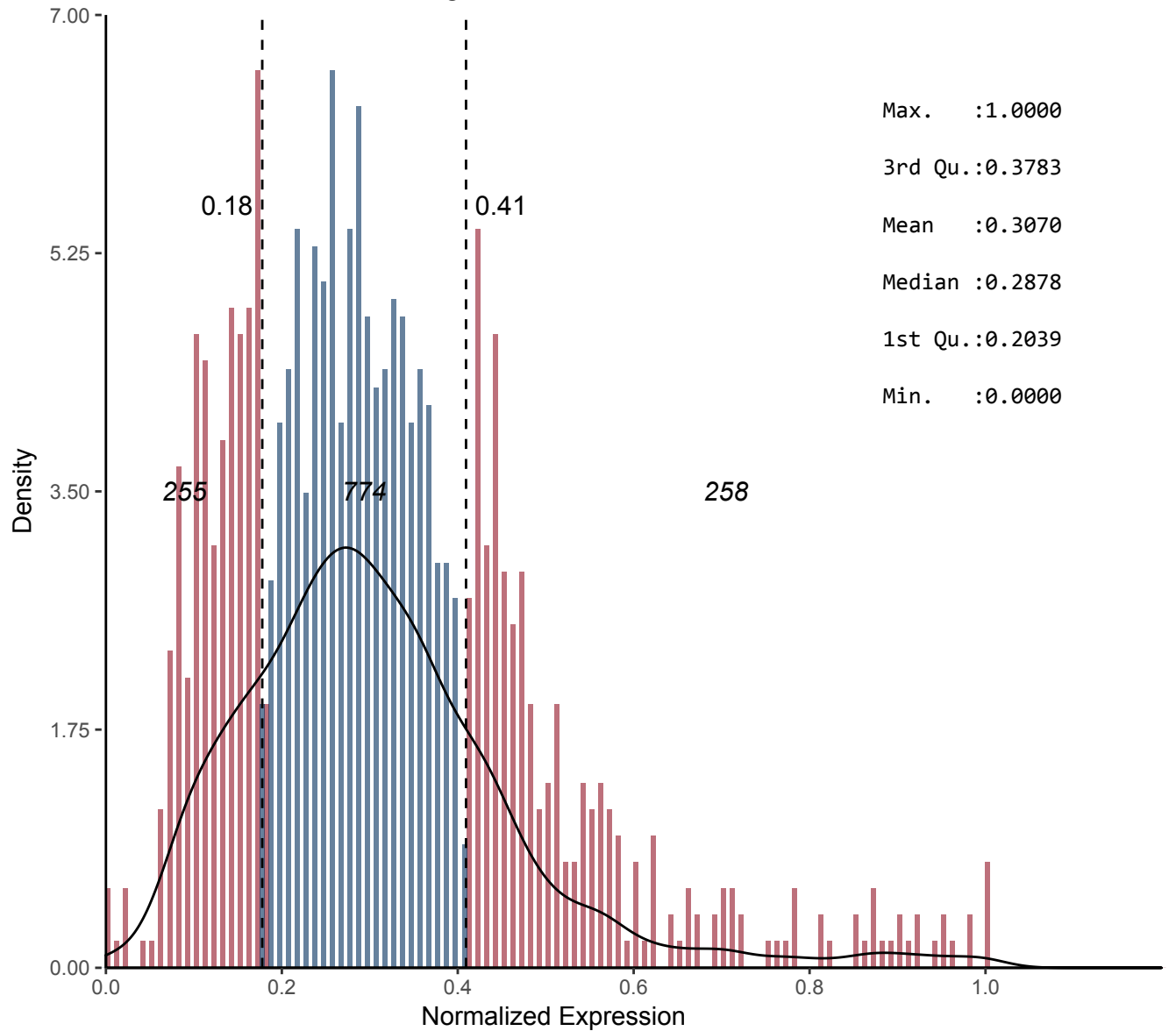


Figure 301 - CD305



Aberrant TRUE FALSE

Figure 302 - CD306



Aberrant TRUE FALSE

Figure 303 - CD307A*

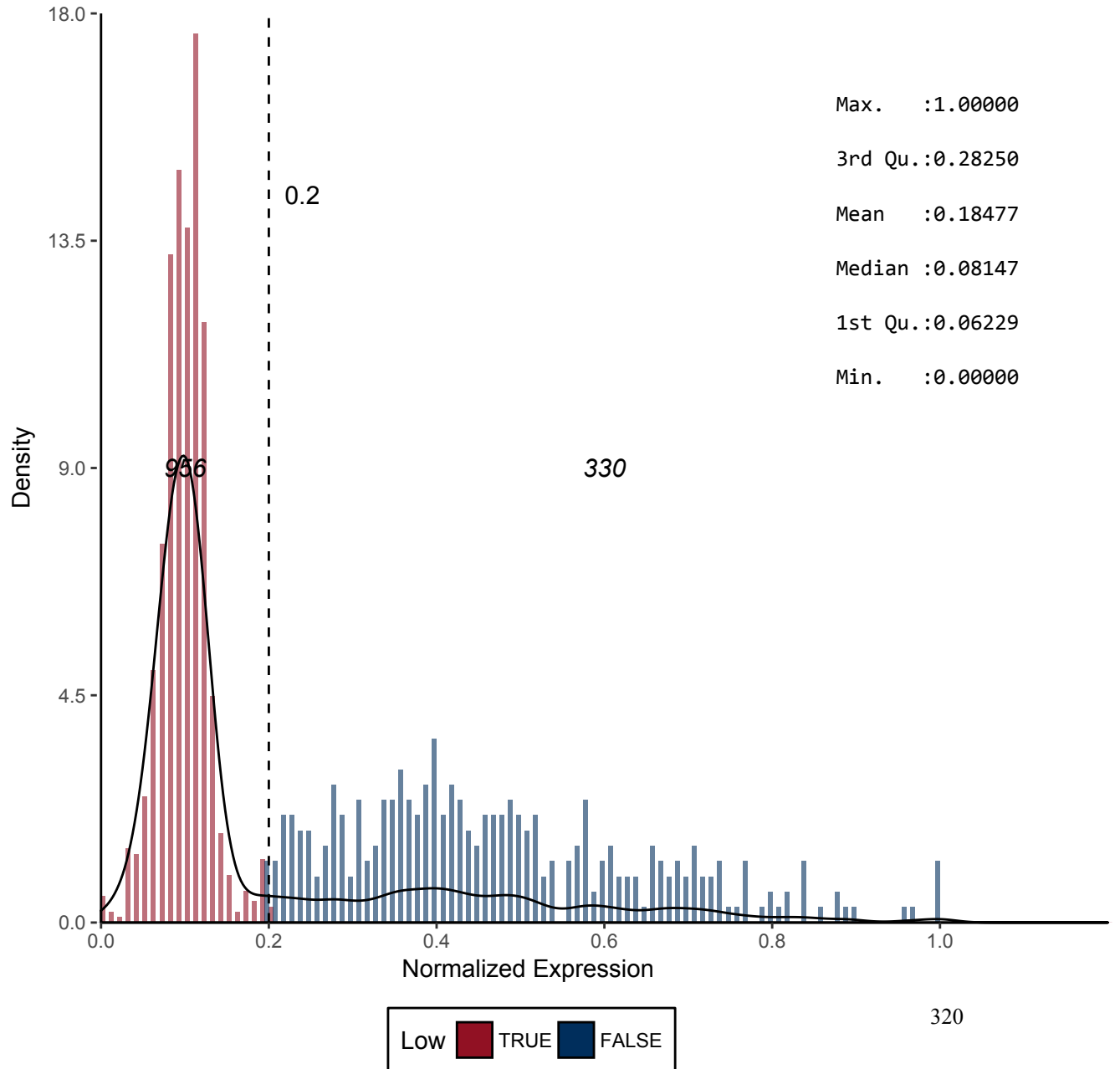


Figure 304 - CD307B

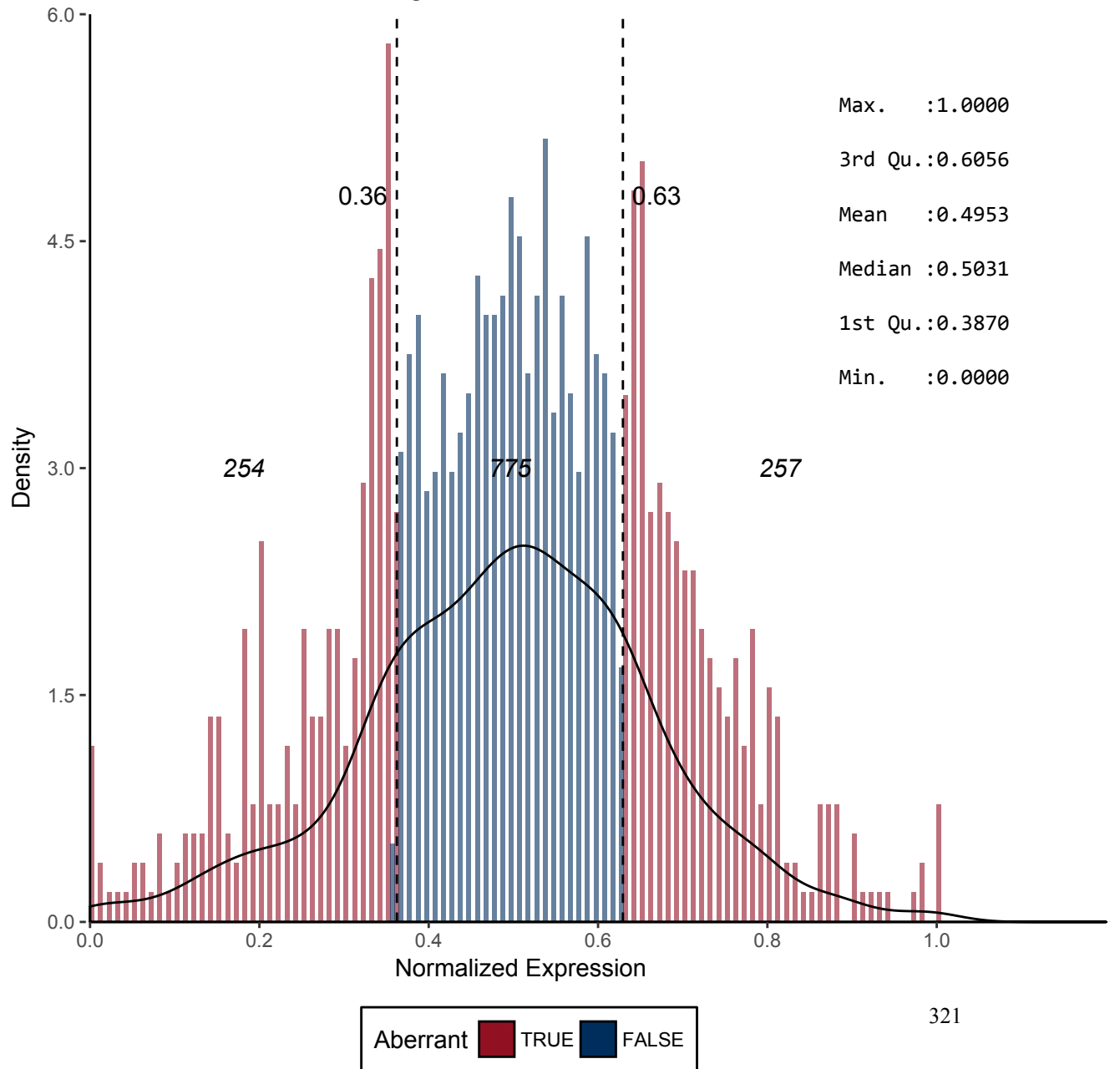


Figure 305 - CD307C

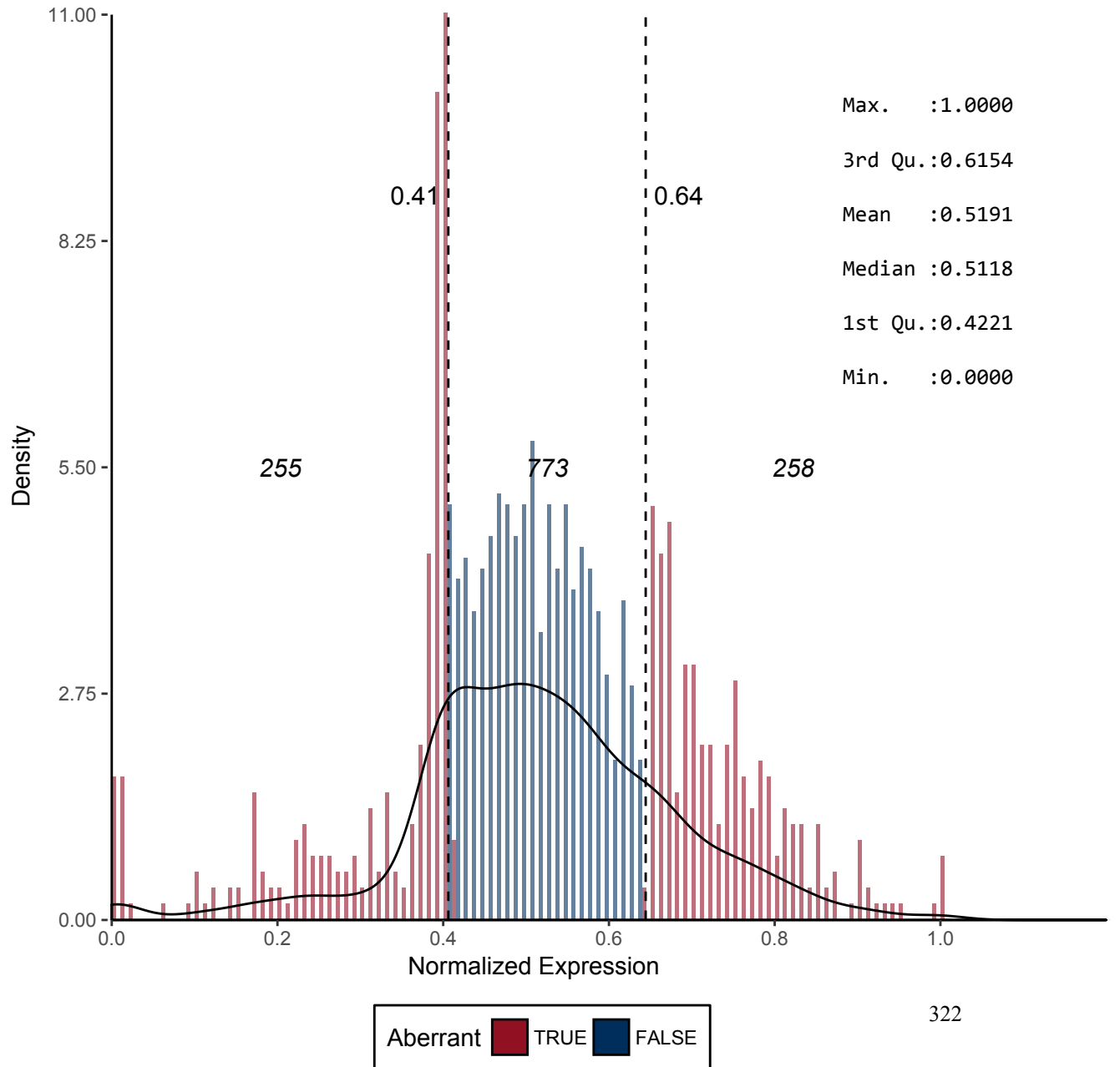


Figure 306 - CD307D*

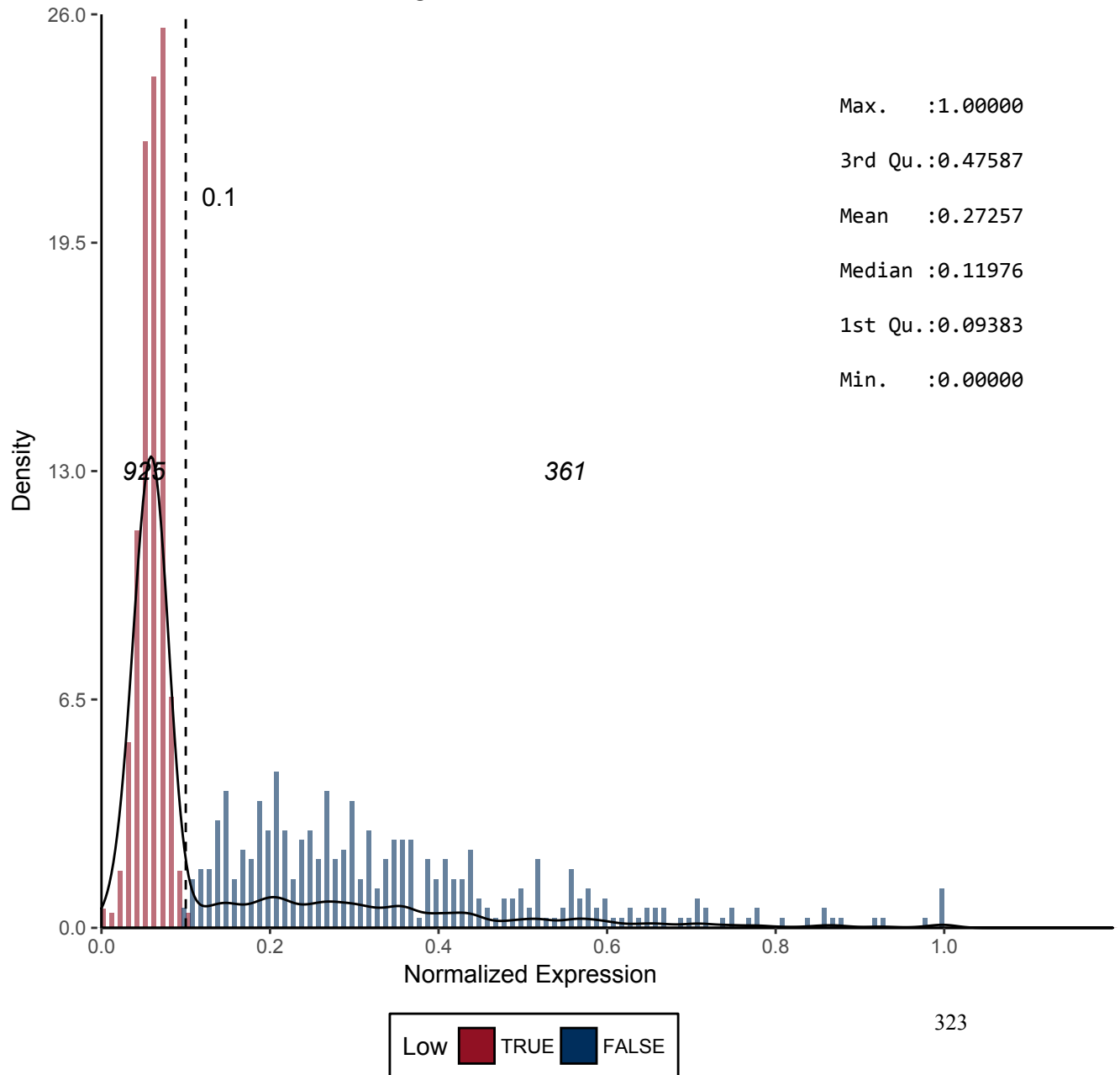
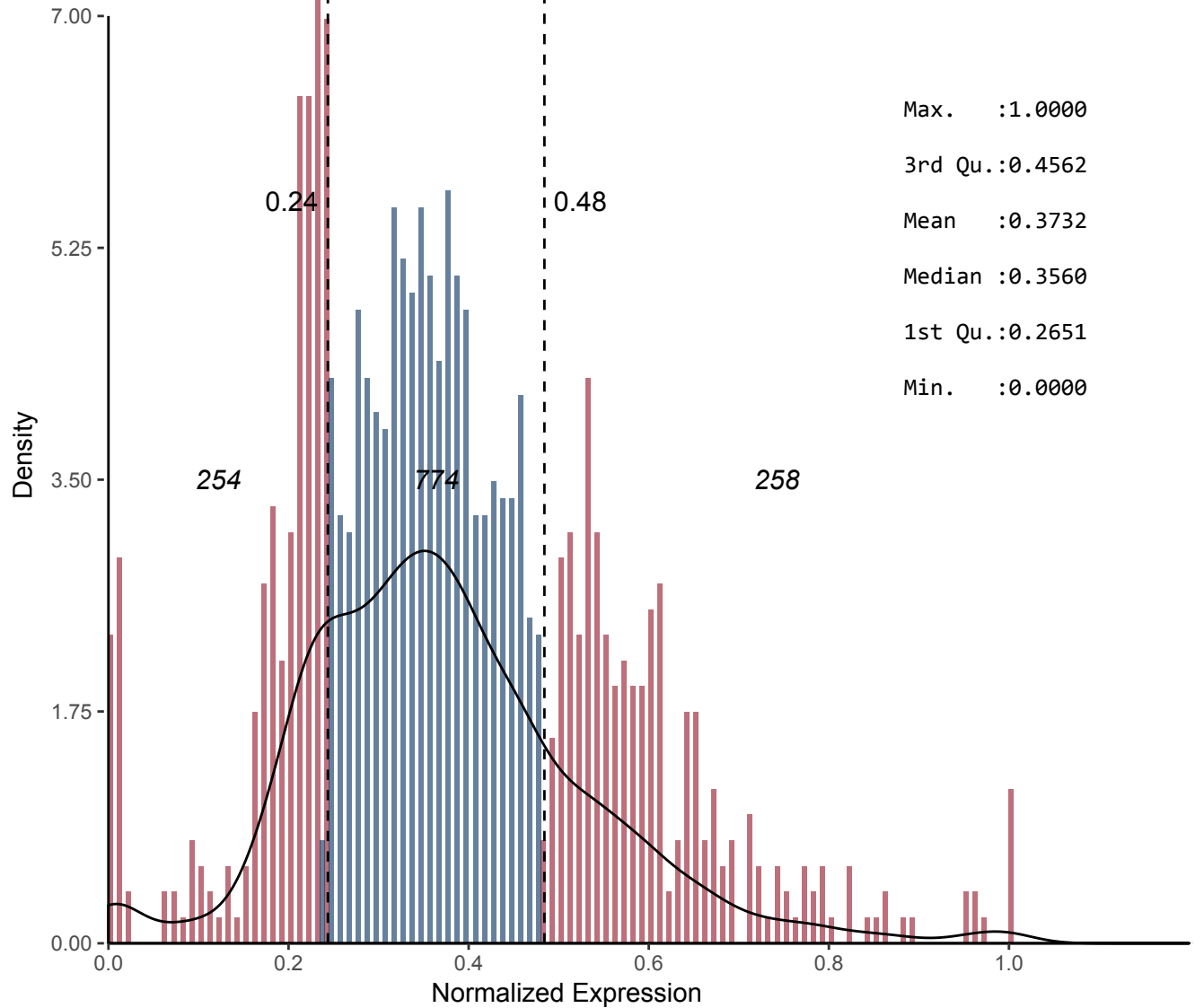
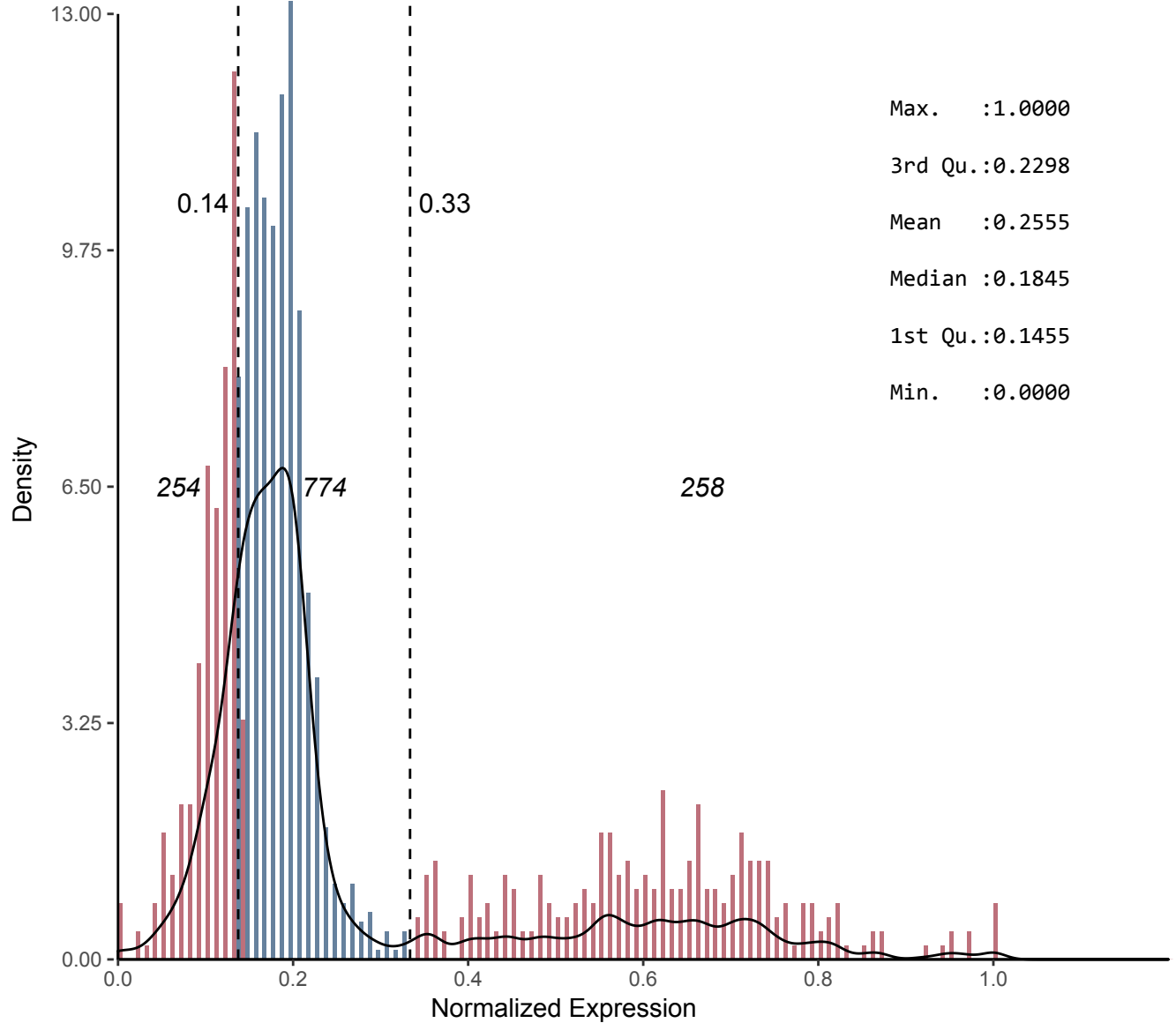


Figure 307 - CD307E



Aberrant TRUE FALSE

Figure 308 - CD308



Aberrant ■ TRUE ■ FALSE

Figure 309 - CD309*

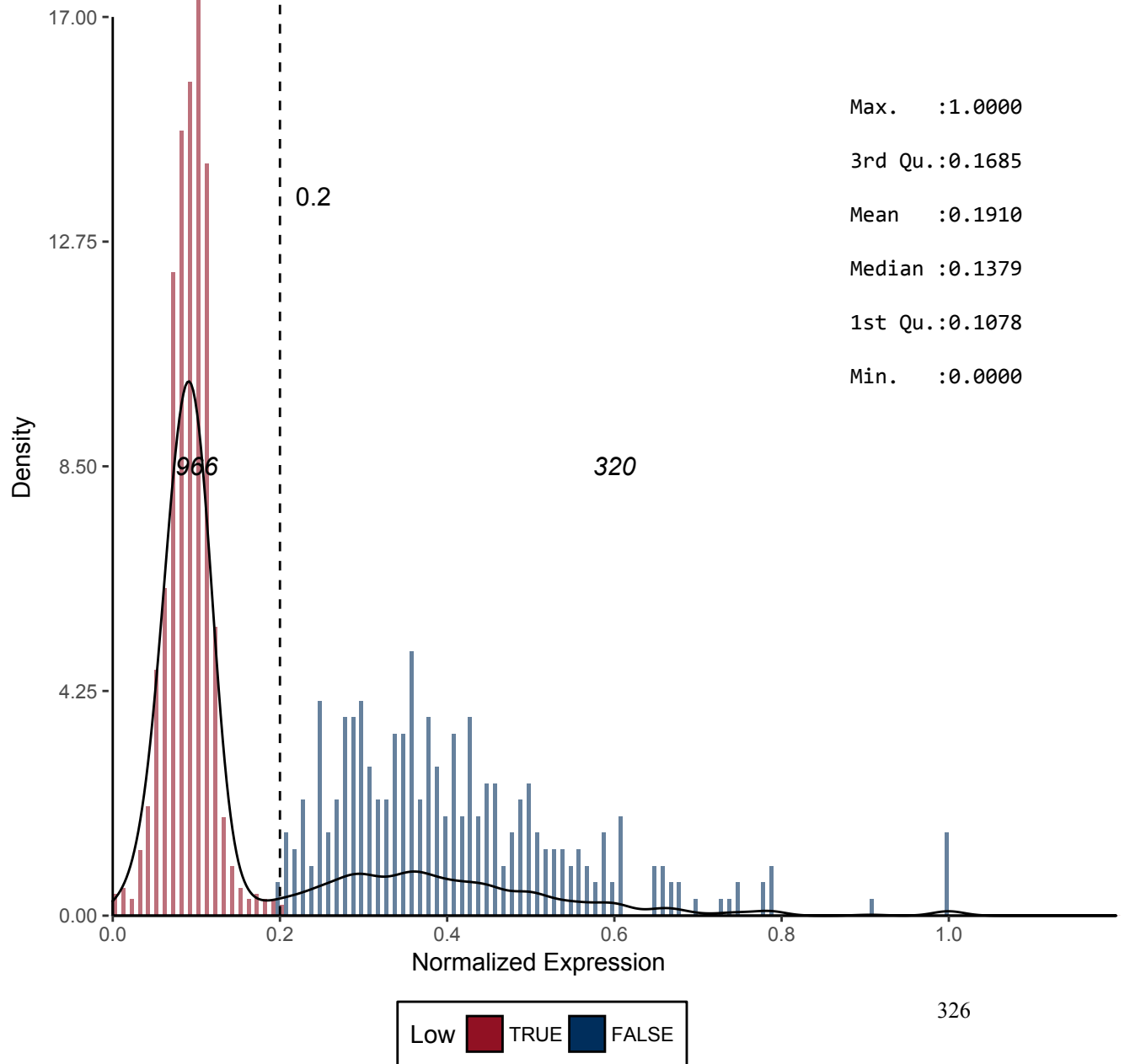


Figure 310 - CD312

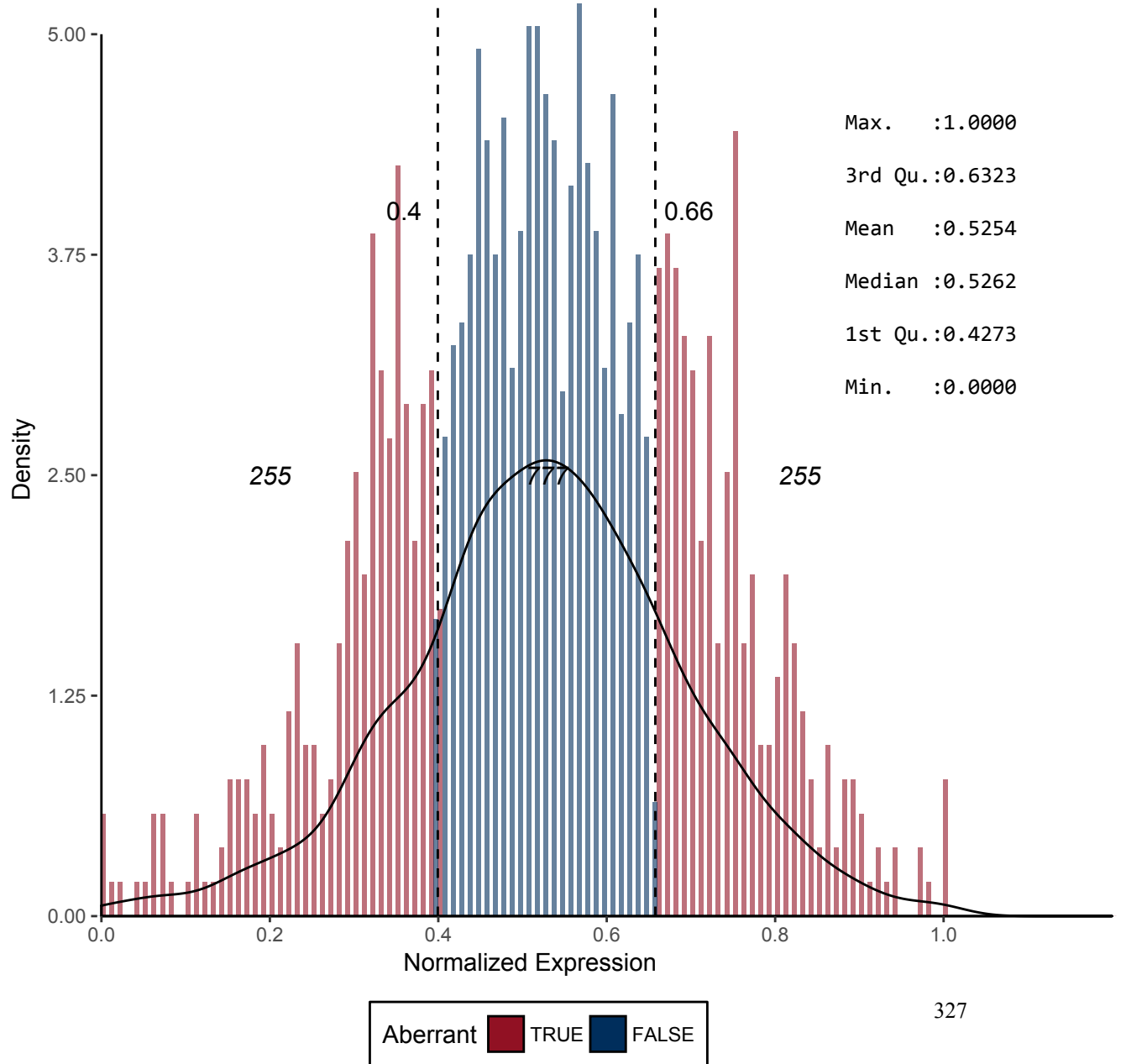


Figure 311 - CD315*

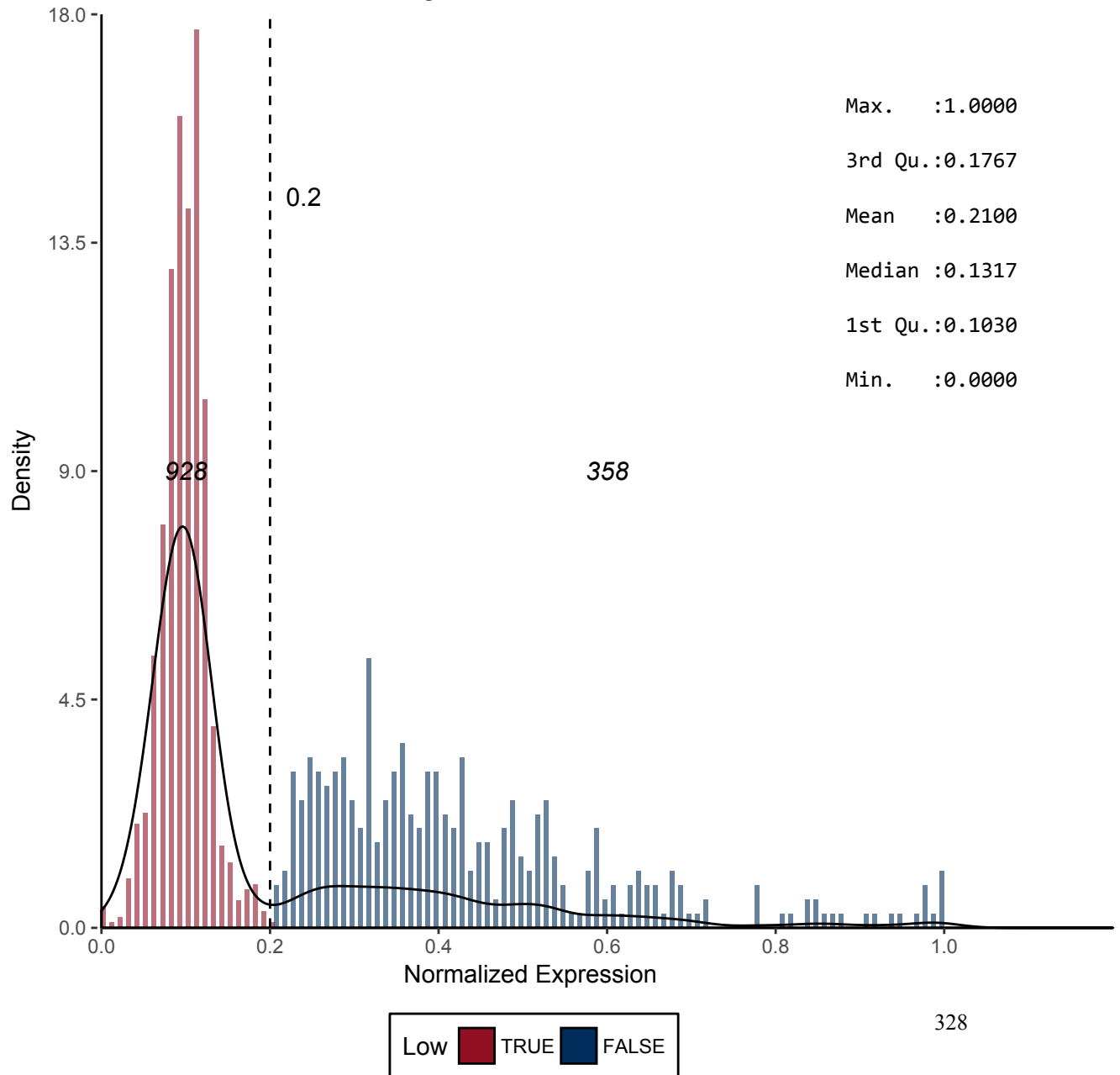


Figure 312 - CD316*

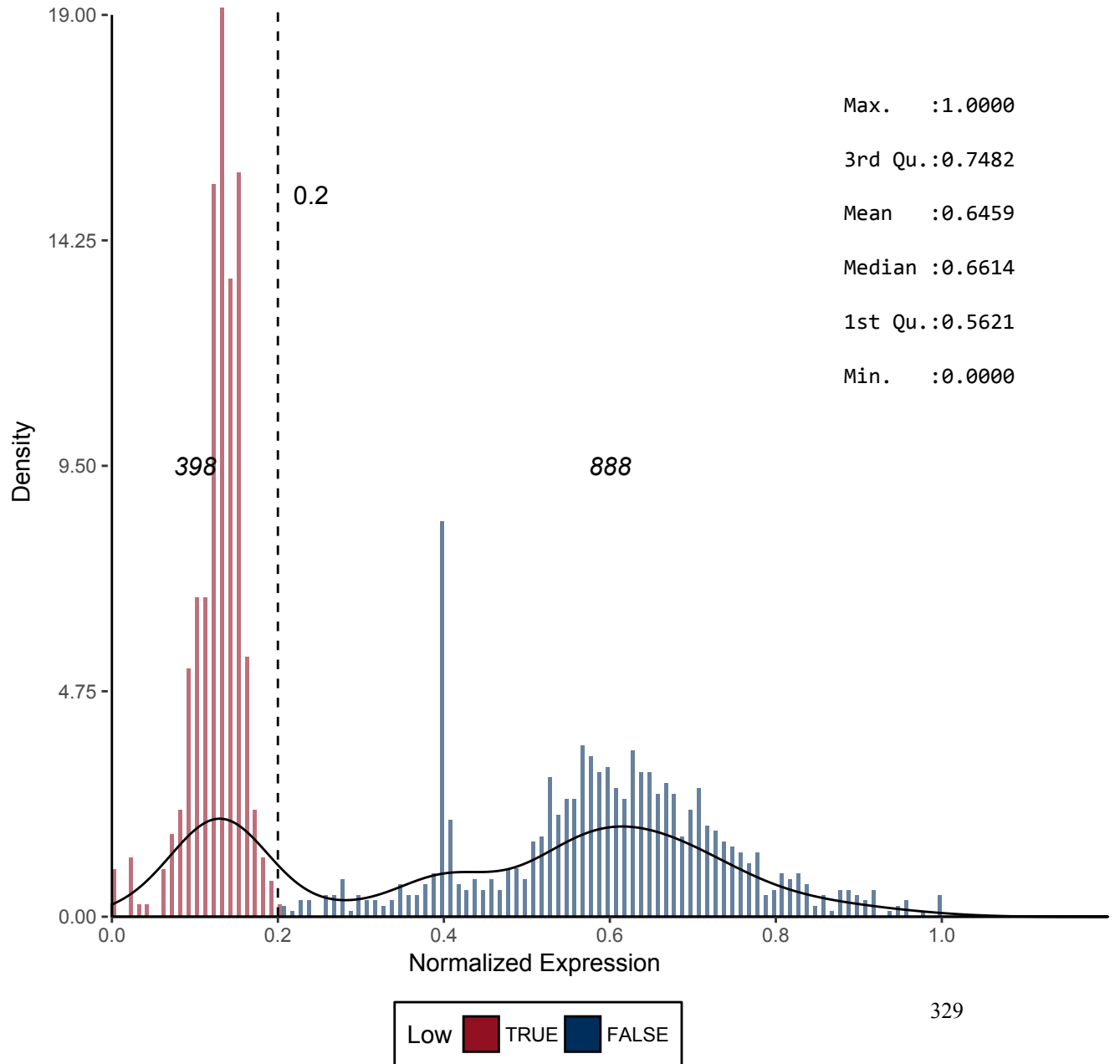


Figure 313 - CD317

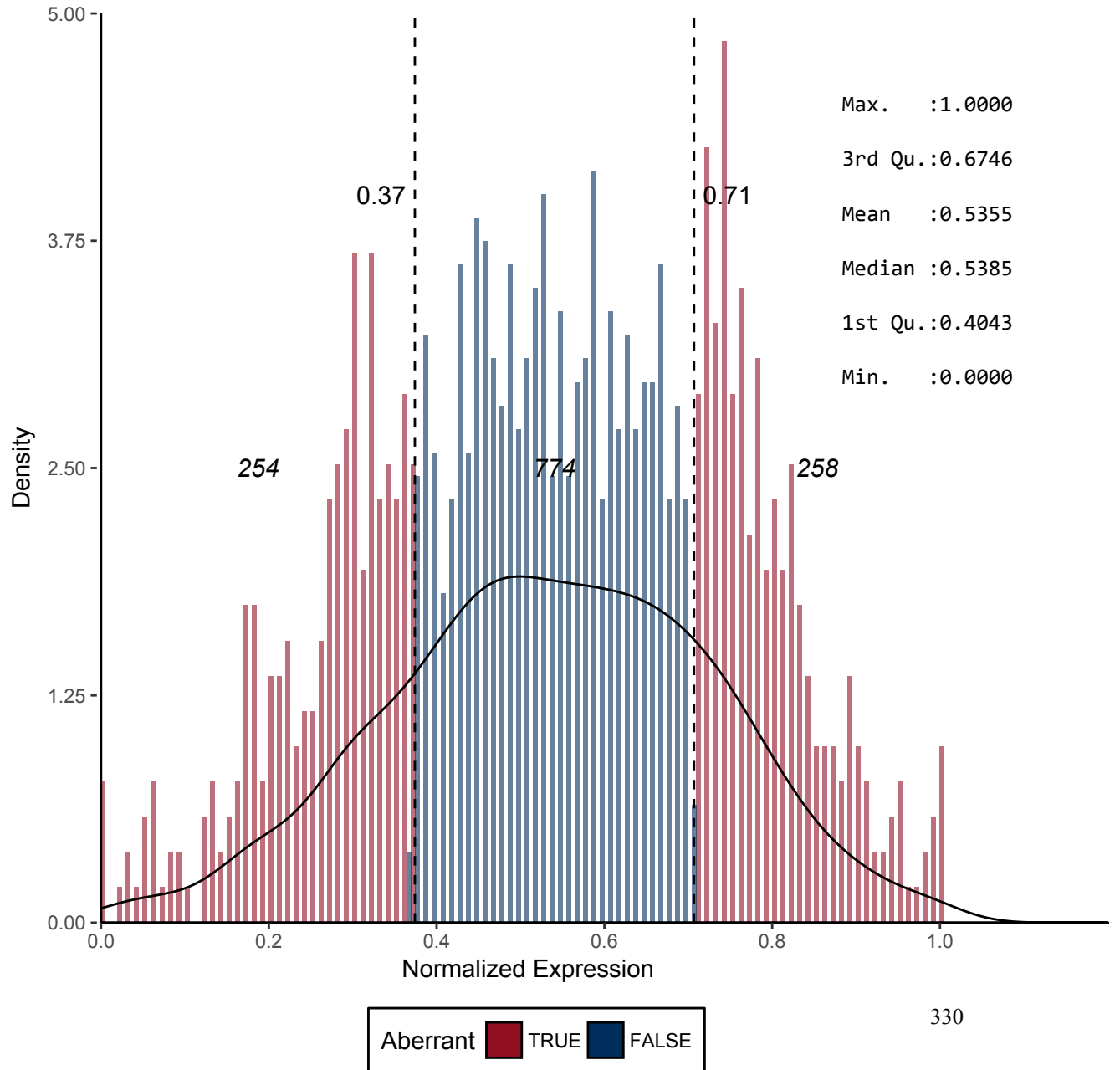


Figure 314 - CD318*

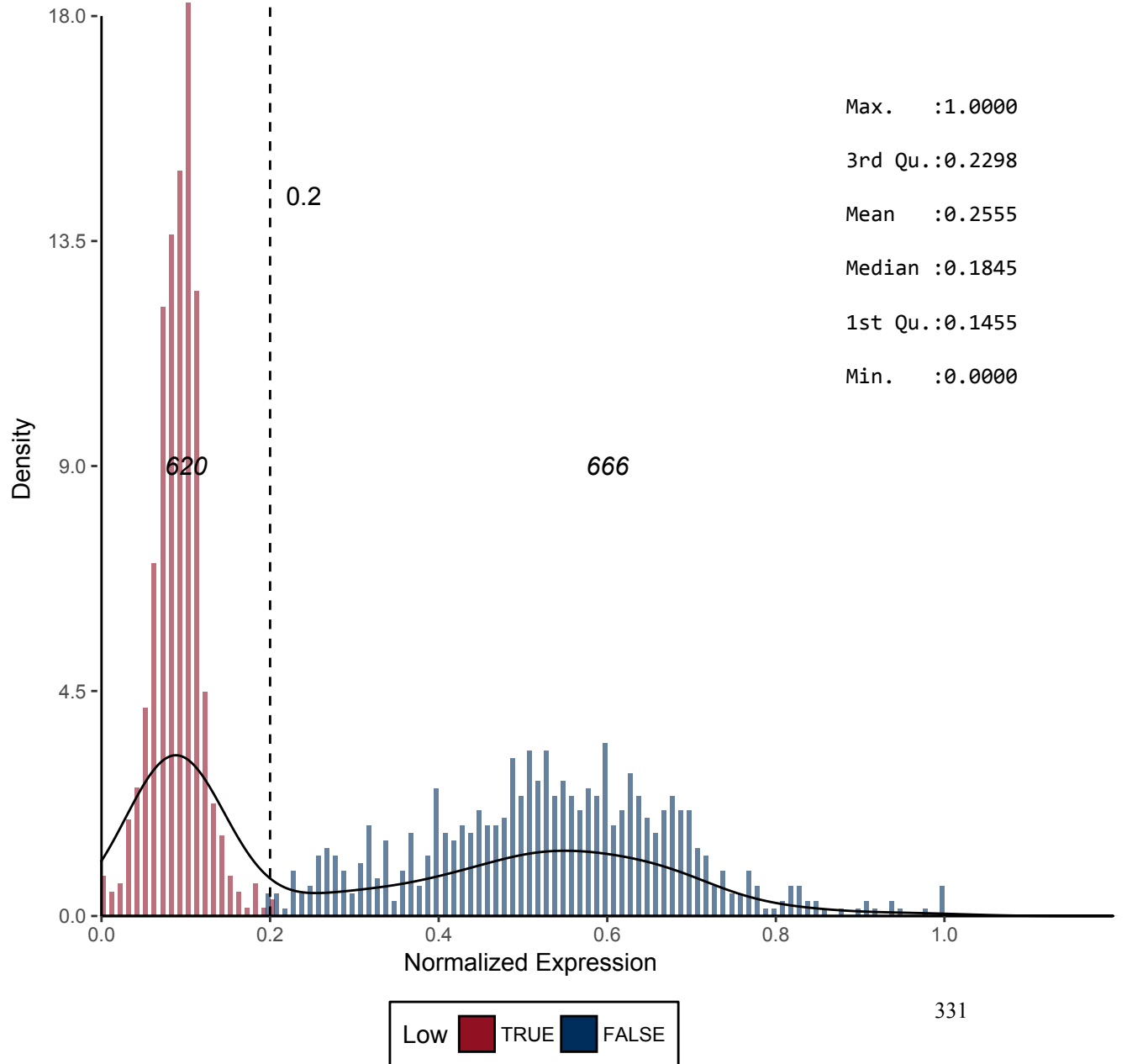


Figure 315 - CD319

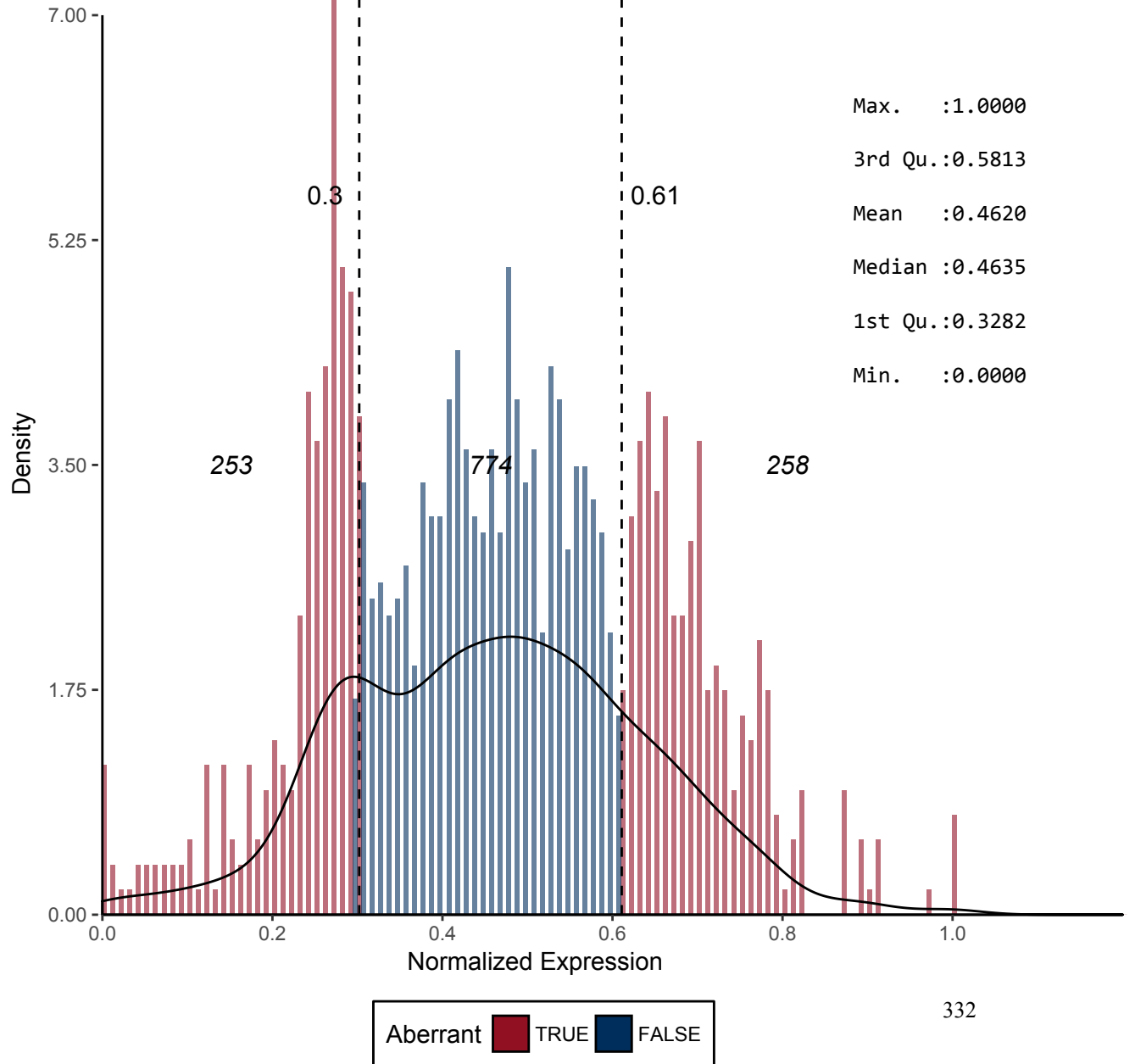


Figure 316 - CD320

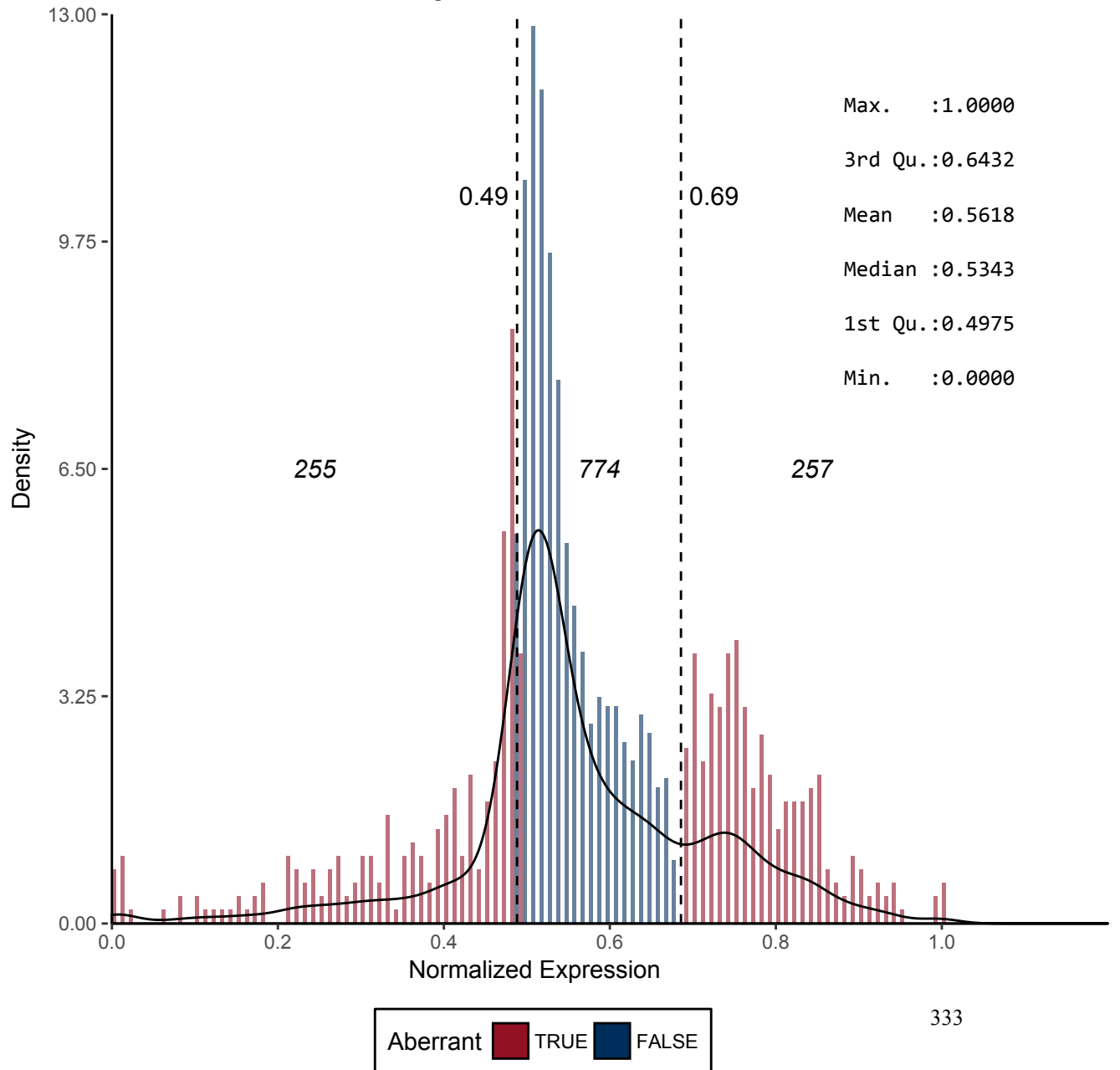
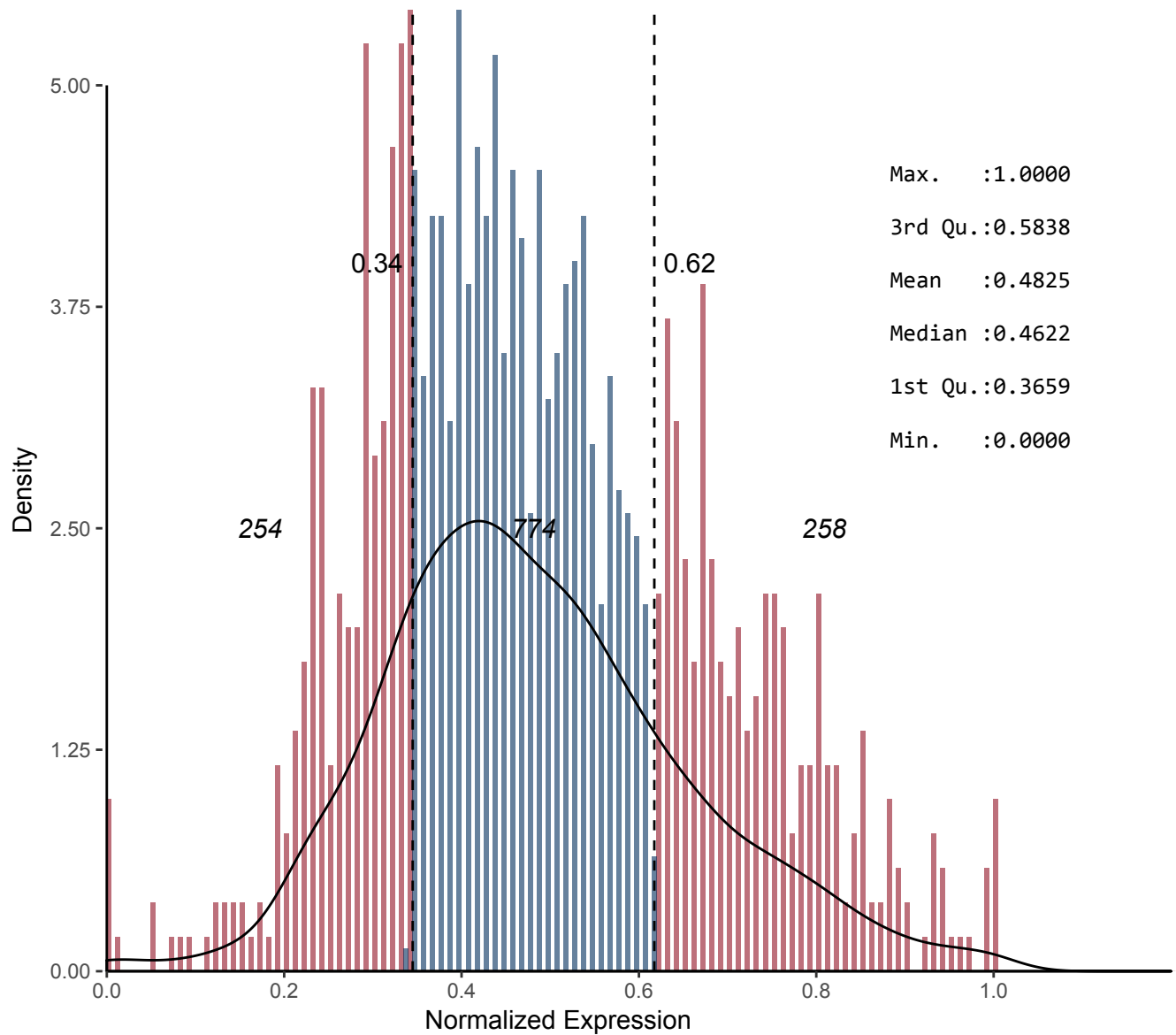


Figure 317 - CD321



Aberrant TRUE FALSE

Figure 318 - CD322*

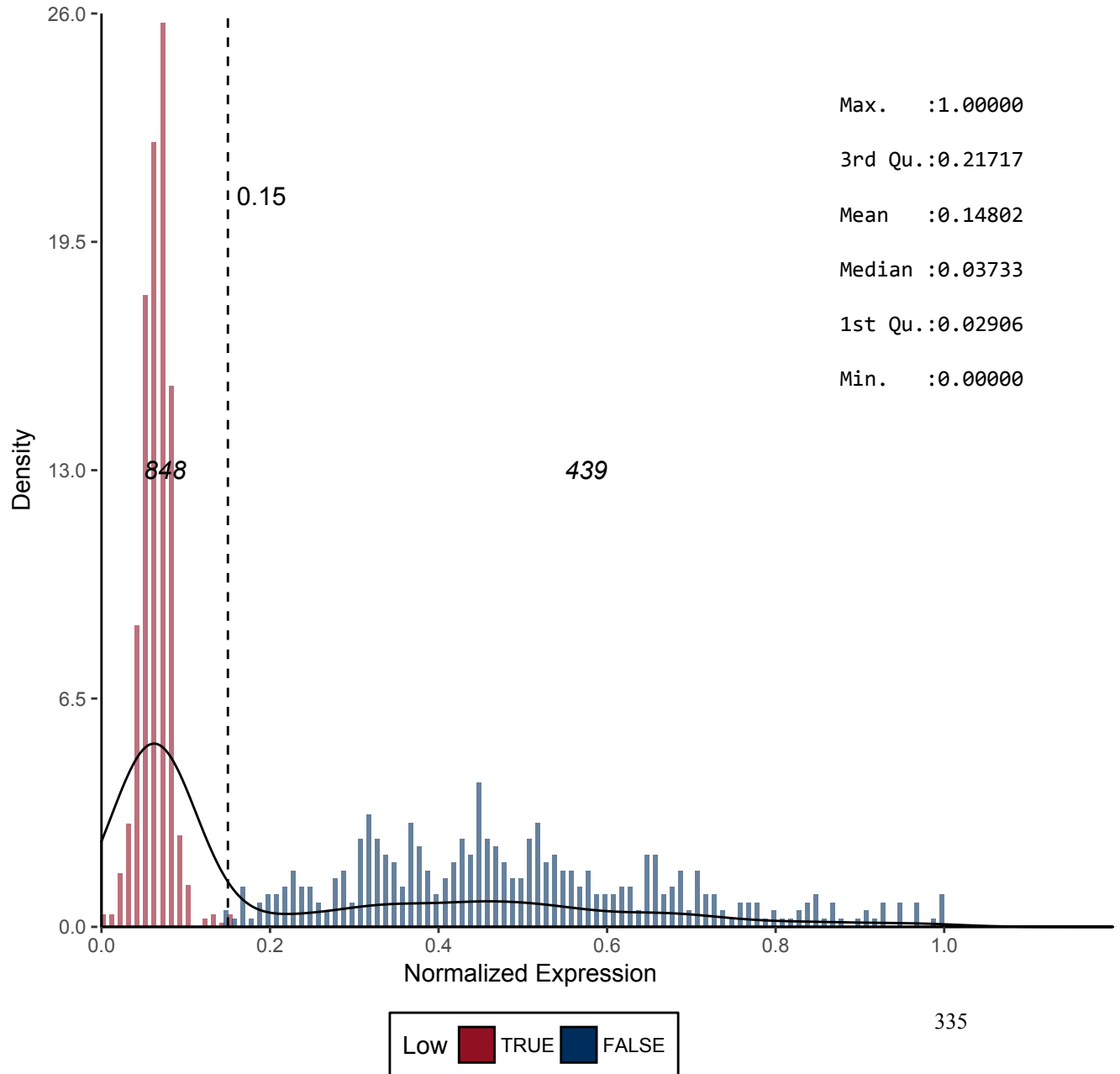


Figure 319 - CD324*

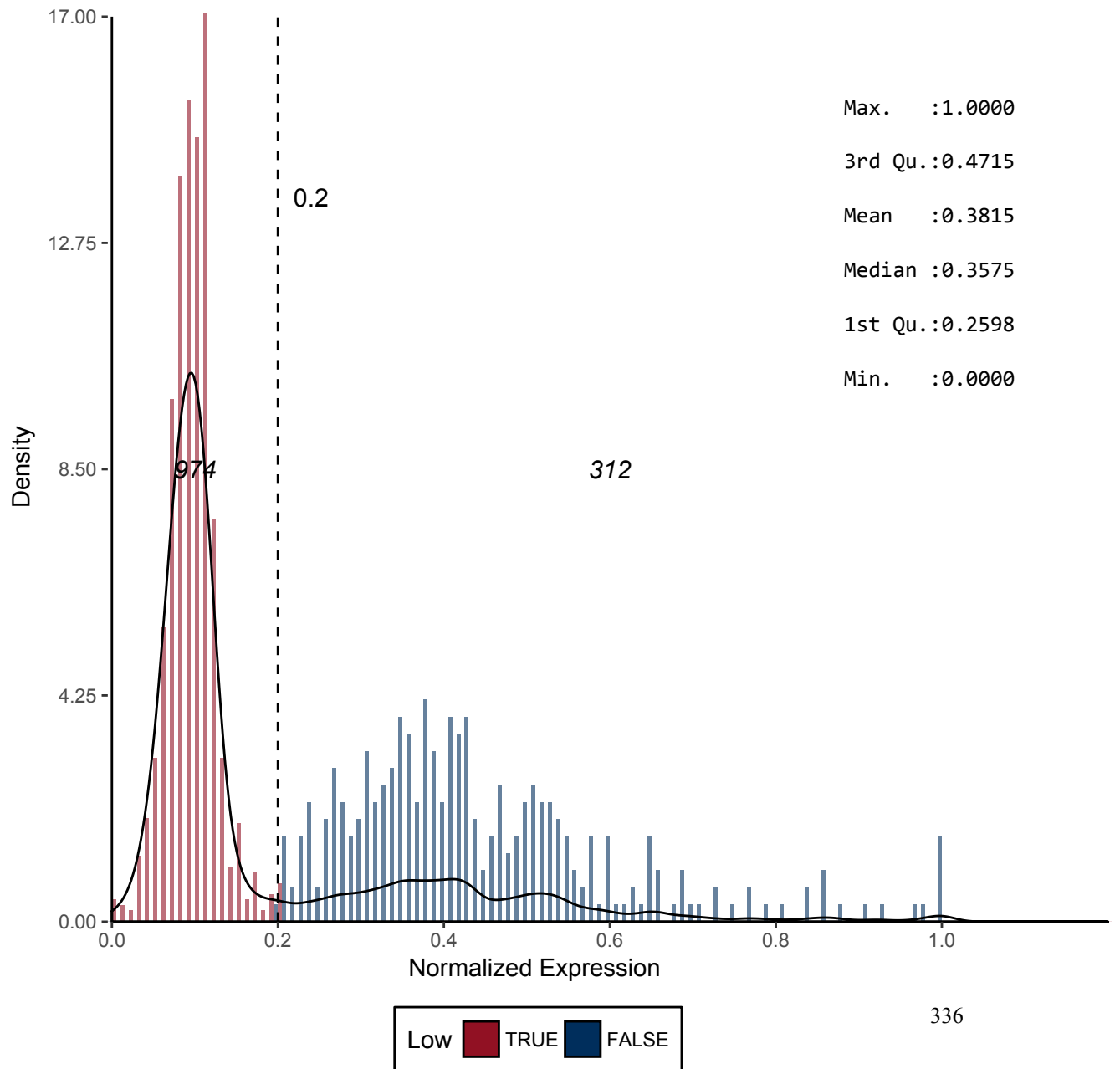


Figure 320 - CD325

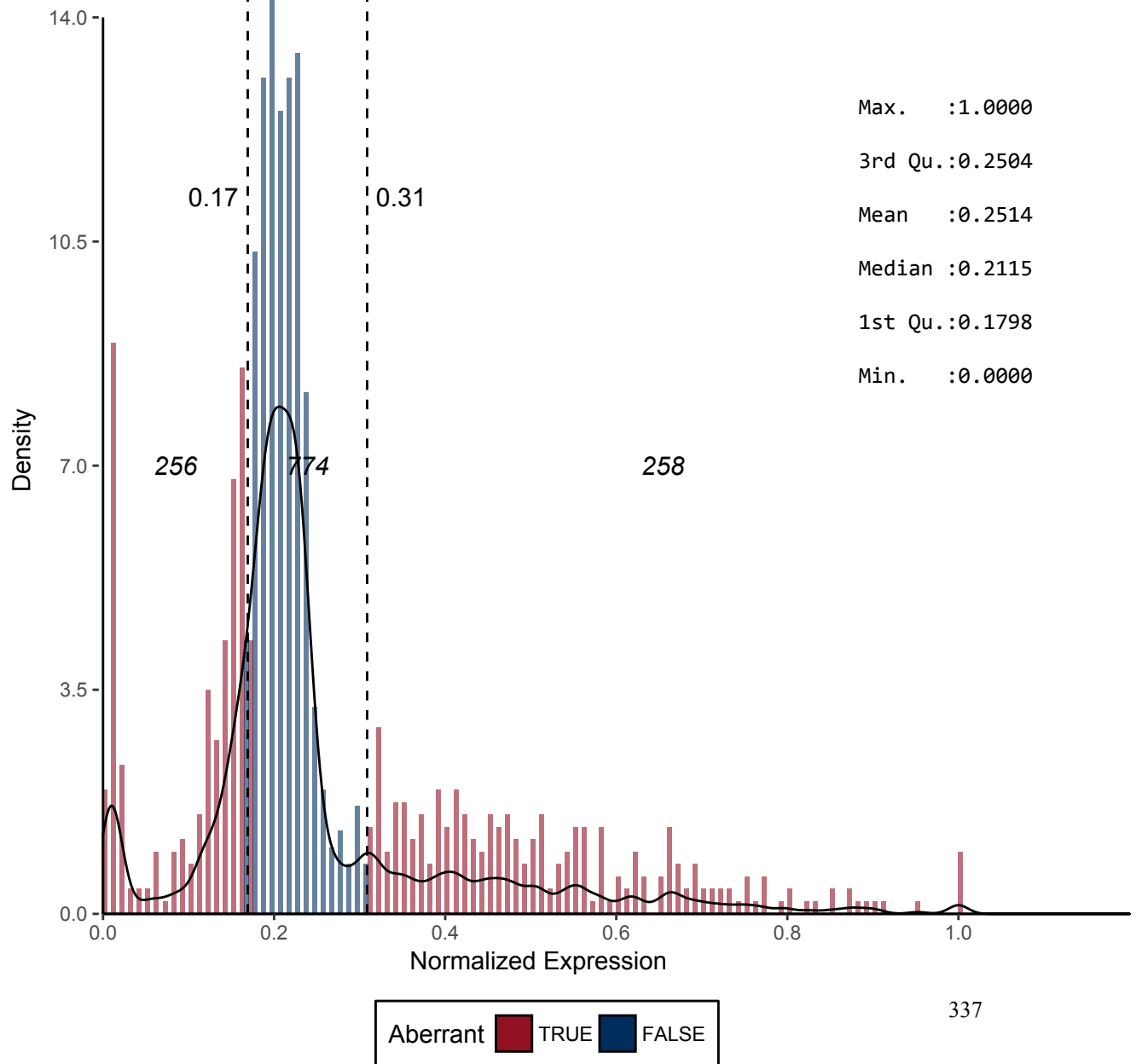


Figure 321 - CD326*

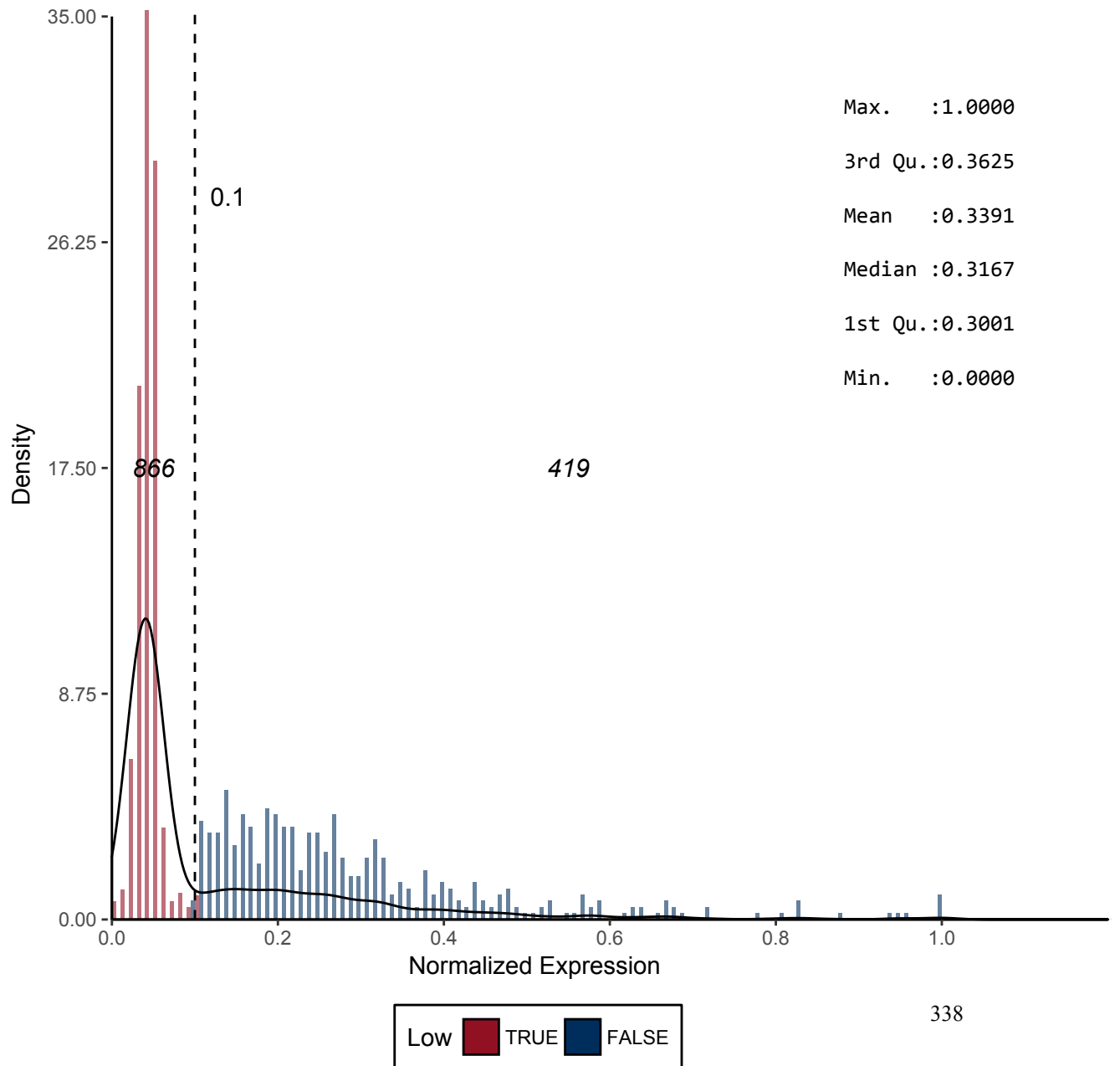


Figure 322 - CD327

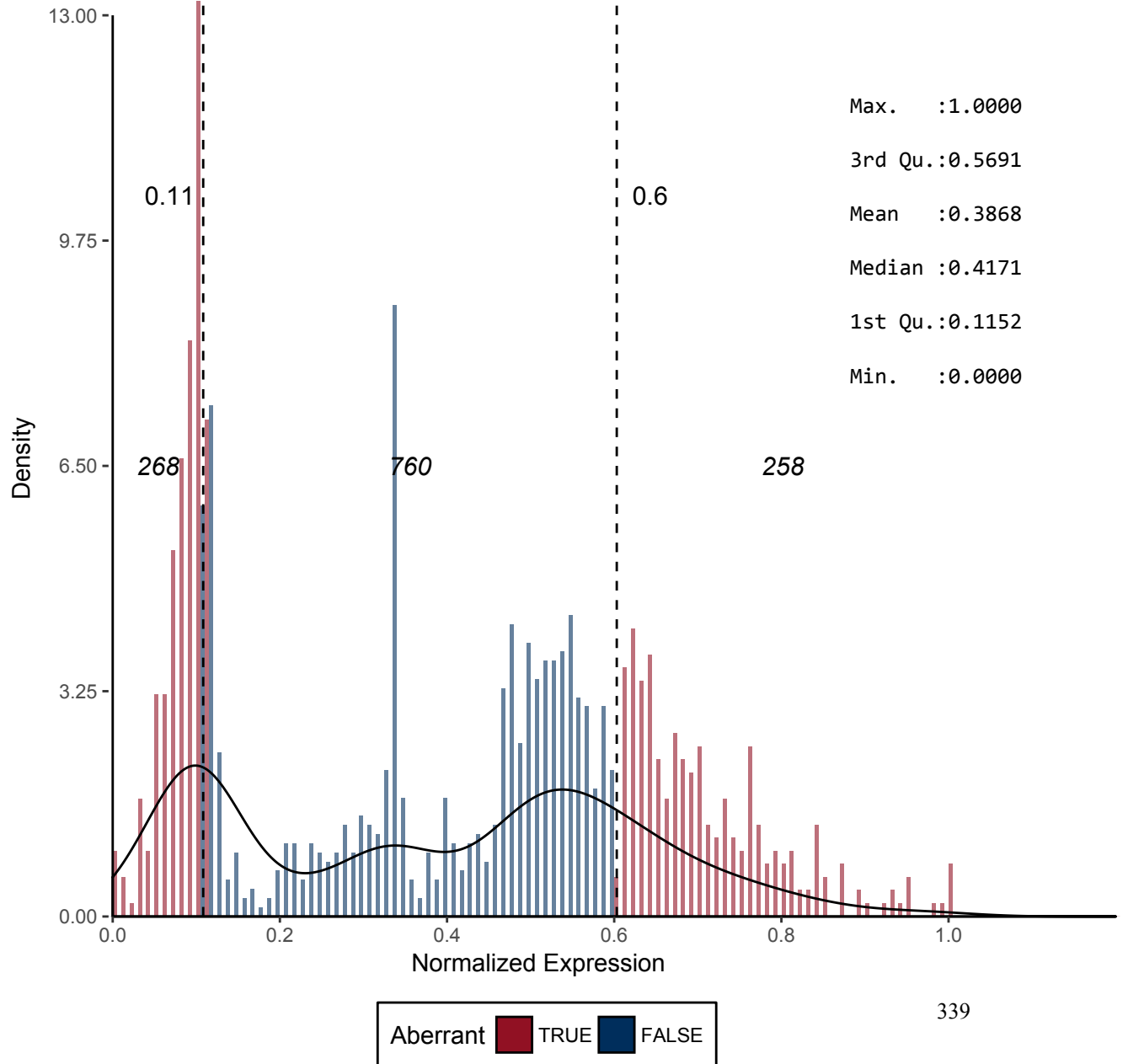


Figure 323 - CD328

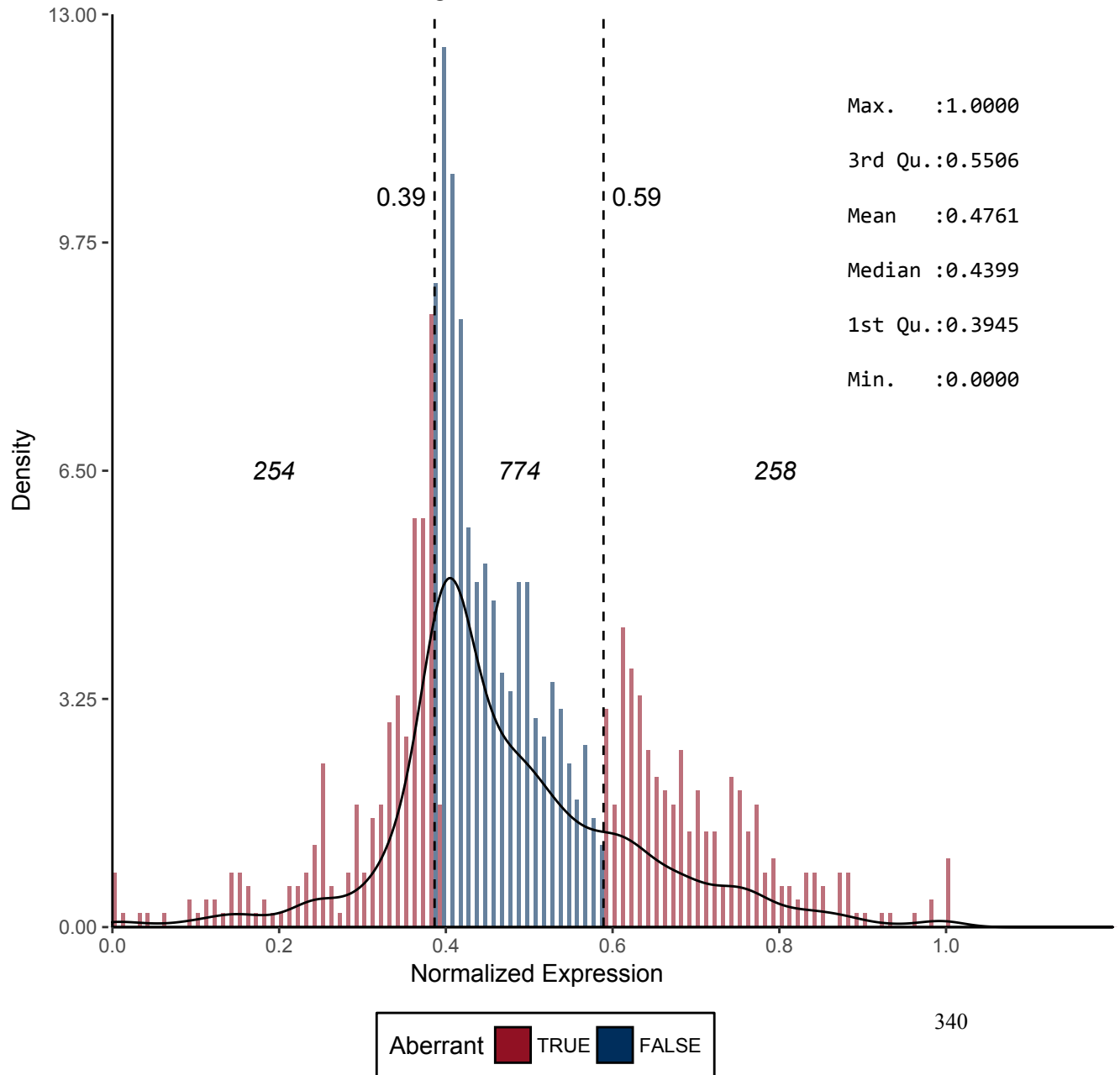


Figure 324 - CD329

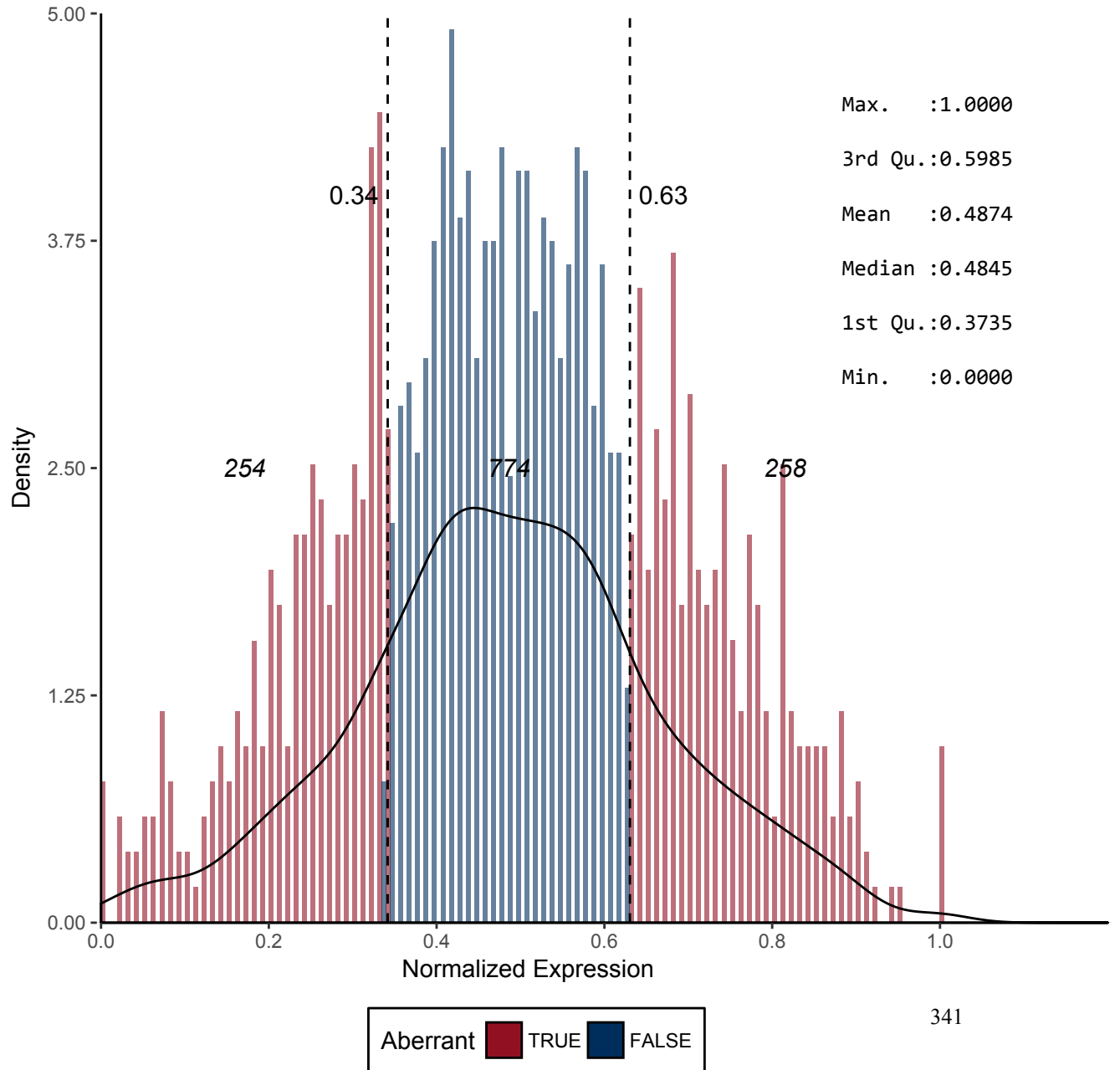


Figure 325 - CD331*

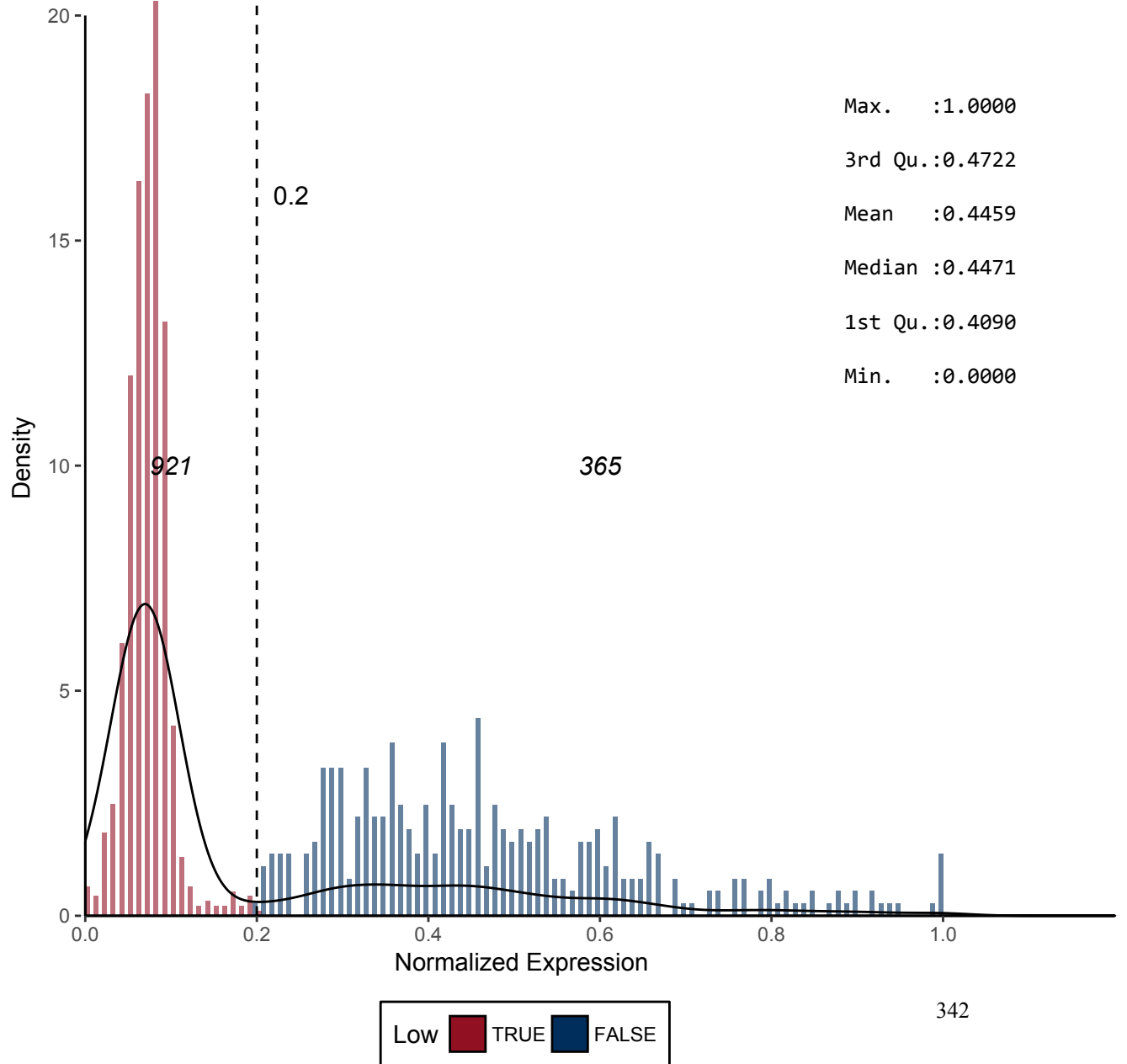


Figure 326 - CD332

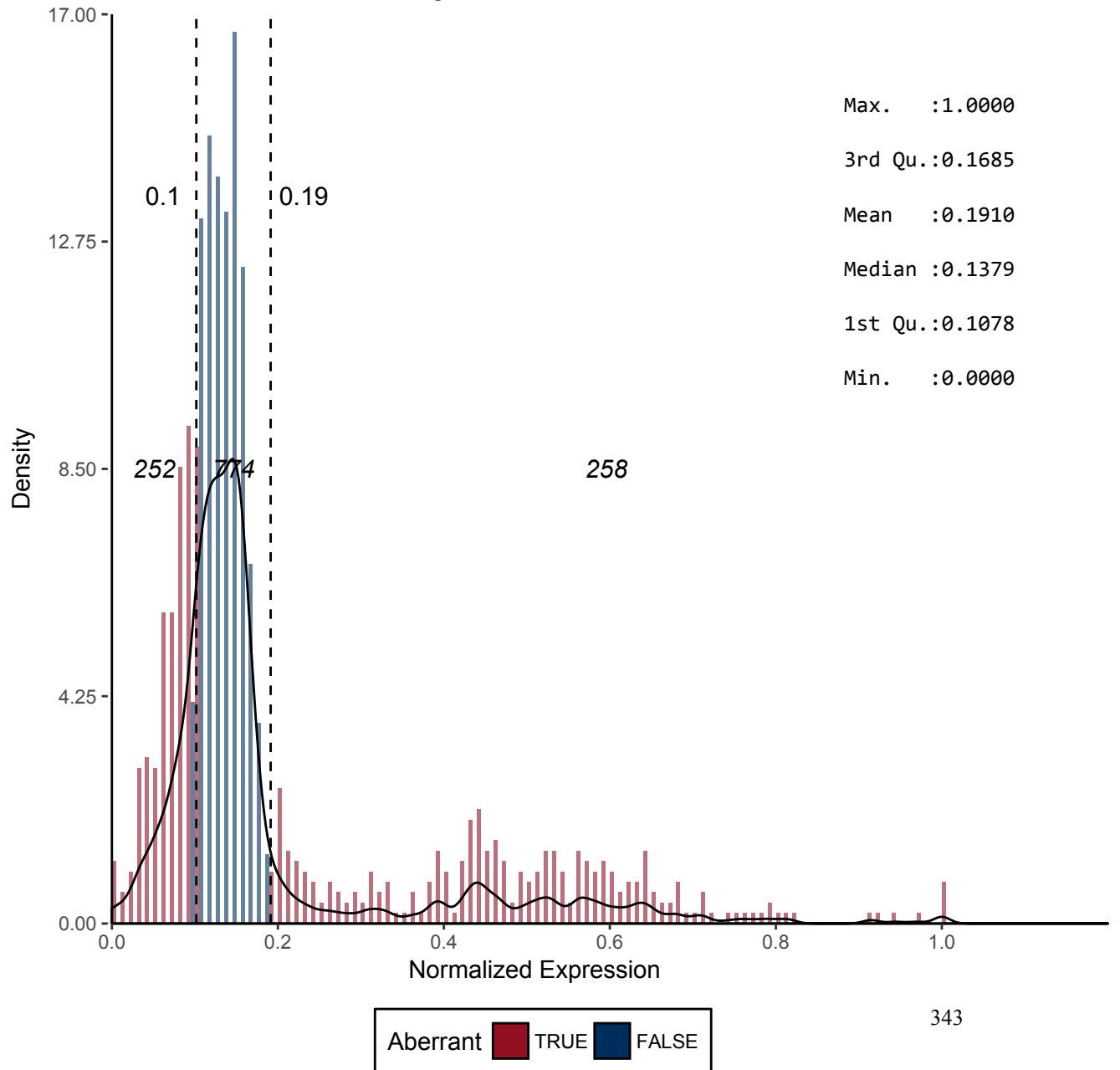
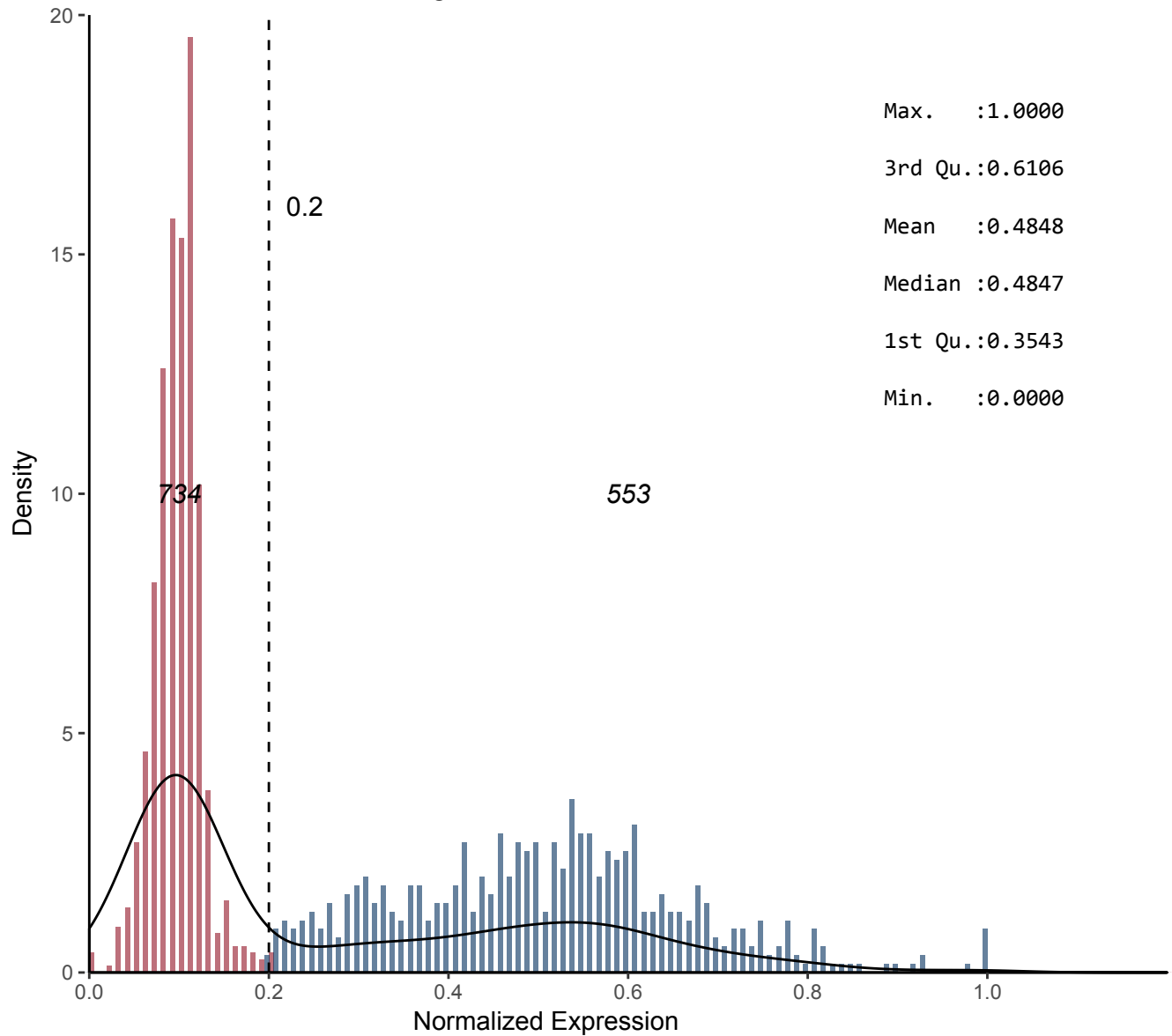


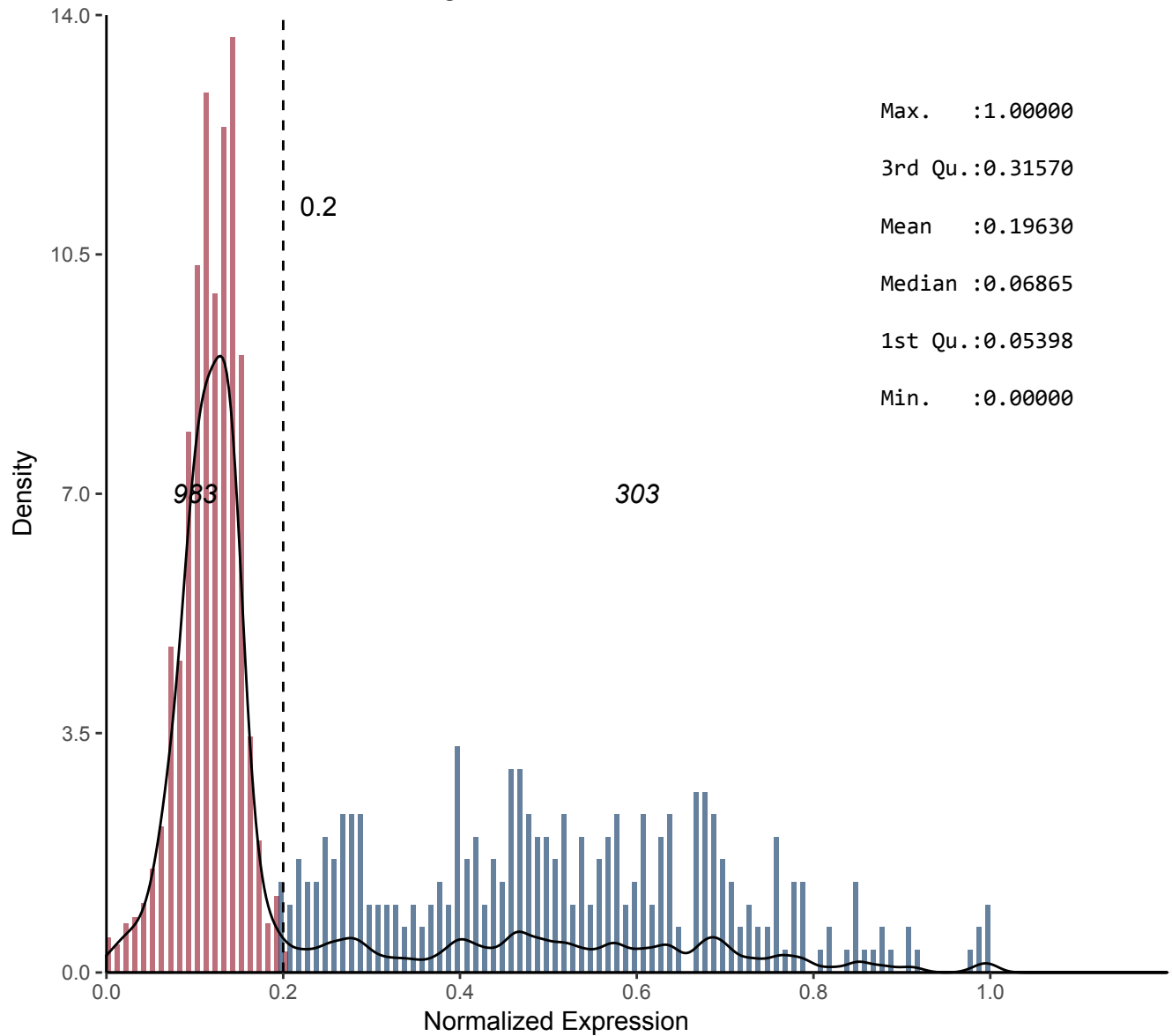
Figure 327 - CD333*



Low ■ TRUE ■ FALSE

344

Figure 328 - CD334*



Low ■ TRUE ■ FALSE

Figure 329 - CD335*

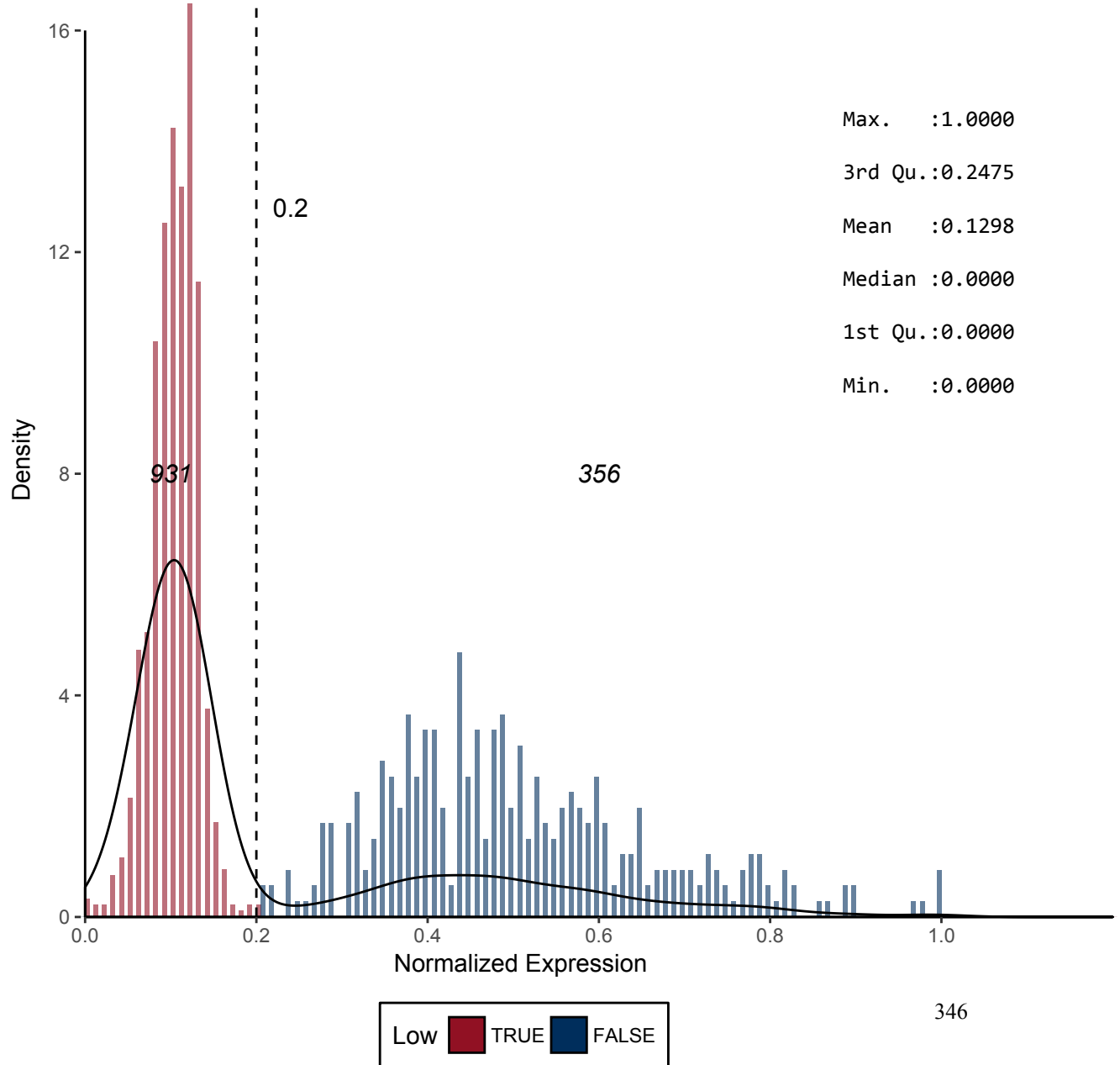


Figure 330 - CD336*

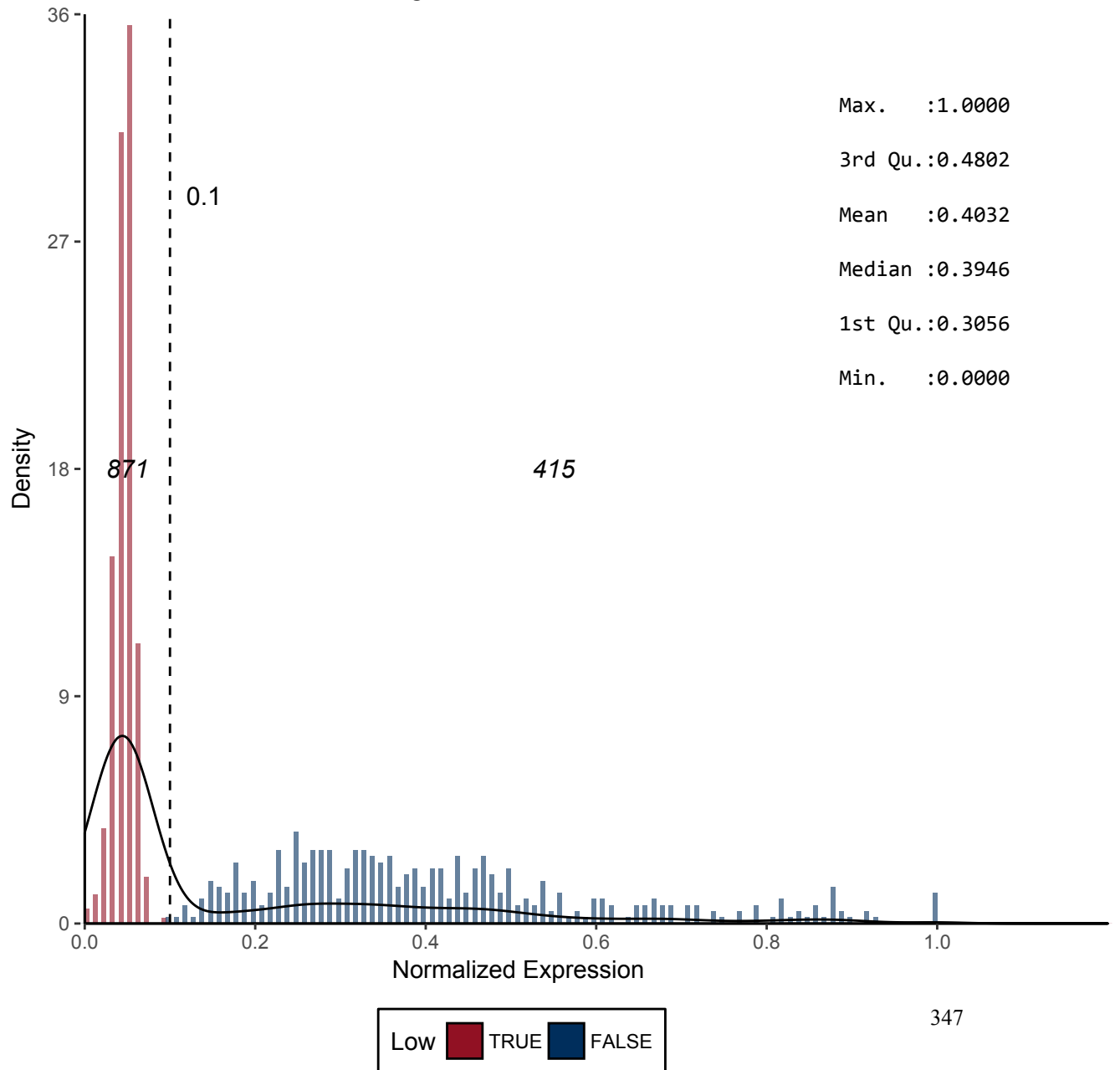


Figure 331 - CD337

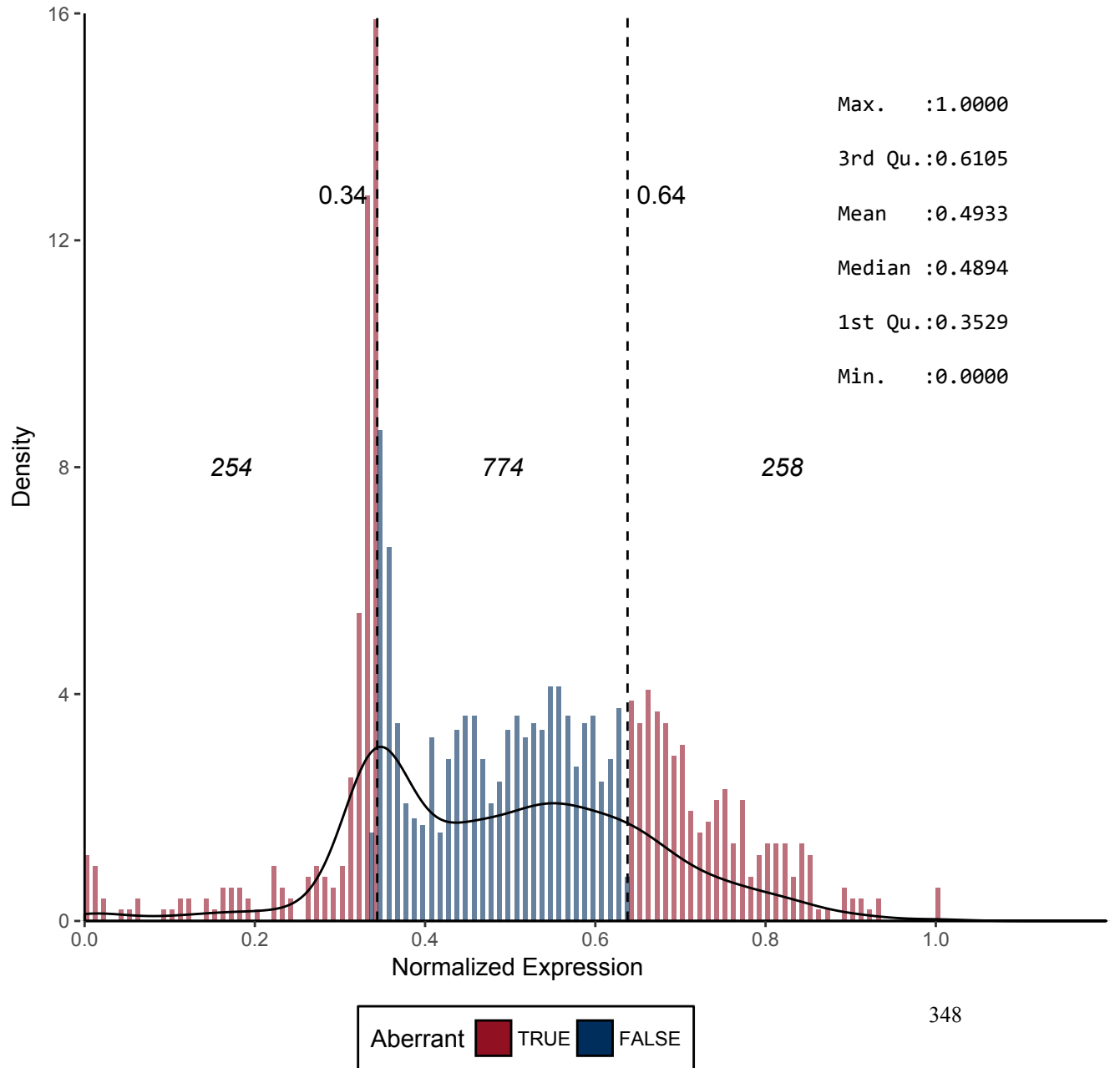


Figure 332 - CD338*

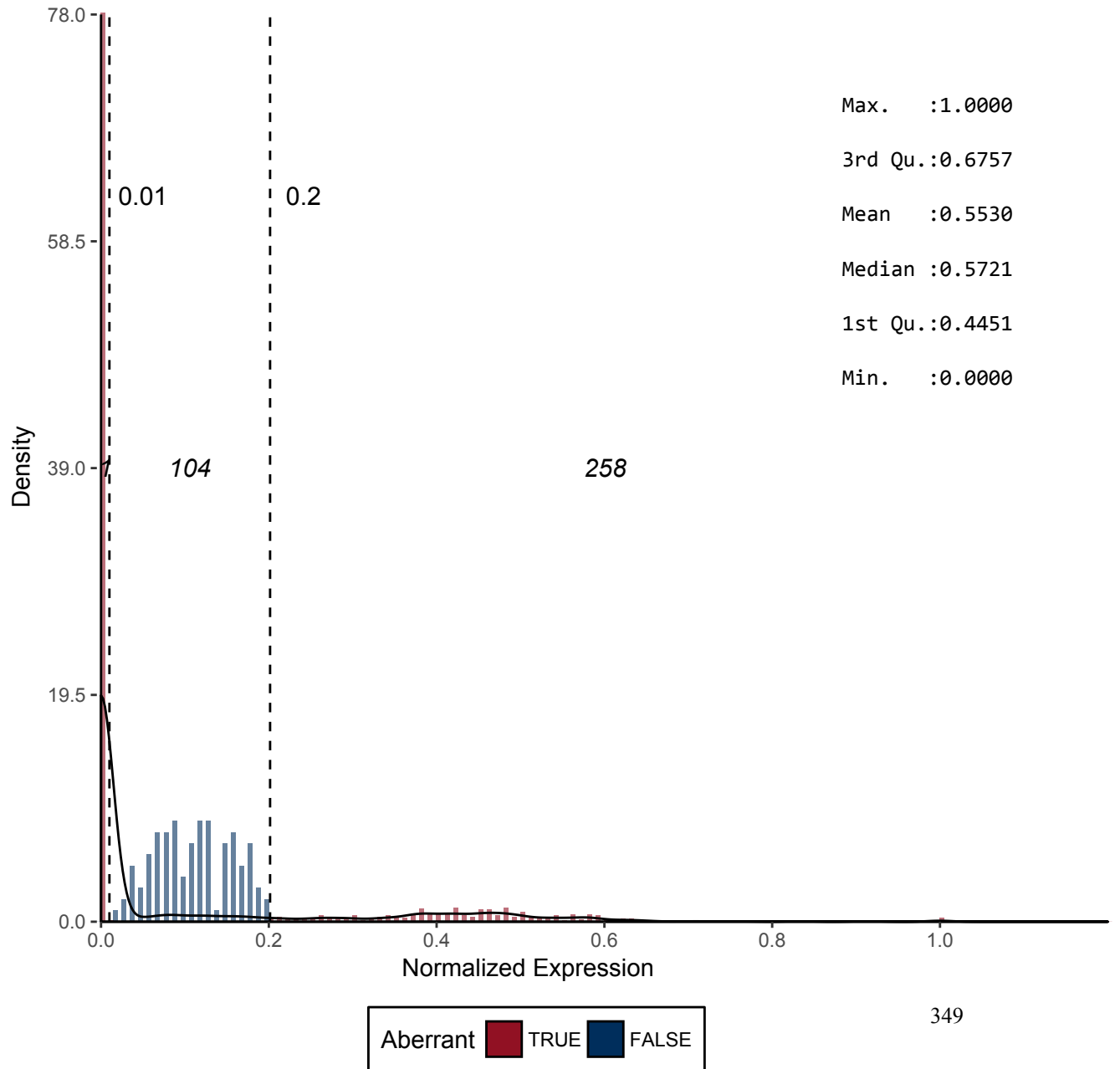


Figure 333 - CD339*

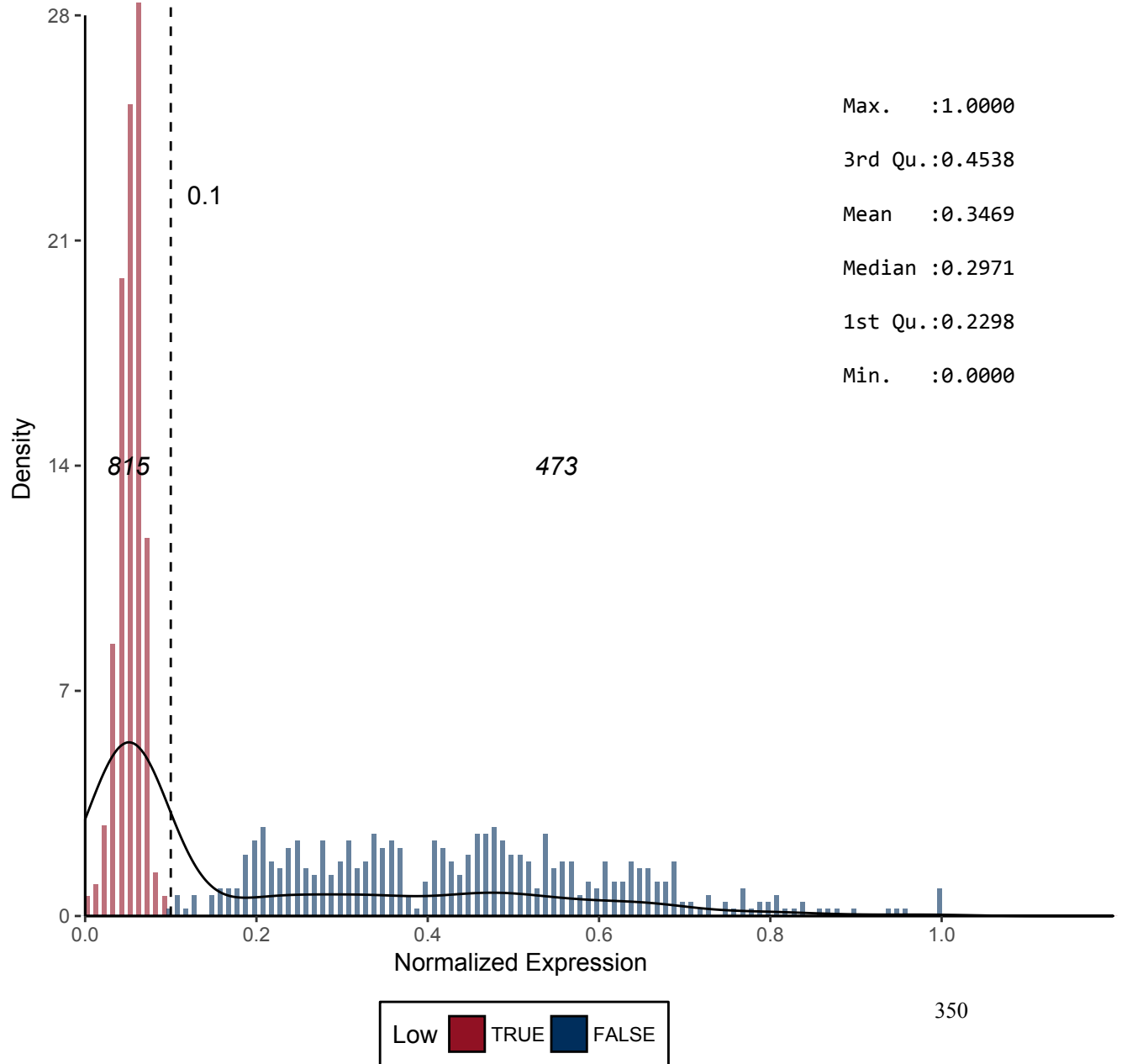


Figure 334 - CD340

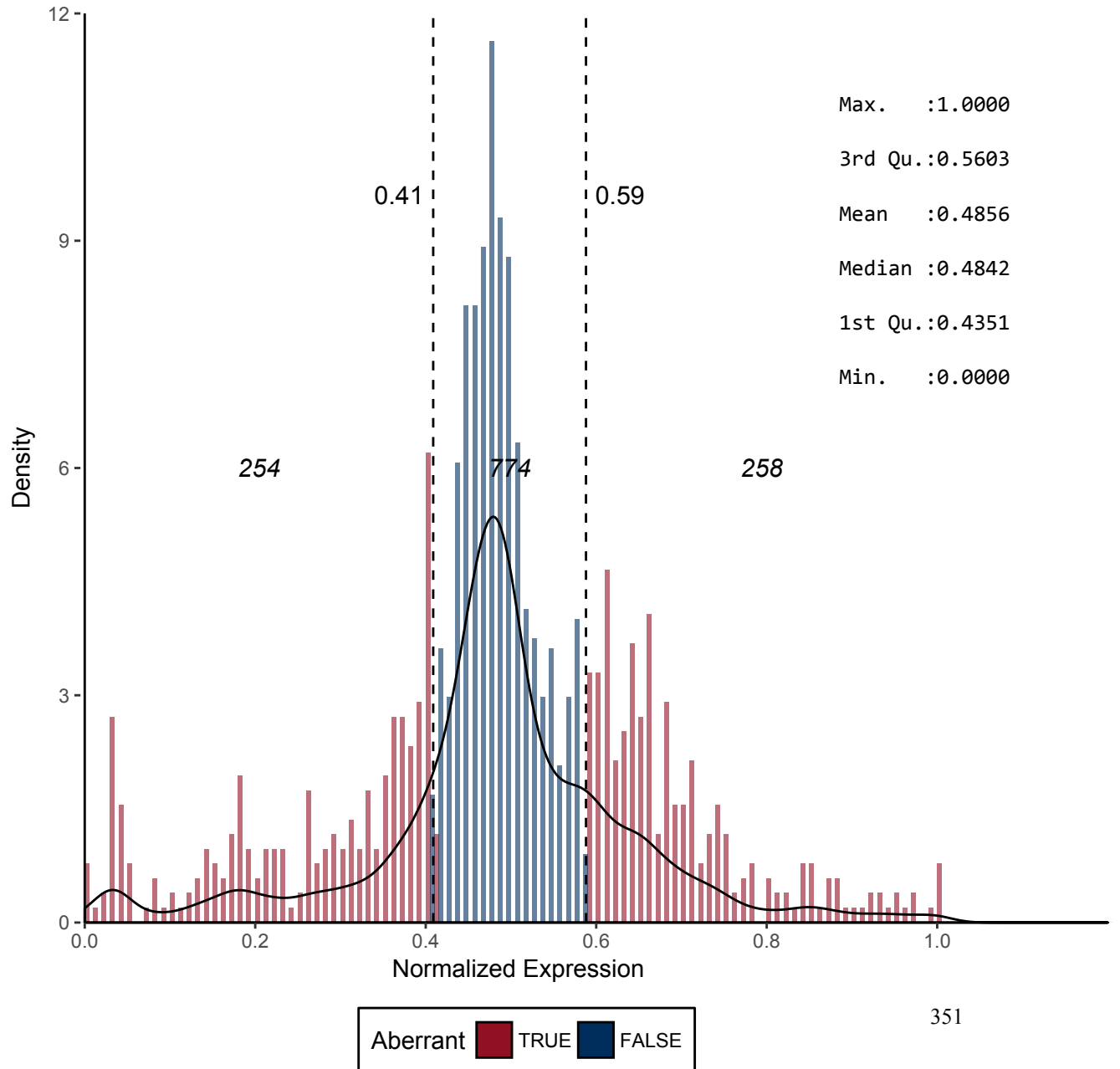


Figure 335 - CD344*

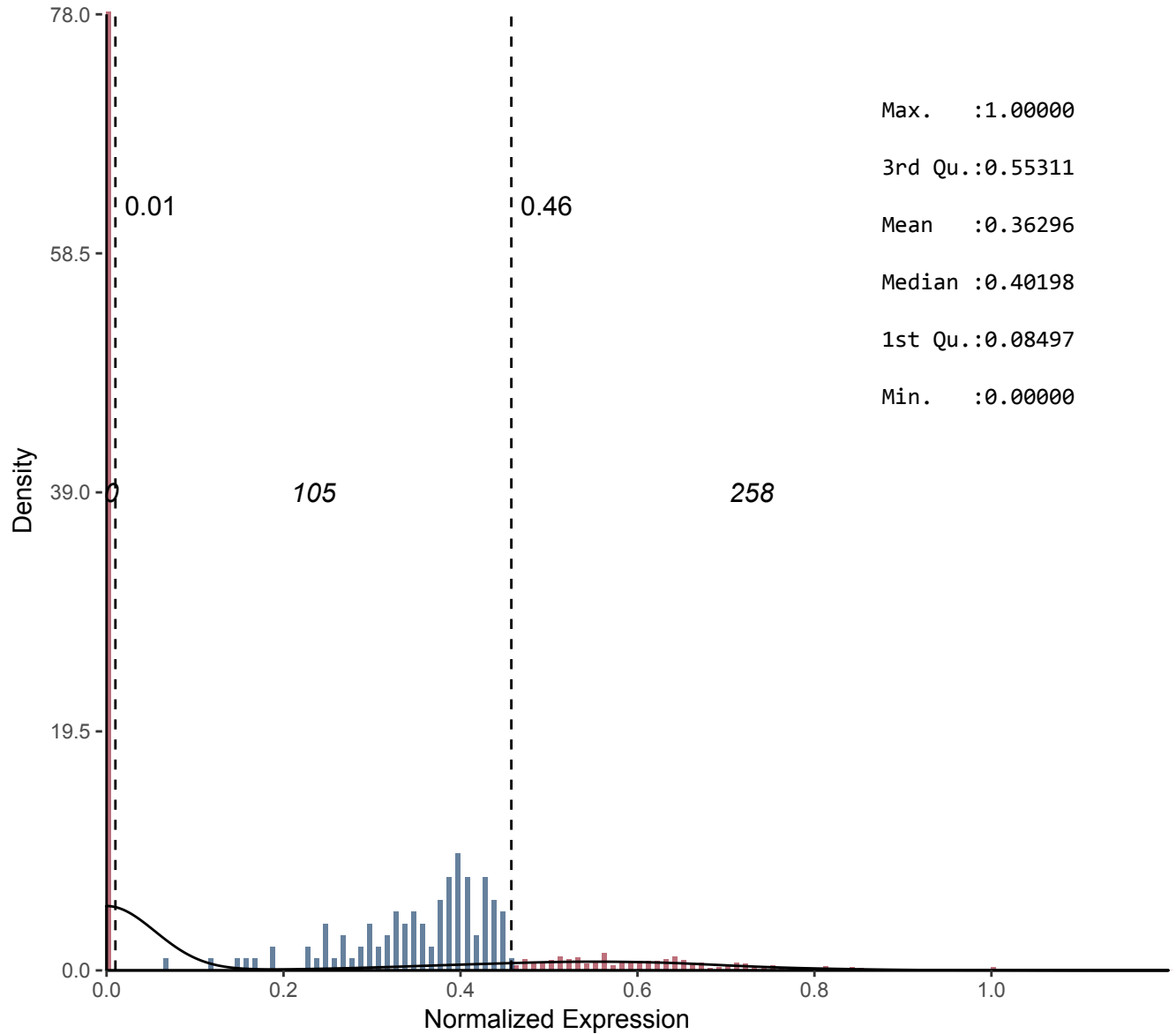


Figure 336 - CD349*

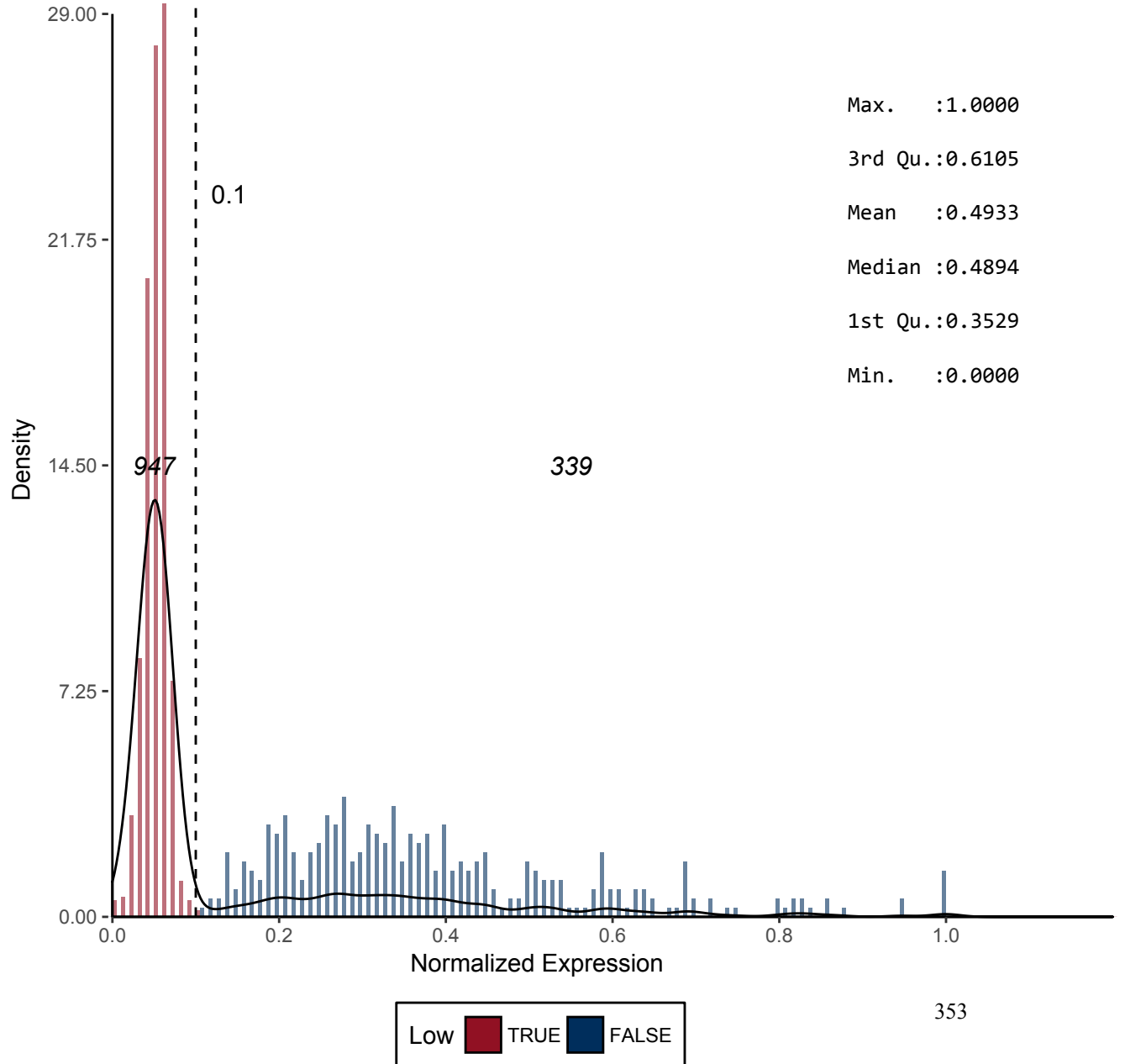


Figure 337 - CD350*

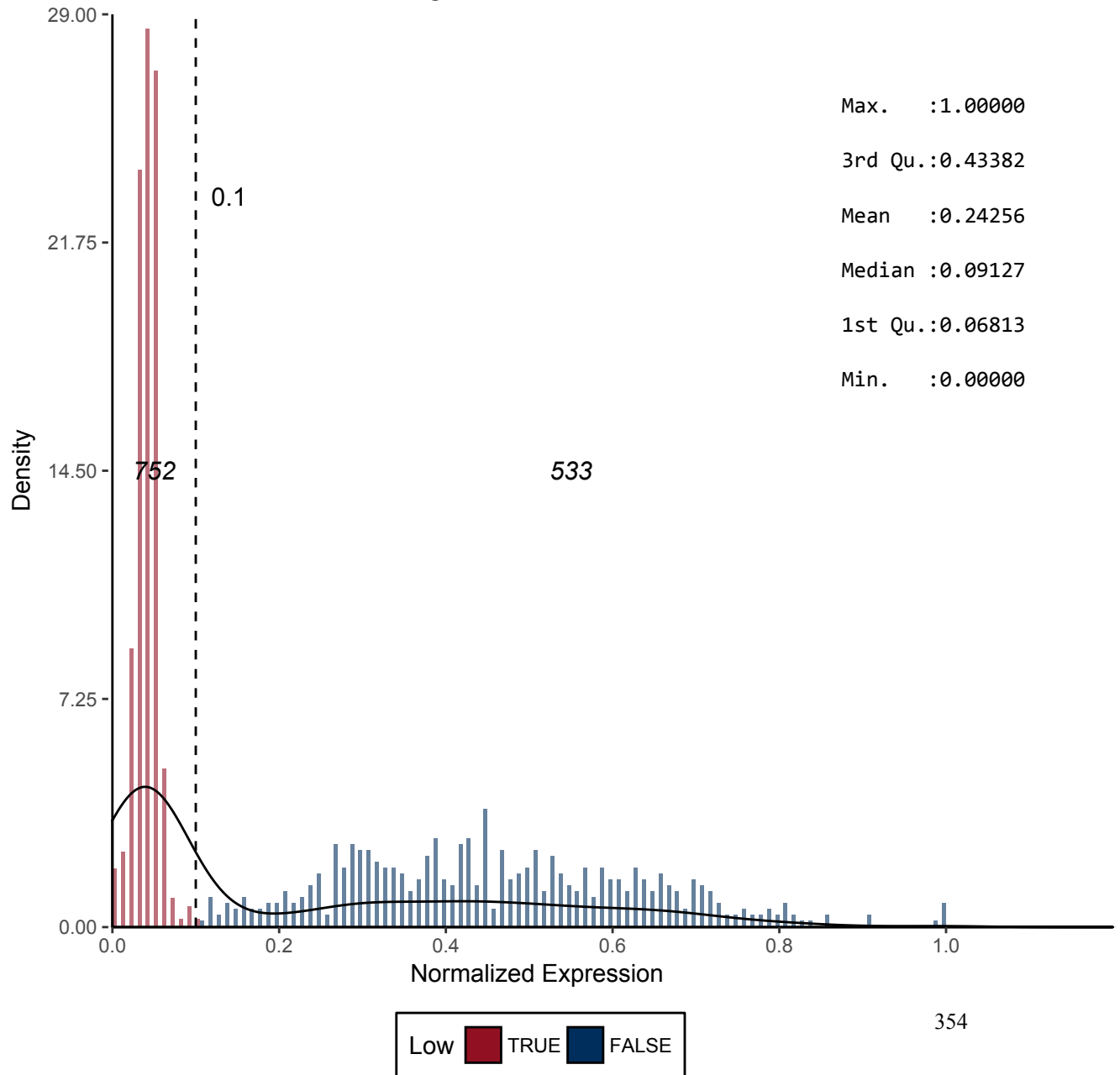


Figure 338 - CD351

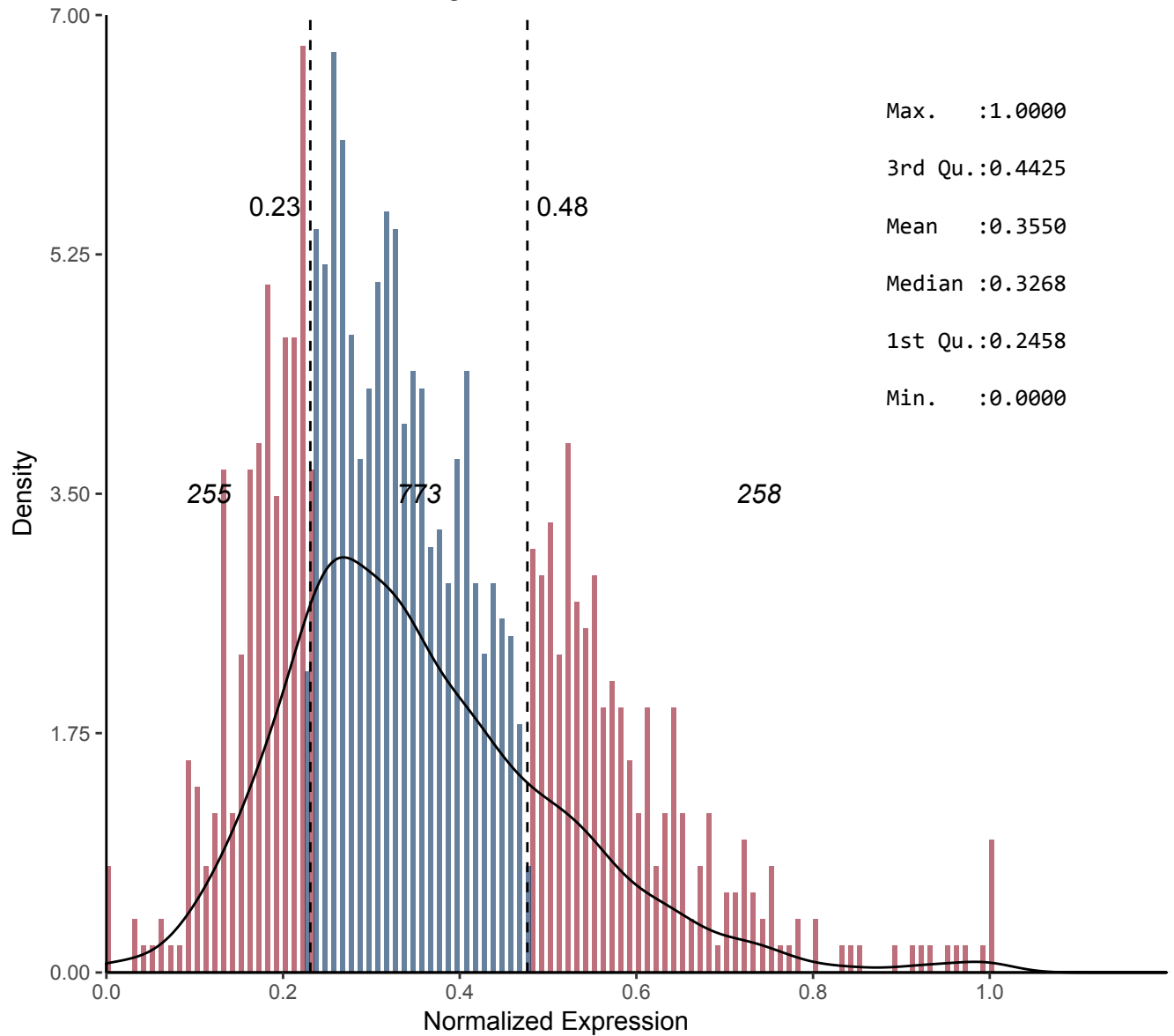


Figure 339 - CD353*

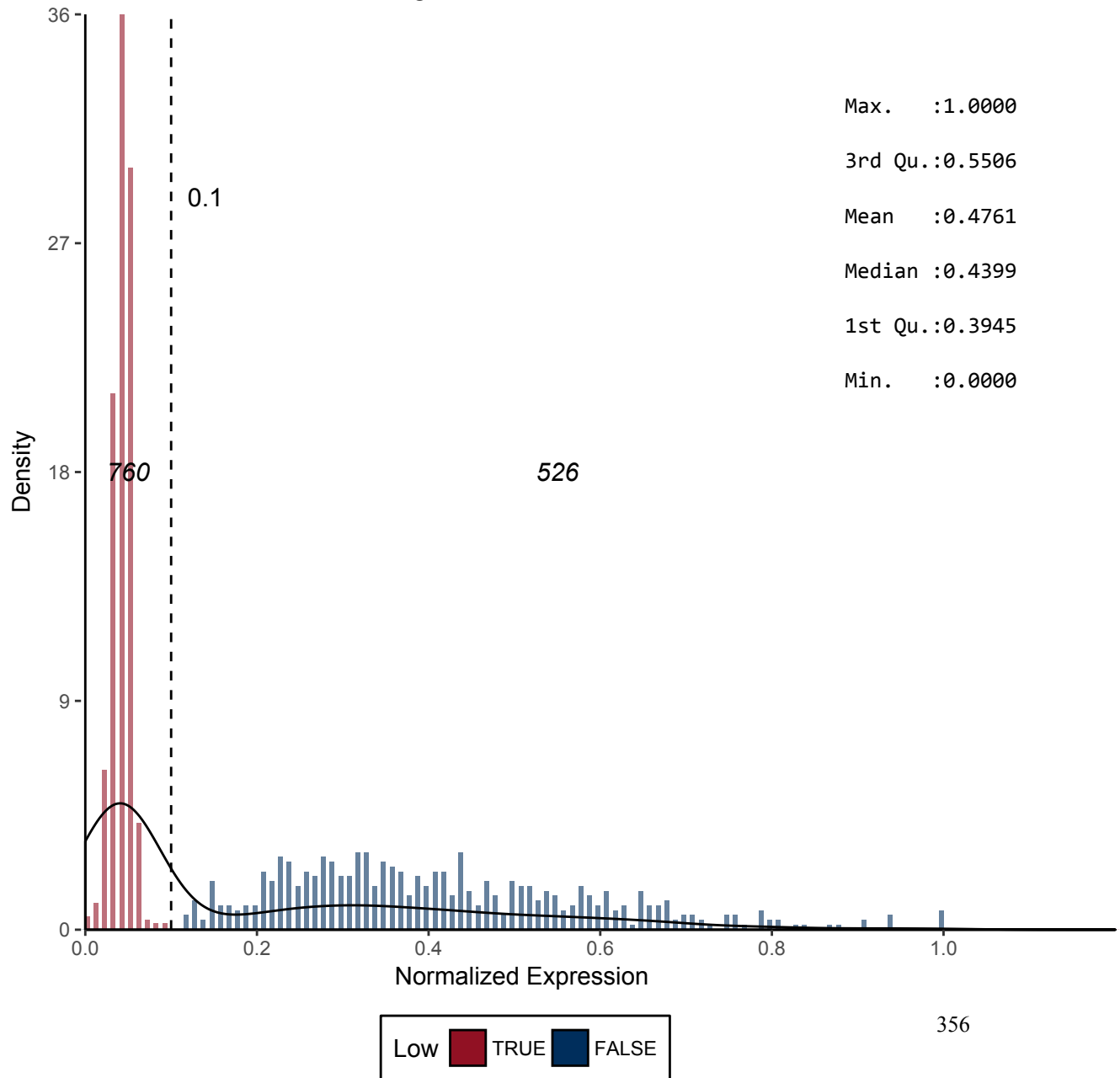


Figure 340 - CD354

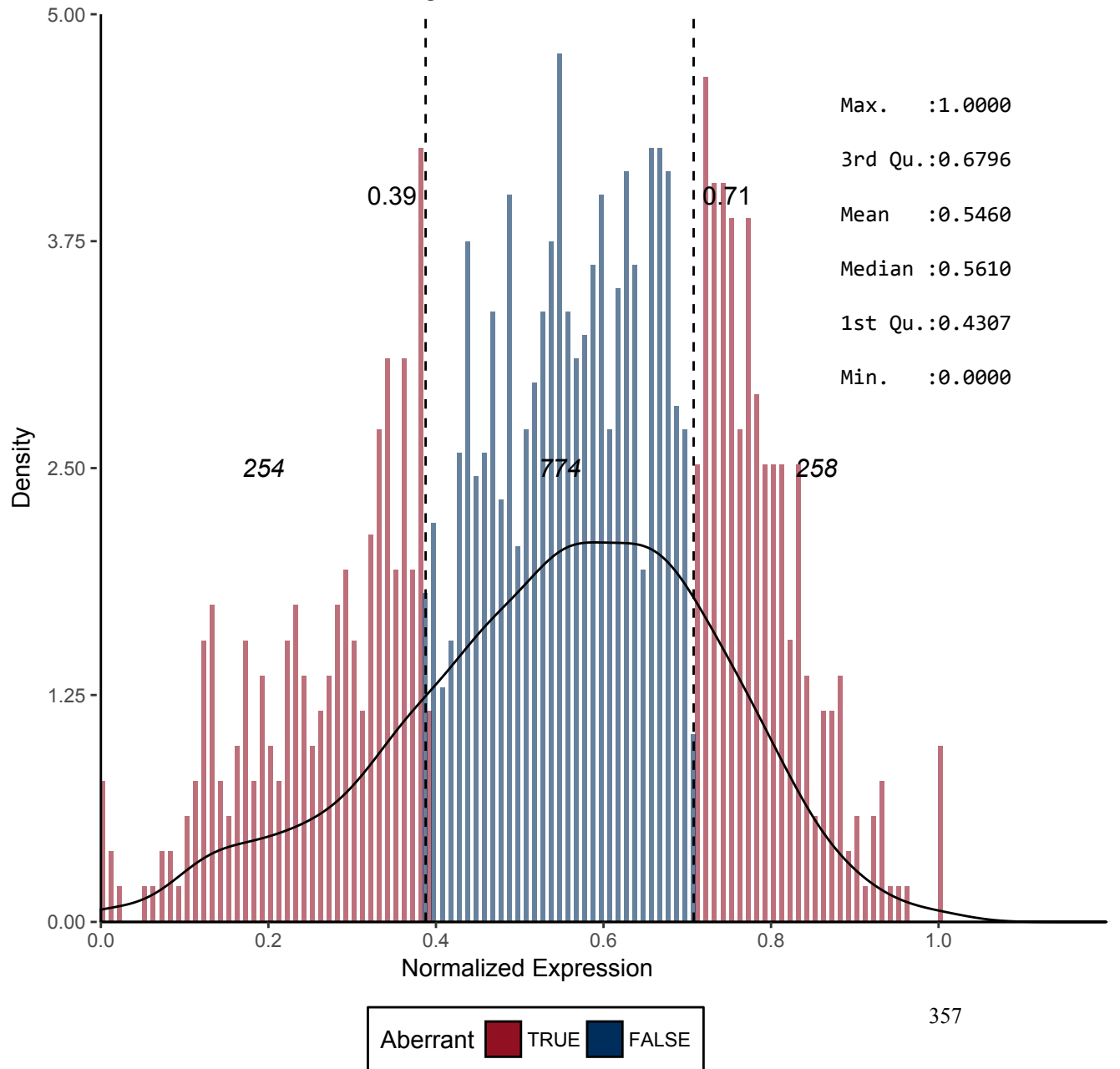


Figure 341 - CD355*

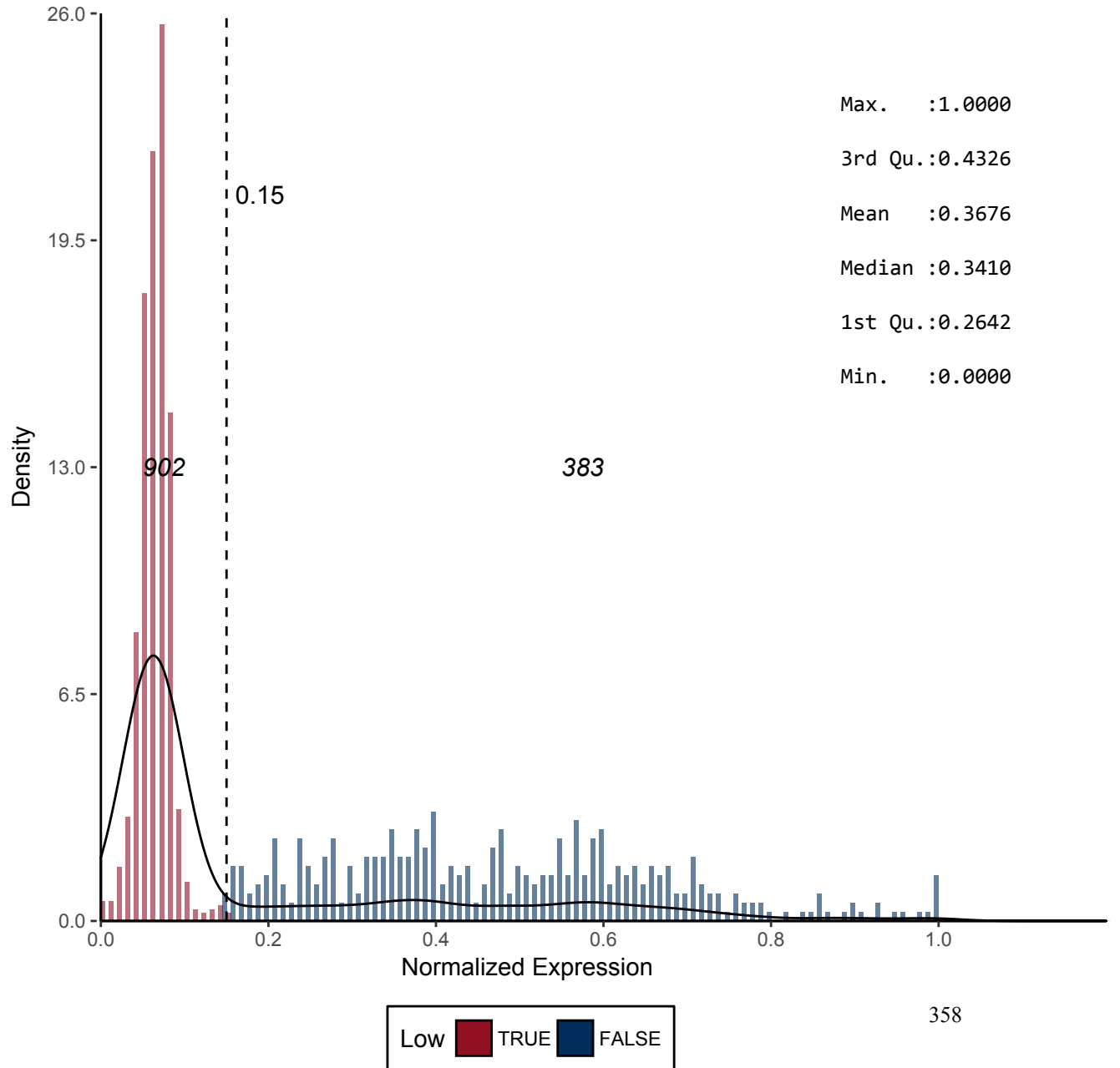


Figure 342 - CD357*

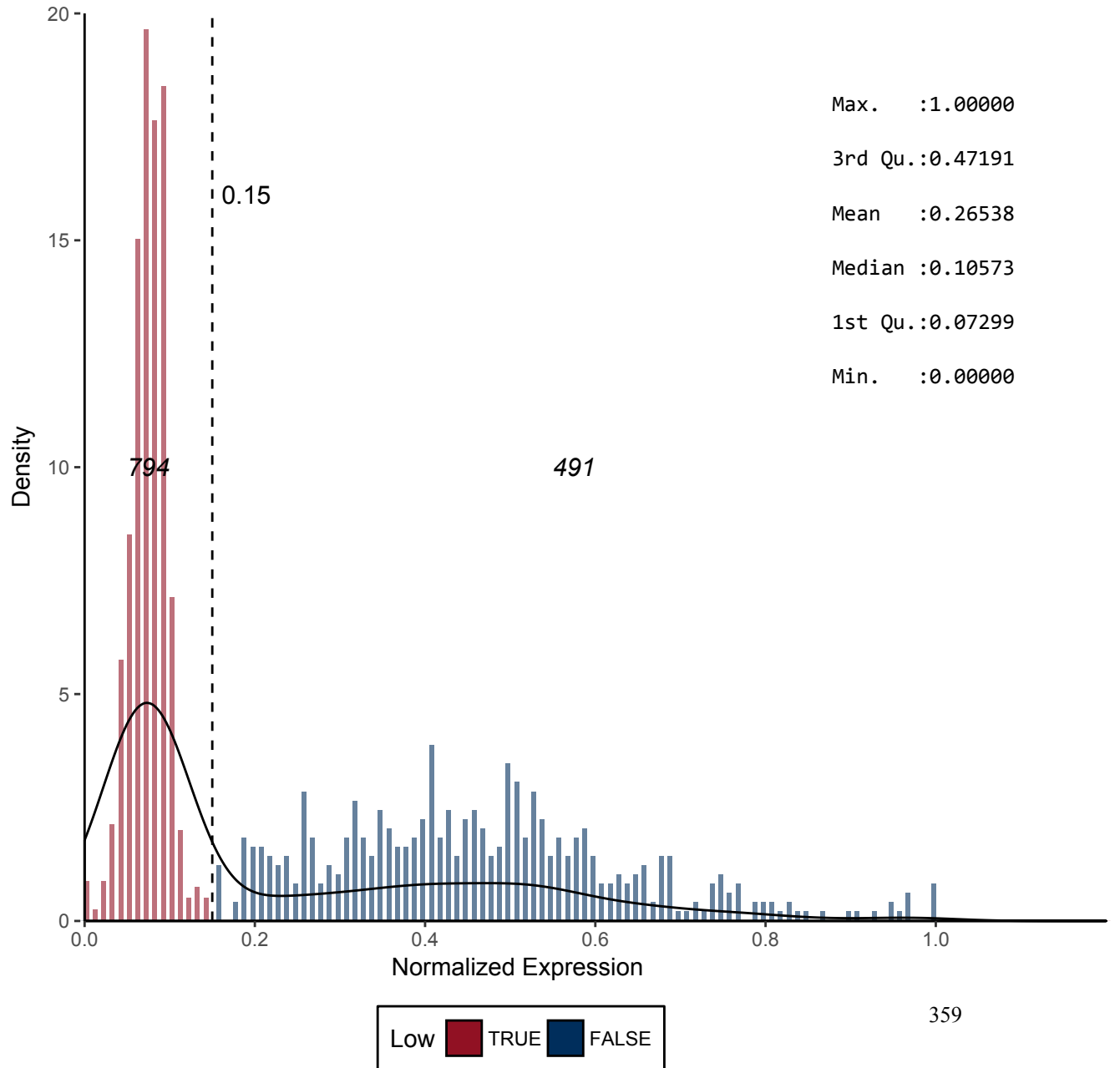
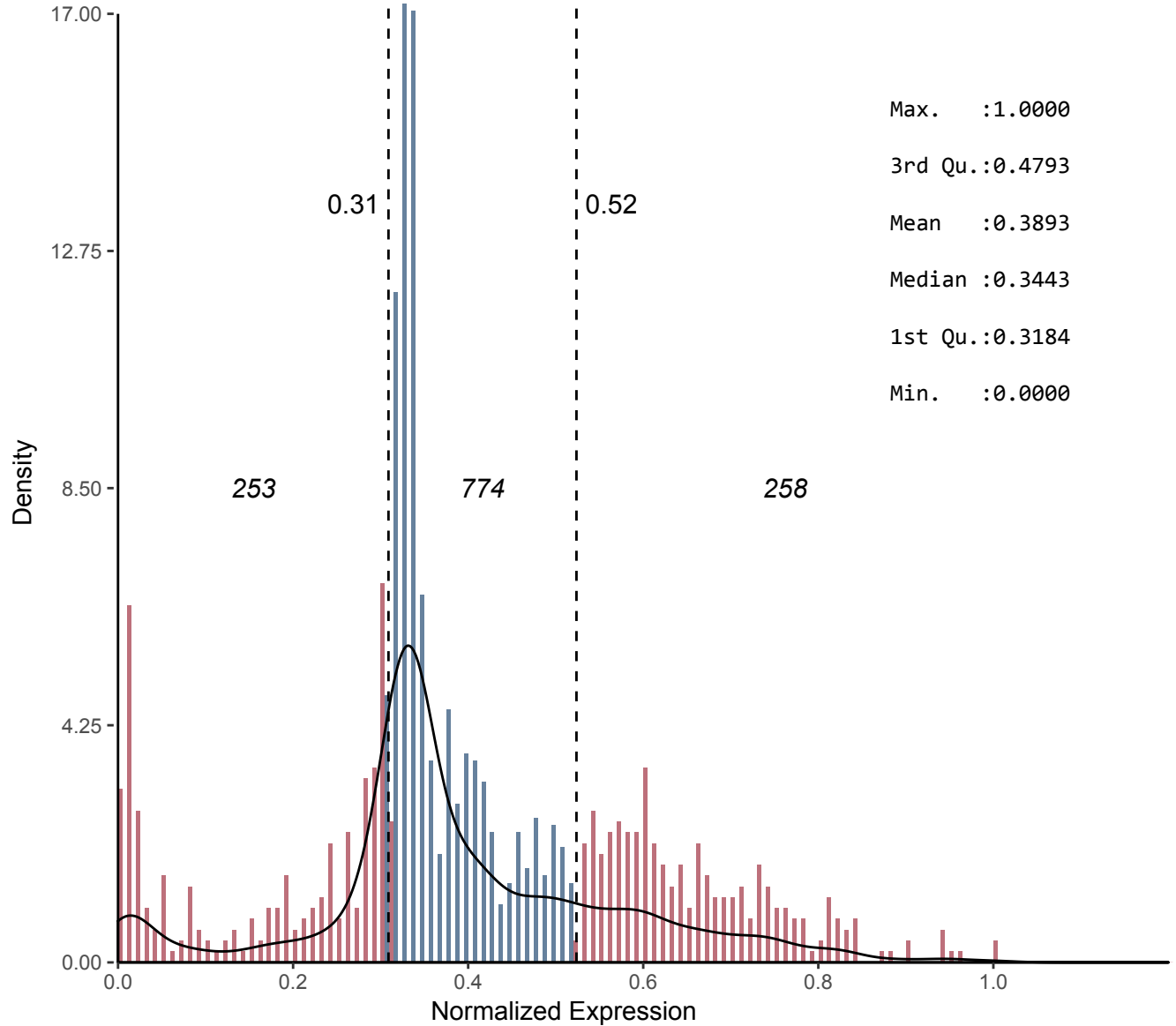


Figure 343 - CD358



Aberrant ■ TRUE ■ FALSE

Figure 344 - CD360

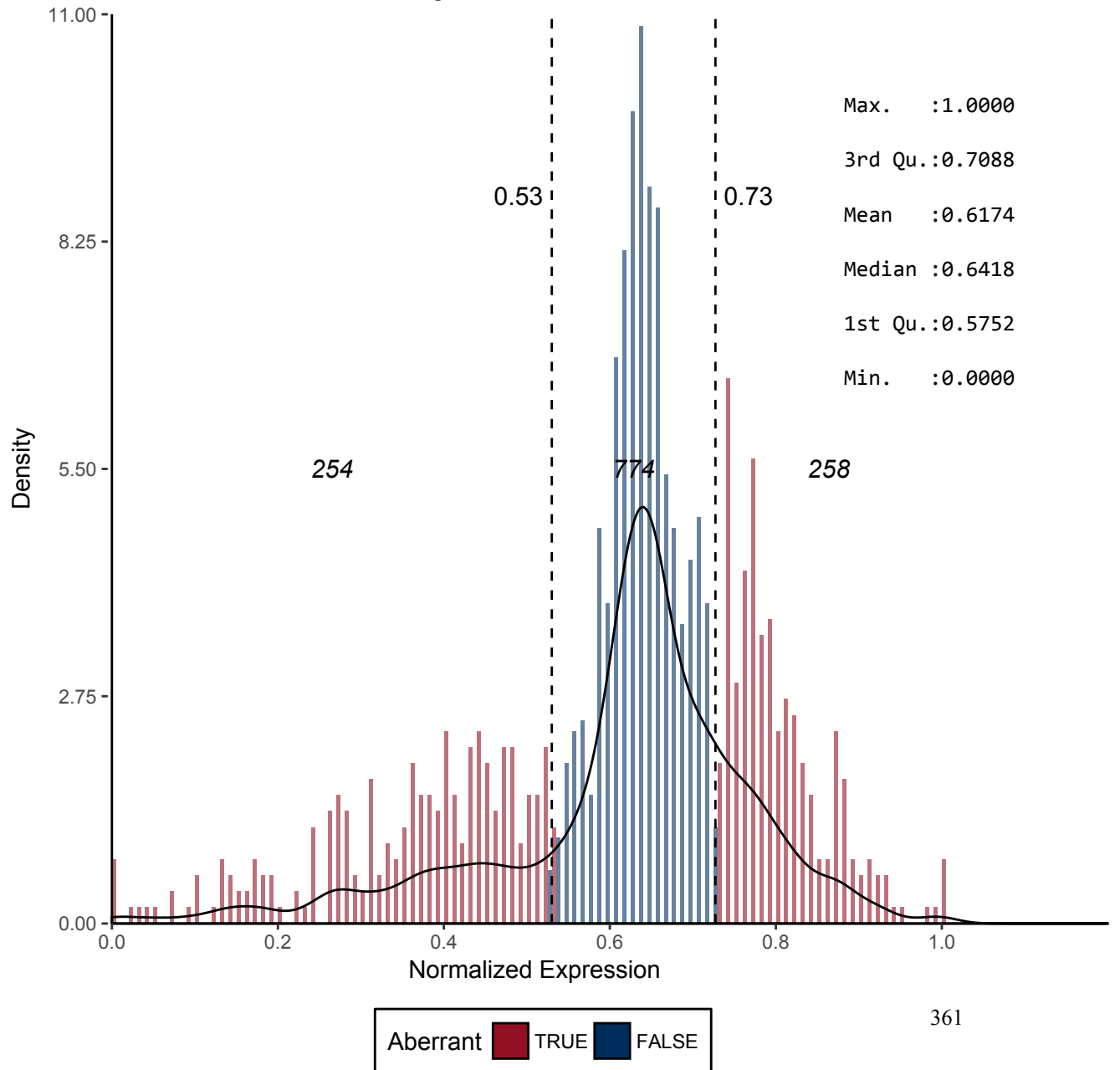
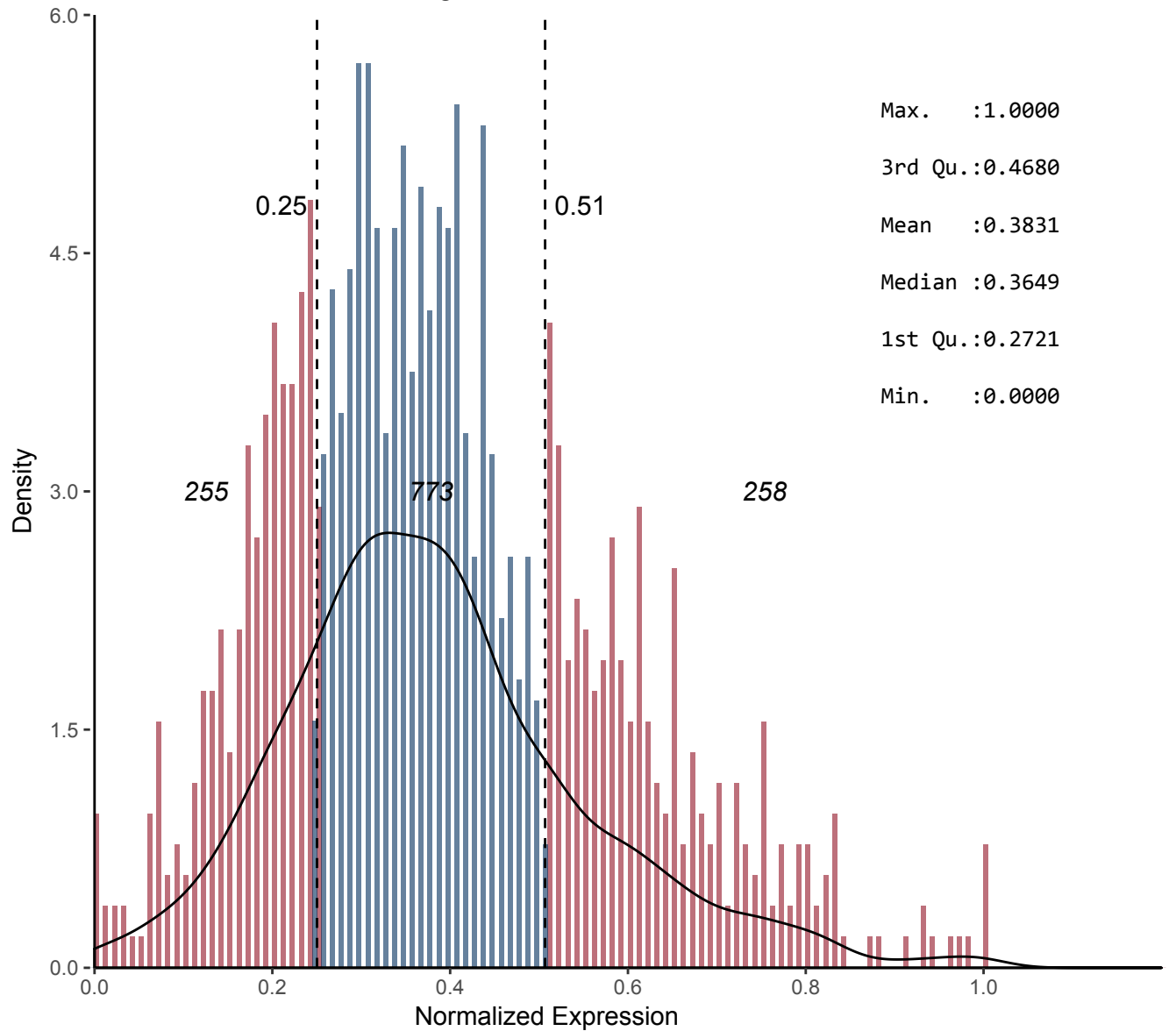


Figure 345 - CD361



Aberrant TRUE FALSE

Figure 346 - CD362

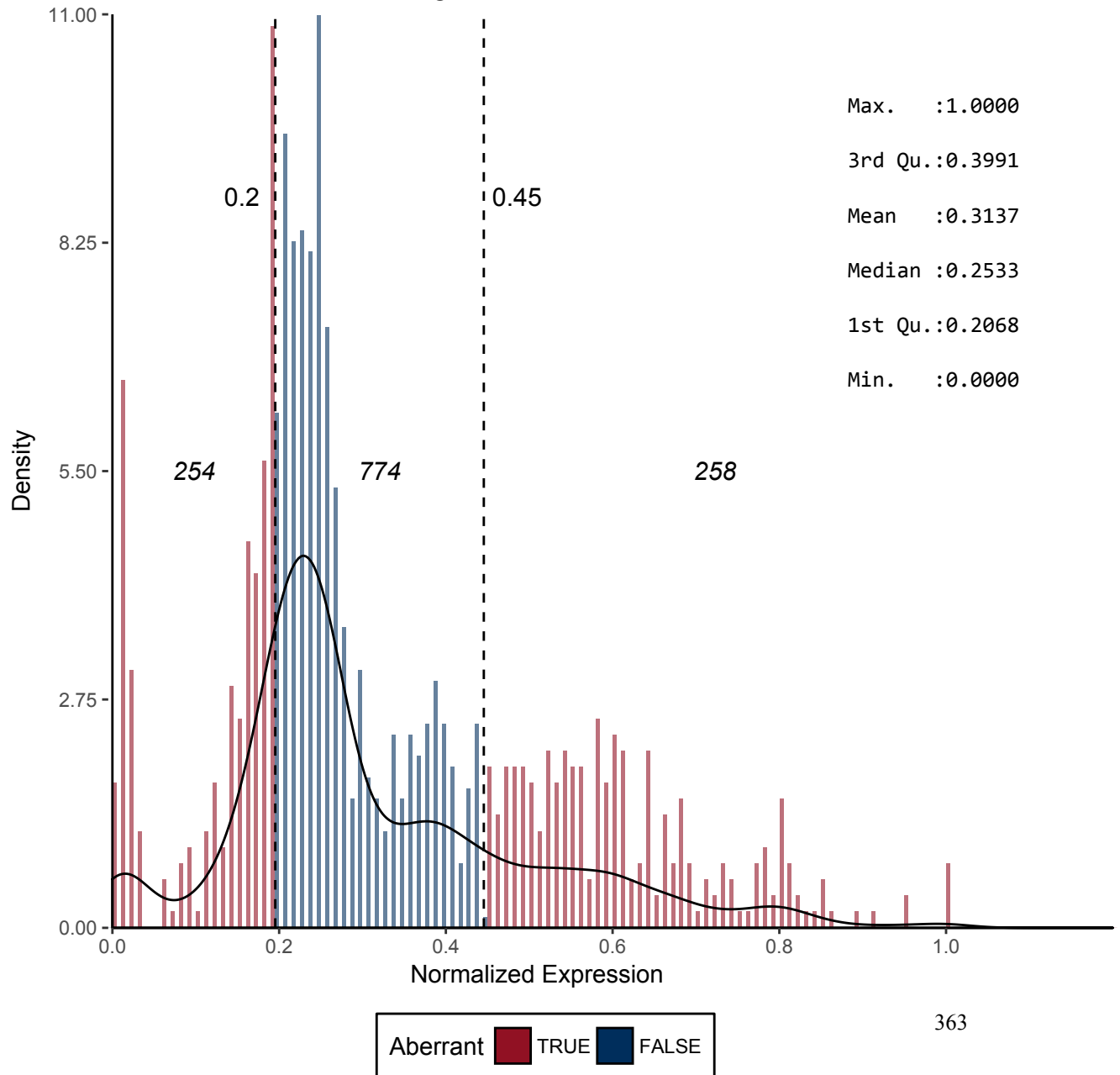


Figure 347 - CD363

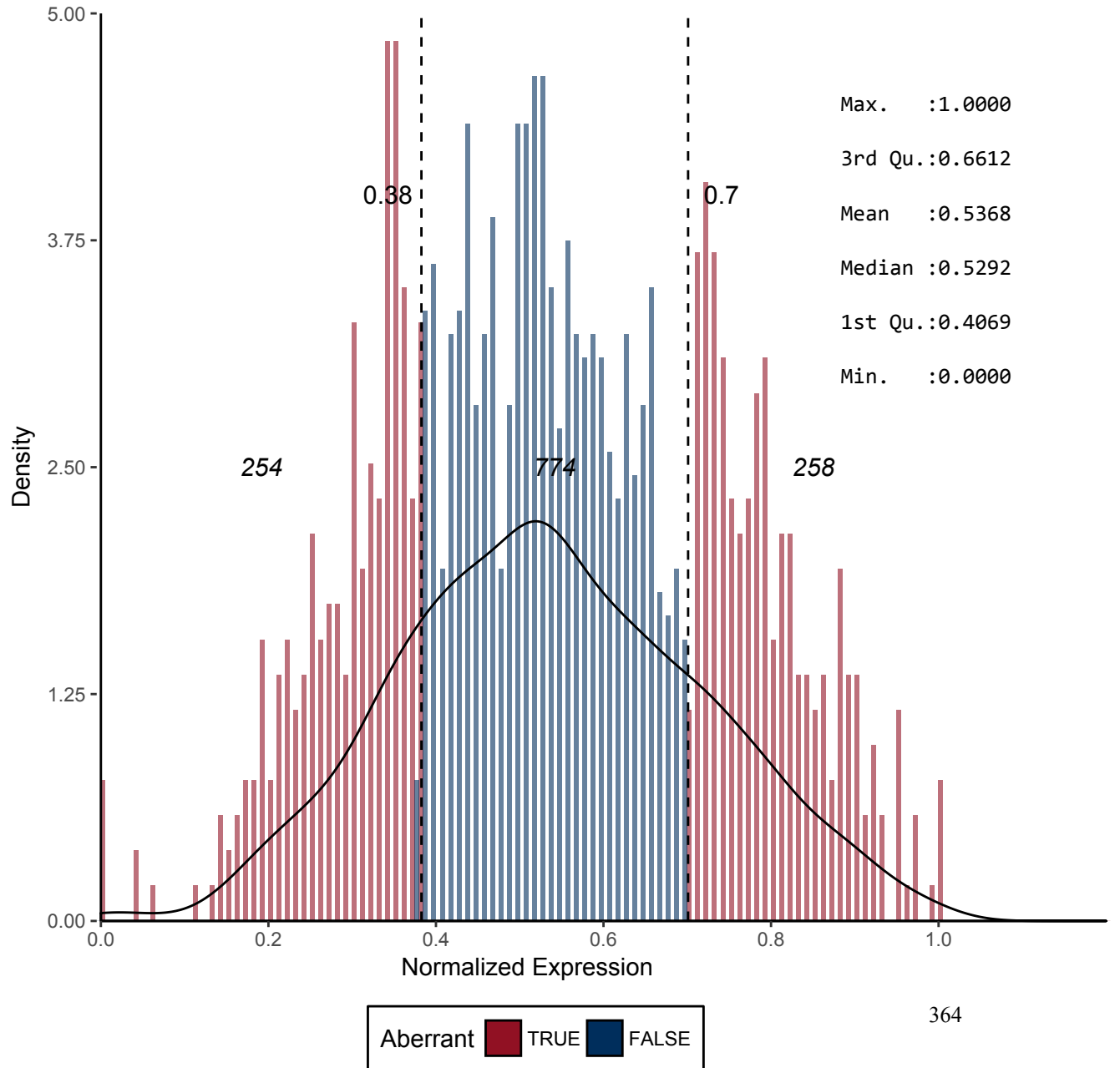


Figure 348 - CD364

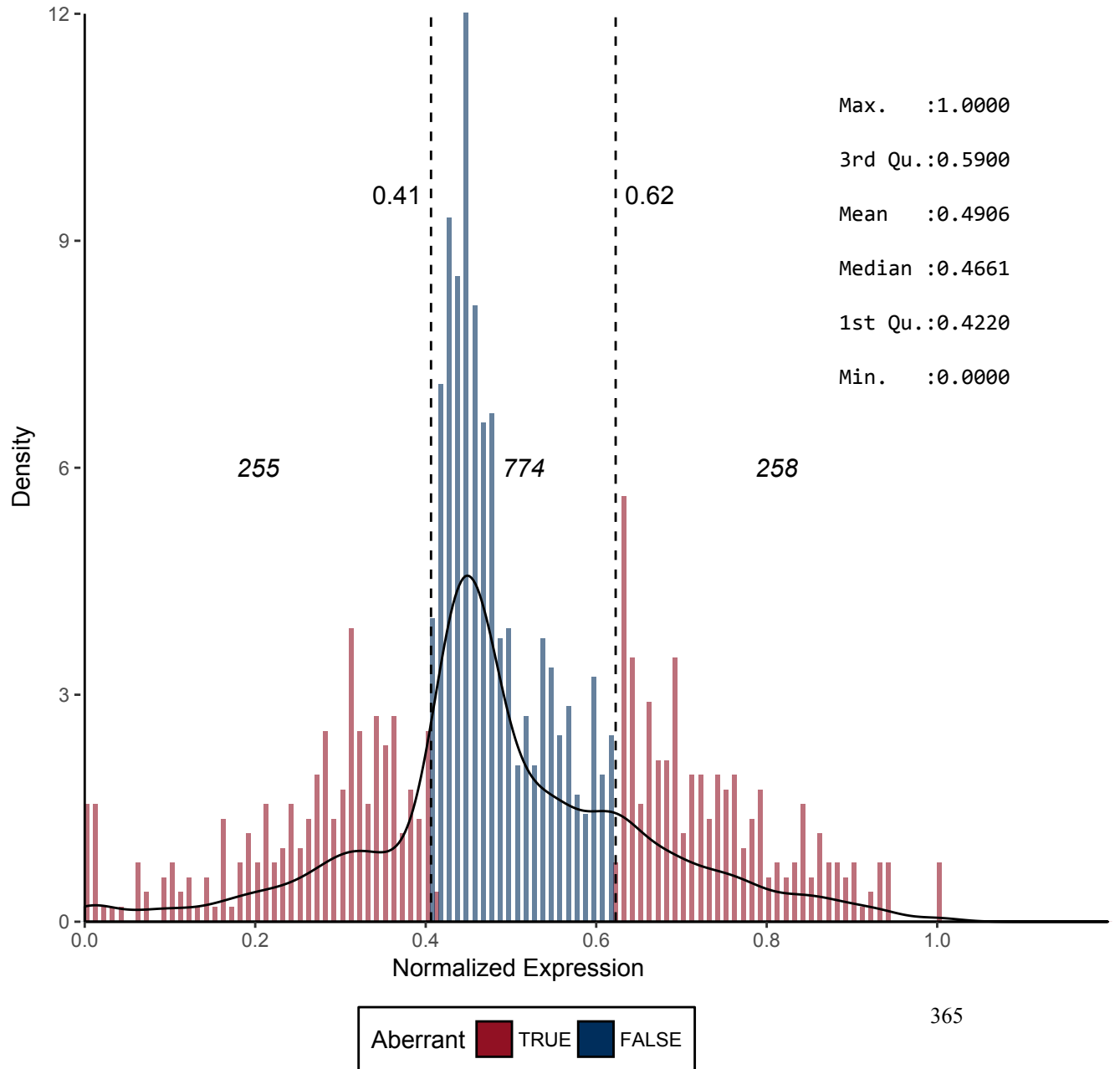


Figure 349 - CD366

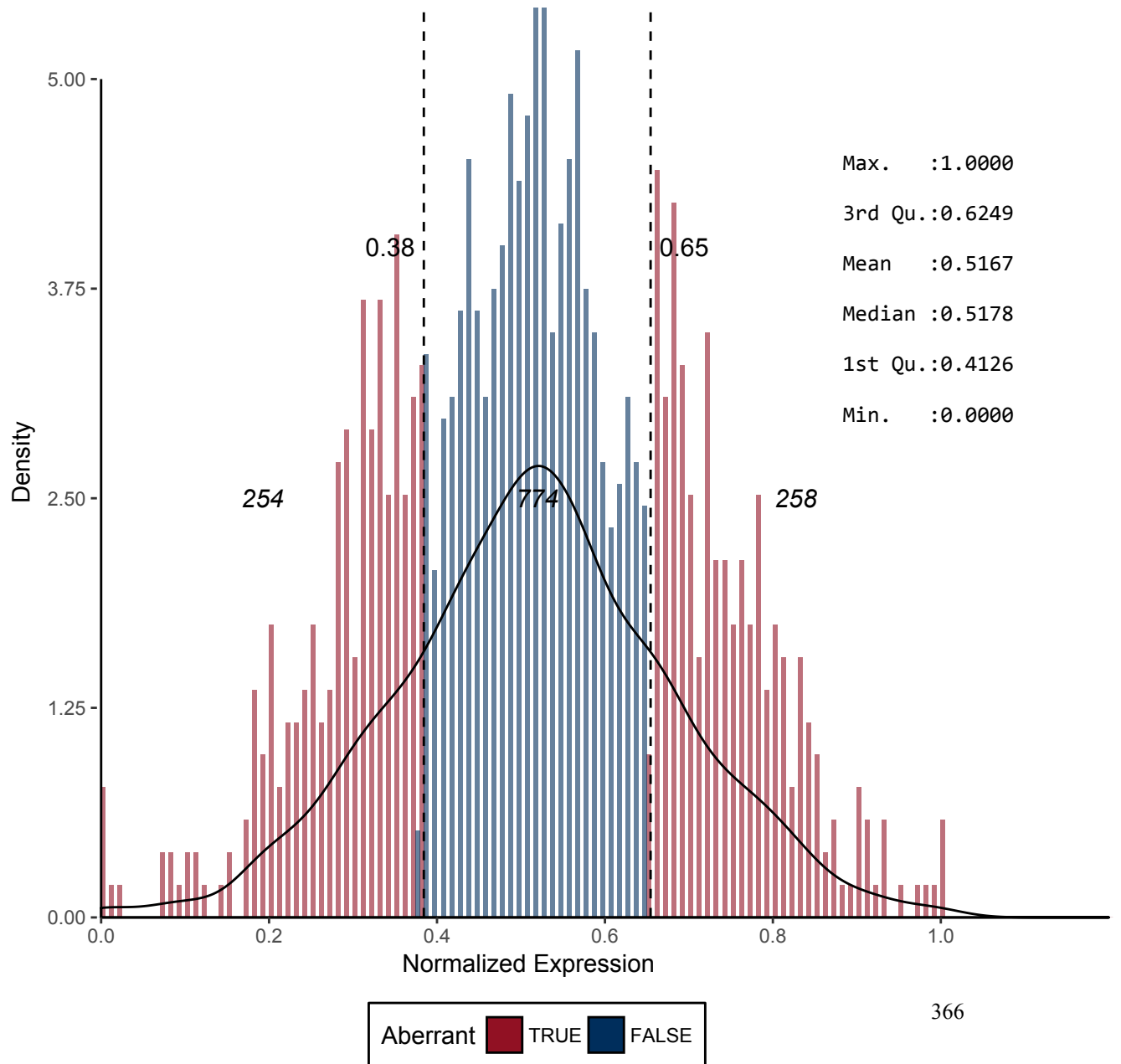


Figure 350 - CD367

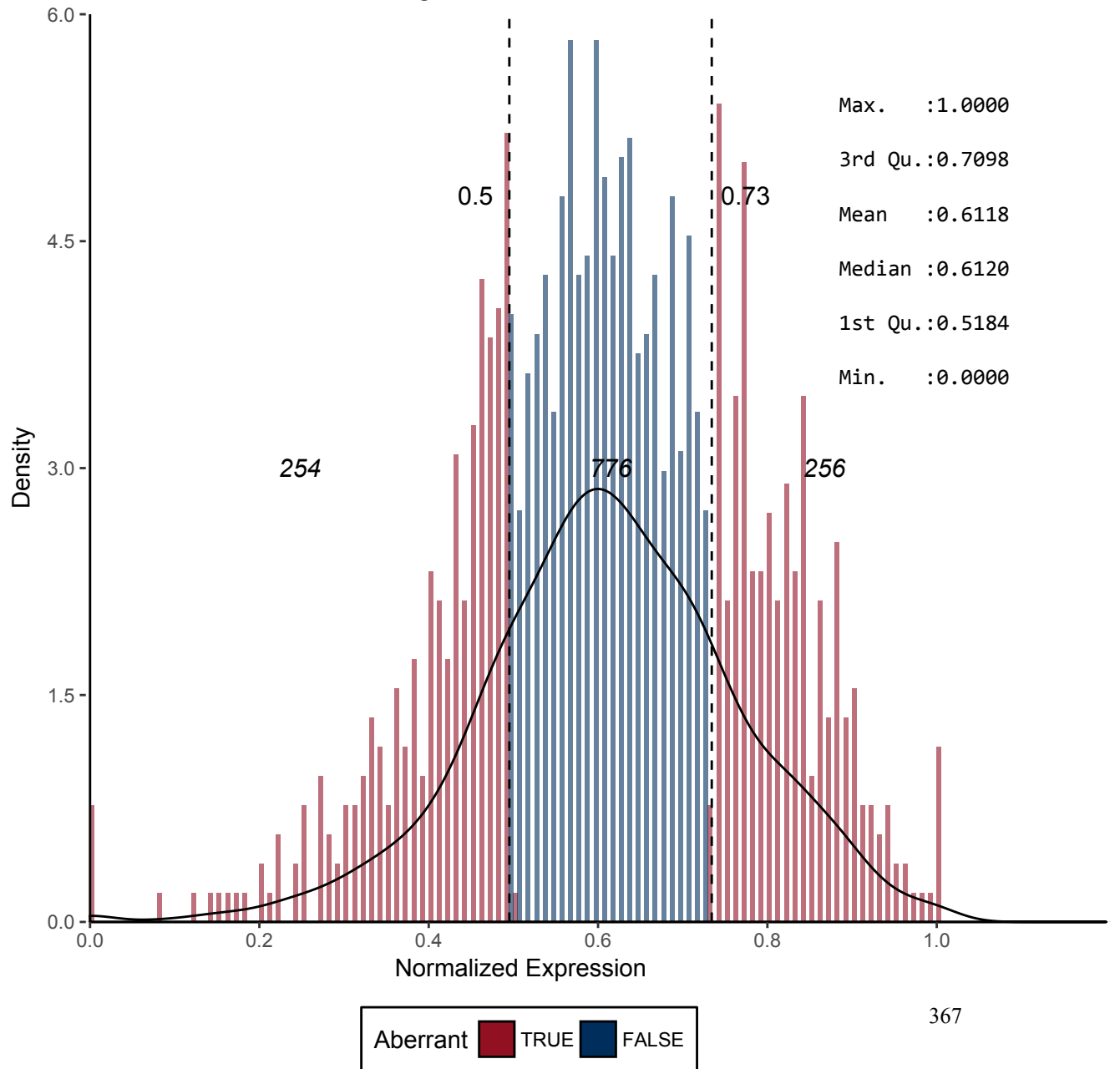


Figure 351 - CD369

