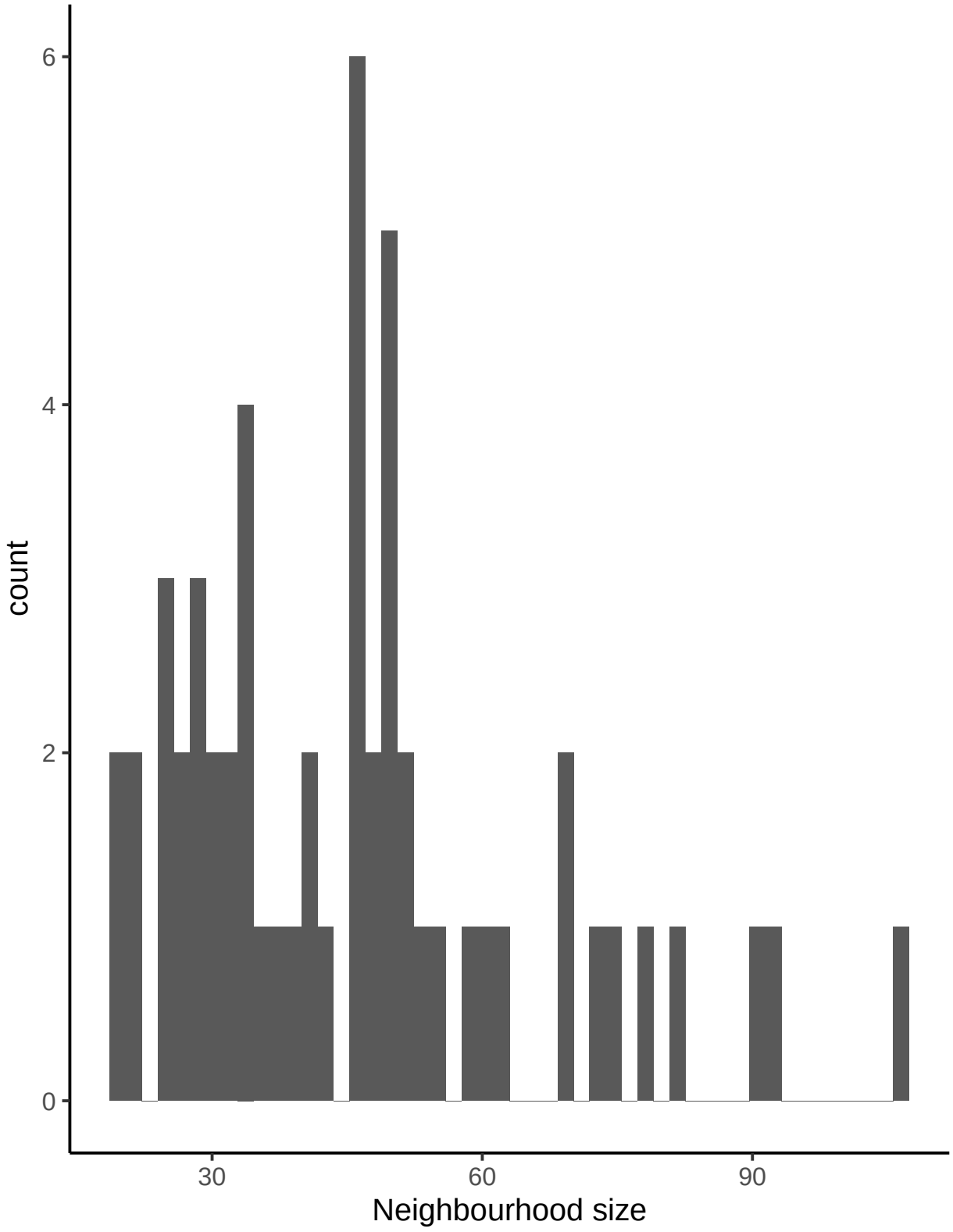
IMPORTANT: This requires R>4.0.0. Run with R=4.0.4. (all other code is developed in 3.6.1).

```
## class: Milo
## dim: 58051 774
## metadata(0):
## assays(2): counts logcounts
## rownames(58051): ENSG00000223972 ENSG00000227232 ... ENSG00000277475
##   ENSG00000268674
## rowData names(0):
## colnames(774):
##   lane6963.AAGAGGCA.AAGGAGTA.cDNA190807.D9.594V.d42.L001.GRCh38.hisat2.bam
##   lane6963.AAGAGGCA.ACTGCATA.cDNA190807.E9.594V.d42.L001.GRCh38.hisat2.bam
##   ...
##   lane7048.TCCTGAGC.TATCCTCT.cDNA190921.G4.637R.d42.L001.GRCh38.hisat2.bam
##   lane7048.TCCTGAGC.TCTCTCCG.cDNA190921.A4.637R.d42.L001.GRCh38.hisat2.bam
## colData names(46): lane i5 ... clusters sample
## reducedDimNames(2): PCA UMAP
## altExpNames(0):
## nhoods dimensions(2): 1 1
## nhoodCounts dimensions(2): 1 1
## nhoodDistances dimension(1): 0
## graph names(0):
## nhoodIndex names(1): 0
## nhoodExpression dimension(2): 1 1
## nhoodReducedDim names(0):
## nhoodGraph names(0):
## nhoodAdjacency dimension(2): 1 1
```




```
## 6 x 38 sparse Matrix of class "dgCMatrix"
##
## 1  2 . . . . 1 . . 4 1 1 . 1 5 1 1 . . . .  . . . 2 . . 3 2 1 . 1 1 . . . 1 . .
```

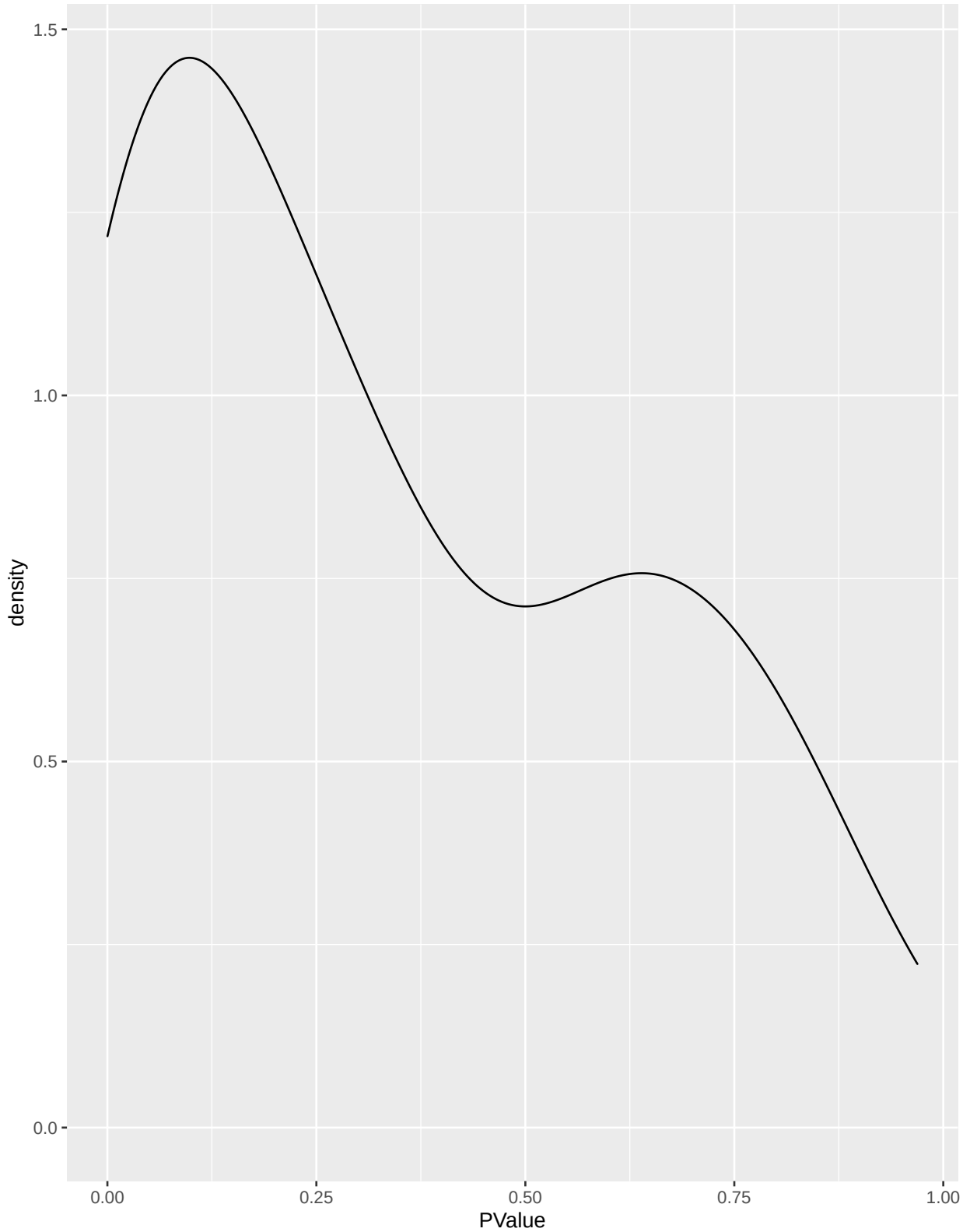
```
## 2 18 1 7 . . 1 . . 2 2 . 2 3 6 . . . . . .  1 . . 3 . . 3 2 1 . . 1 . 5 4 1 . .
## 3  . 2 . . 1 . . . . . . . . . . . . . 1 . . . 16 . . 2 . . 1 . 1 . 4 1 . 3 1 1 1 .
## 4  3 . 2 . 1 1 . . 1 7 . 1 4 4 . . . . . .  . . . 3 . . 4 1 1 . 5 3 . . 5 . . .
## 5  1 4 . 1 5 4 7 2 1 3 1 6 . . . . 3 . . .  . . . . . . . . . . . . 4 . 1 1 2 1 .
## 6  . . . . . . . . 1 . 6 2 1 . 4 1 . . . . .  . . . 1 1 . 2 2 2 . 5 1 . . 2 3 . .
```

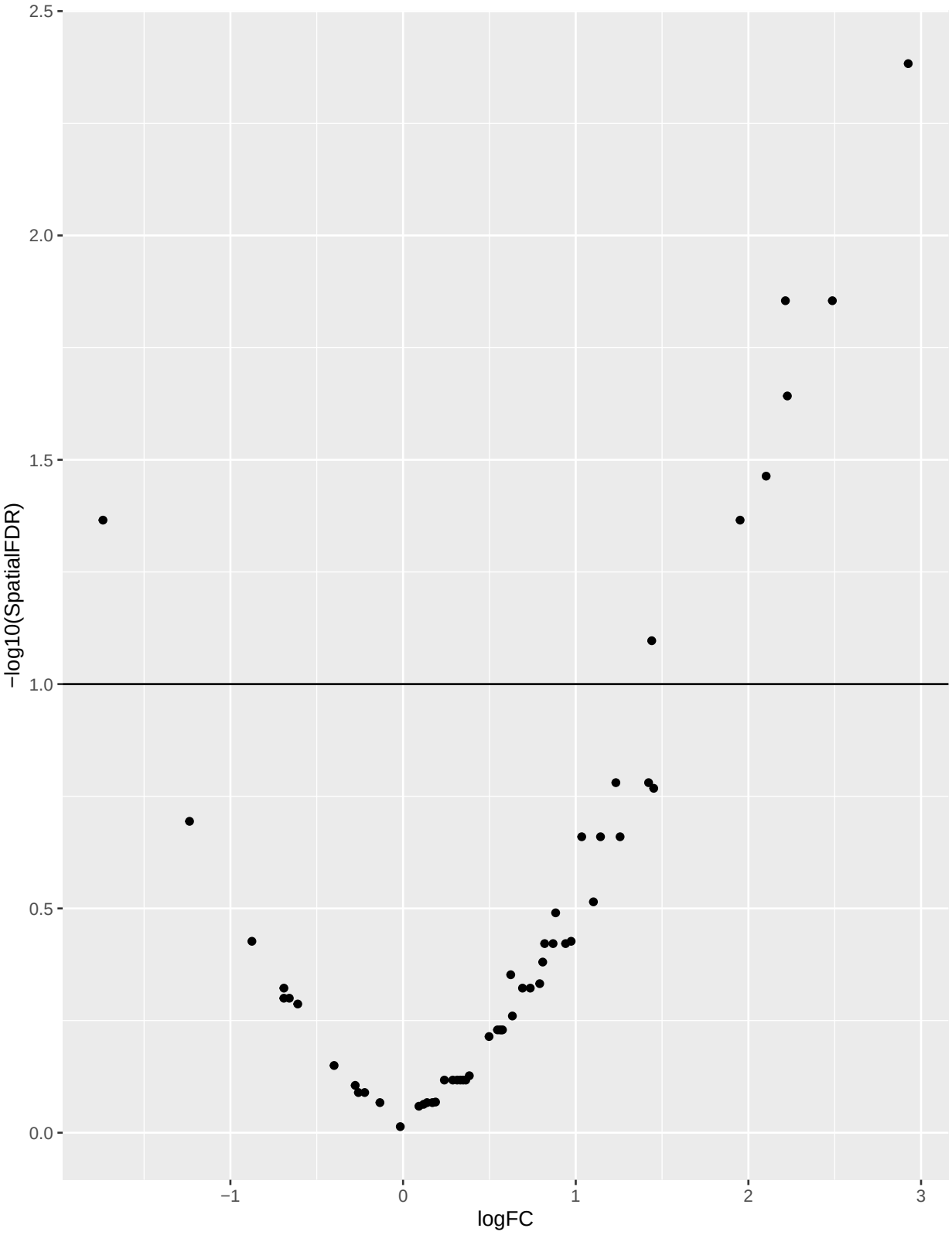
```
##          phenotype  PID   age day   sample
## 594V d42 young d42 594V young d42 594V d42
## 545R d42   old d42 545R   old d42 545R d42
## 594V d0   young d0 594V young  d0  594V d0
## 545R d0     old d0 545R   old  d0  545R d0
## 562K d42 young d42 562K young d42 562K d42
## 543P d42   old d42 543P   old d42 543P d42
```

	logFC	logCPM	F	PValue	FDR	Nhood	SpatialFDR
1	1.42200643	15.42574	4.639716292	3.136051e-02	0.172482794	1	0.165834384
2	0.82013820	15.88891	2.023790884	1.550097e-01	0.387524130	2	0.378787460
3	1.25682776	15.52615	3.691965421	5.481856e-02	0.222510645	3	0.218902305
4	2.22569846	15.67237	9.789613338	1.780565e-03	0.024482769	4	0.022791203
5	-0.01612801	15.71831	0.001506525	9.690426e-01	0.969042614	5	0.969042614
6	1.10243913	15.54412	2.868094847	9.050906e-02	0.311124881	6	0.305725045
7	0.62355967	16.24616	1.649157993	1.992238e-01	0.456554568	7	0.444470382
8	0.73663468	15.39667	1.377559067	2.406585e-01	0.483379399	8	0.476070282
9	-0.65892926	15.54236	1.184800115	2.765134e-01	0.506941268	9	0.501351335
10	0.69166983	15.77923	1.346196348	2.460841e-01	0.483379399	10	0.476070282
11	0.88361732	15.98812	2.672282548	1.022684e-01	0.330868503	11	0.323460651
12	0.31322297	15.44510	0.246721289	6.194484e-01	0.764180904	12	0.763103572
13	1.95202000	15.40622	7.949060290	4.859107e-03	0.043726039	13	0.043103609
14	-0.60993893	15.81253	1.104871381	2.933278e-01	0.520420270	14	0.516493659
15	-0.69017507	15.79353	1.383403388	2.396637e-01	0.483379399	15	0.476070282
16	0.09183710	16.11418	0.032677062	8.565682e-01	0.872430573	16	0.872761964
17	0.34783652	15.32346	0.309014013	5.783487e-01	0.764180904	17	0.763103572
18	0.23913896	16.22247	0.238647293	6.252389e-01	0.764180904	18	0.763103572
19	0.33176305	15.65060	0.268669294	6.042837e-01	0.764180904	19	0.763103572
20	0.97332752	15.53156	2.290176698	1.303547e-01	0.382535224	20	0.374334542
21	-1.23680055	15.54462	4.026446562	4.492793e-02	0.205919693	21	0.202237935
22	2.10280976	15.58024	8.641443004	3.324071e-03	0.036564785	22	0.034390042
23	0.63309524	15.52637	0.981789733	3.218784e-01	0.553228532	23	0.549239559
24	0.80883516	15.76860	1.810301570	1.786261e-01	0.427149409	24	0.416448014
25	2.48633191	15.69208	11.906552153	5.710978e-04	0.015247513	25	0.013977424
26	0.28775485	15.76364	0.242588267	6.223976e-01	0.764180904	26	0.763103572
27	0.56045887	15.66102	0.757600562	3.841860e-01	0.592510656	27	0.589829389
28	-0.39946336	15.69629	0.473825014	4.913134e-01	0.711111448	28	0.708114437
29	0.94120029	15.38708	2.082021469	1.492009e-01	0.387524130	29	0.378787460
30	1.03470902	15.97956	3.591871146	5.820836e-02	0.222510645	30	0.218902305
31	-0.25873537	15.48870	0.152209748	6.964745e-01	0.813080510	31	0.813511633
32	2.92567253	15.69756	15.508876656	8.496136e-05	0.004672875	32	0.004140015
33	-0.69044727	15.64187	1.201653490	2.731248e-01	0.506941268	33	0.501351335
34	1.14347050	15.85454	3.522590042	6.068472e-02	0.222510645	34	0.218902305
35	0.36311011	15.51534	0.339800686	5.600107e-01	0.764180904	35	0.763103572
36	2.21441237	15.75421	11.203557821	8.316825e-04	0.015247513	36	0.013977424
37	0.38367463	15.52652	0.393927278	5.303146e-01	0.747879595	37	0.746332944
38	0.18814280	15.69912	0.091987842	7.616969e-01	0.854243220	38	0.854282361
39	0.79132857	15.45800	1.531595163	2.160199e-01	0.475243856	39	0.465259264

```
## 40  0.11895473 15.88093  0.045078926 8.318808e-01 0.863272550    40 0.864327719
## 41  0.16966869 15.48147  0.079053562 7.786135e-01 0.854243220    41 0.856669795
## 42 -0.27715758 15.65202  0.197865162 6.564982e-01 0.784943489    42 0.784256457
## 43  0.57568786 15.65923  0.815397455 3.666391e-01 0.592510656    43 0.589829389
## 44  0.56926930 15.54910  0.794193397 3.729434e-01 0.592510656    44 0.589829389
## 45 -0.87548745 15.74837  2.268953300 1.321485e-01 0.382535224    45 0.374334542
## 46  1.23246413 15.91818  4.656699948 3.105249e-02 0.172482794    46 0.165834384
## 47 -1.73812075 15.43002  7.702869353 5.565132e-03 0.043726039    47 0.043103609
## 48  0.54684941 15.48238  0.746078848 3.878252e-01 0.592510656    48 0.589829389
## 49  0.49805183 15.72313  0.672426934 4.123054e-01 0.612886474    49 0.610387953
## 50 -0.13402600 15.33335  0.059563813 8.072120e-01 0.854243220    50 0.856669795
## 51 -0.22224523 15.77778  0.138719160 7.095975e-01 0.813080510    51 0.813511633
## 52  0.13888488 15.94343  0.059289216 8.076481e-01 0.854243220    52 0.856669795
## 53  1.44019170 15.94495  6.337048783 1.190252e-02 0.081829811    53 0.080038341
## 54  0.86865806 15.77722  2.127091537 1.448737e-01 0.387524130    54 0.378787460
## 55  1.45170890 15.65917  4.439528904 3.524142e-02 0.176207088    55 0.170716261
```

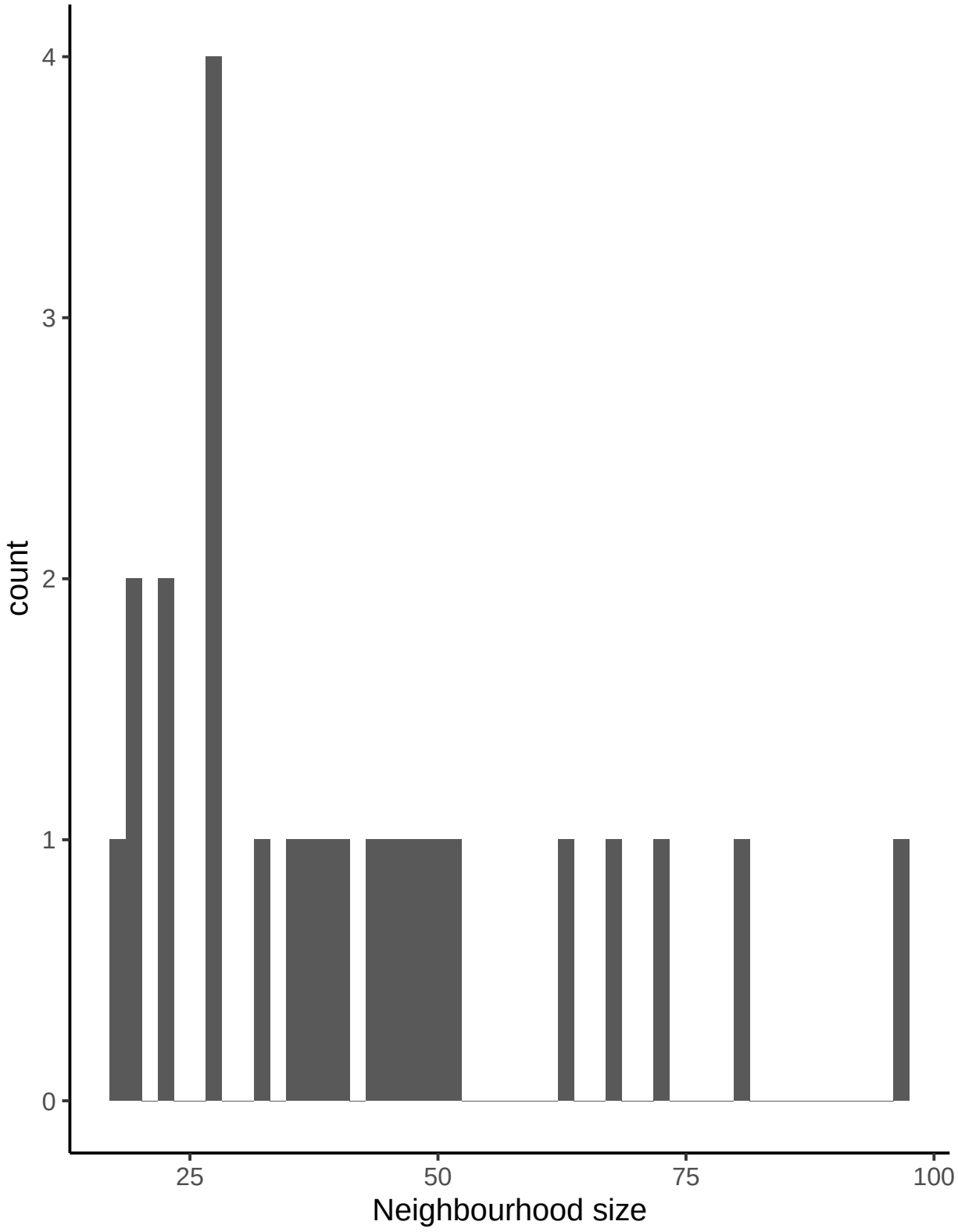
```
##       logFC   logCPM         F       PValue         FDR Nhood  SpatialFDR
## 32 2.925673 15.69756 15.508877 8.496136e-05 0.004672875    32 0.004140015
## 25 2.486332 15.69208 11.906552 5.710978e-04 0.015247513    25 0.013977424
## 36 2.214412 15.75421 11.203558 8.316825e-04 0.015247513    36 0.013977424
## 4  2.225698 15.67237  9.789613 1.780565e-03 0.024482769     4 0.022791203
## 22 2.102810 15.58024  8.641443 3.324071e-03 0.036564785    22 0.034390042
## 13 1.952020 15.40622  7.949060 4.859107e-03 0.043726039    13 0.043103609
```


1.5
1.0
0.5
0.0
density
0.00
0.25
0.50
0.75
1.00
PValue




```
## class: Milo
## dim: 58051 347
## metadata(0):
```

```
## assays(2): counts logcounts
## rownames(58051): ENSG00000223972 ENSG00000227232 ... ENSG00000277475
##   ENSG00000268674
## rowData names(0):
## colnames(347):
##   lane6963.AGGCAGAA.AAGGAGTA.cDNA190807.D3.545R.d42.L001.GRCh38.hisat2.bam
##   lane6963.AGGCAGAA.ACTGCATA.cDNA190807.E3.545R.d42.L001.GRCh38.hisat2.bam
##   ...
##   lane7048.TAAGGCGA.GTAAGGAG.cDNA190921.F1.543P.d42.L001.GRCh38.hisat2.bam
##   lane7048.TAAGGCGA.TATCCTCT.cDNA190921.G1.543P.d42.L001.GRCh38.hisat2.bam
## colData names(46): lane i5 ... clusters sample
## reducedDimNames(2): PCA UMAP
## altExpNames(0):
## nhoods dimensions(2): 1 1
## nhoodCounts dimensions(2): 1 1
## nhoodDistances dimension(1): 0
## graph names(0):
## nhoodIndex names(1): 0
## nhoodExpression dimension(2): 1 1
## nhoodReducedDim names(0):
## nhoodGraph names(0):
## nhoodAdjacency dimension(2): 1 1
```



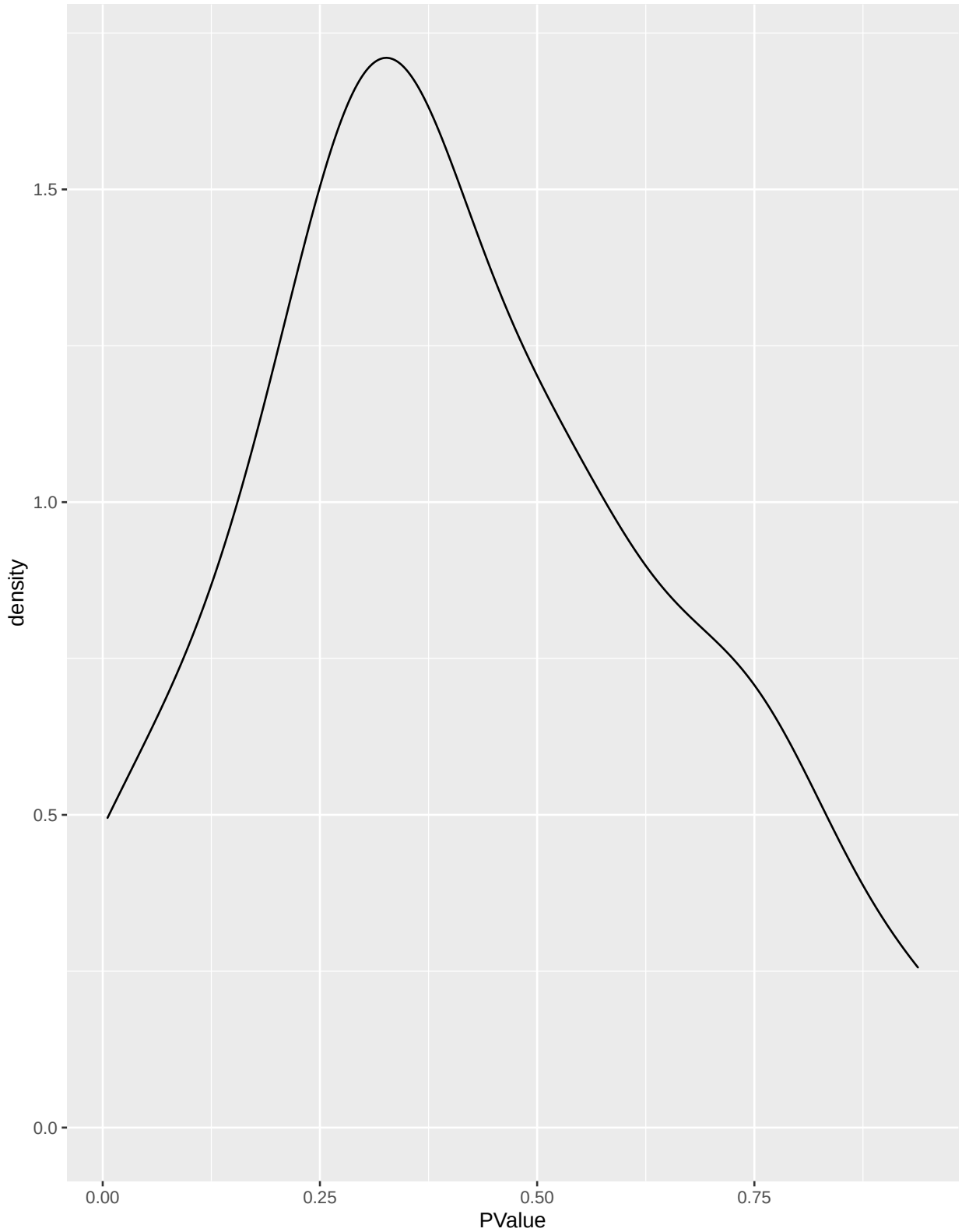

```
## 6 x 19 sparse Matrix of class "dgCMatrix"
##
## 1 1 .  8 1  6 2  3 .  . . . . . 2 .  4 2  3 .
```

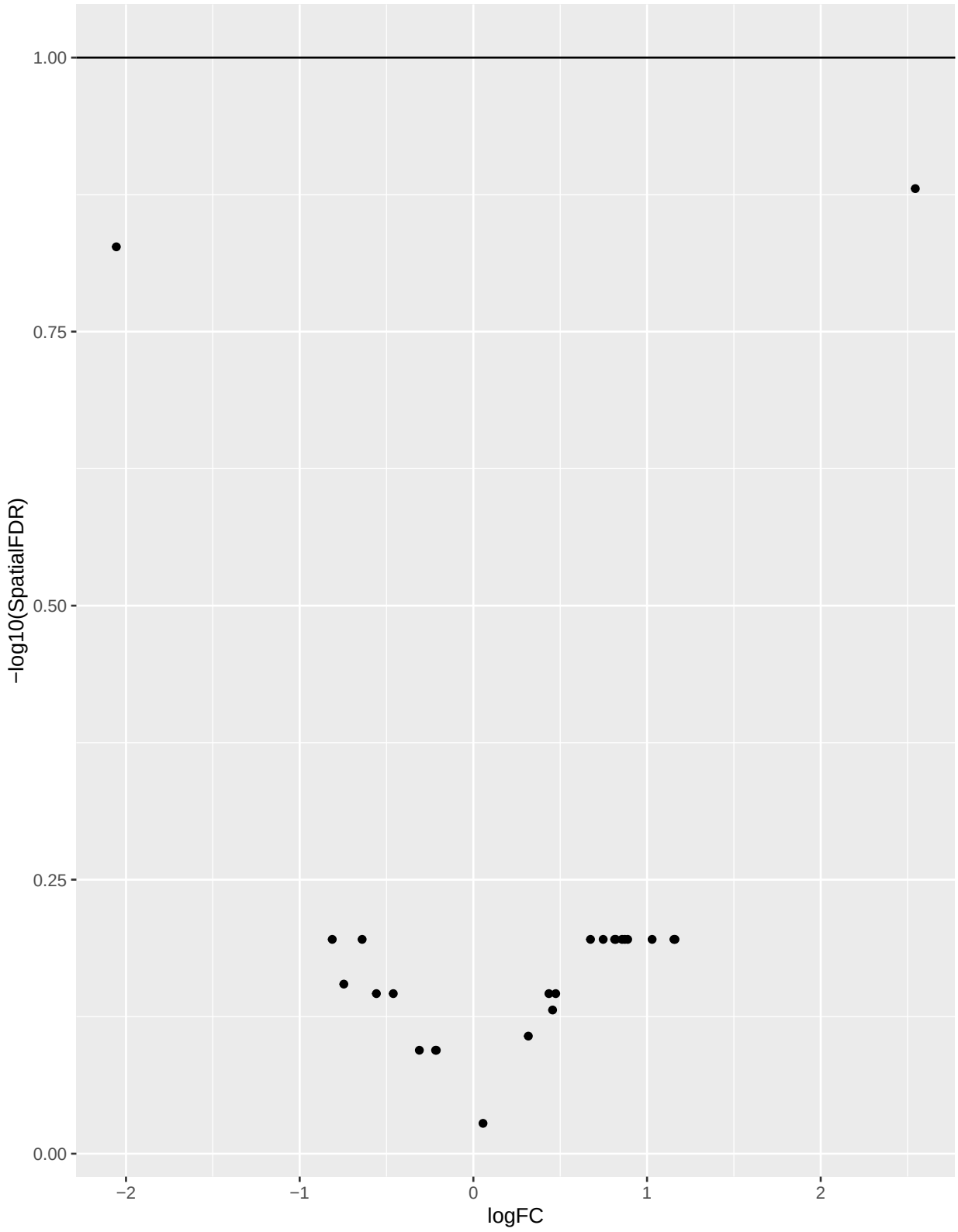
```
## 2 2 1 14 3 12 6  9 2  3 . . . 1 4 .  3 2  1 .
## 3 6 .  8 2 12 5 13 4  4 1 . . 3 8 4 15 1 10 1
## 4 1 .  9 . 12 1  6 .  1 . . . 1 5 .  7 1  7 1
## 5 9 4  6 5  3 5  . 1 10 9 2 1 2 3 2  3 .  3 4
## 6 1 .  3 2  8 2  3 1  . . . . . 8 3  4 1  9 .
```

```
##          phenotype  PID age day   sample
## 545R d42   old d42 545R old d42 545R d42
## 545R d0     old d0 545R old  d0  545R d0
## 543P d42   old d42 543P old d42 543P d42
## 543P d0     old d0 543P old  d0  543P d0
## 520P d42   old d42 520P old d42 520P d42
## 520P d0     old d0 520P old  d0  520P d0
```

```
##          logFC   logCPM           F      PValue       FDR Nhood SpatialFDR
## 1   1.15508300 16.08472 1.842254689 0.175407242 0.6523643     1  0.6374941
## 2   0.67441021 16.60508 0.925105062 0.336685011 0.6523643     2  0.6374941
## 3   1.02913852 17.10194 2.354971797 0.125628214 0.6523643     3  0.6374941
## 4   2.54457684 16.41096 7.773873204 0.005538669 0.1384667     4  0.1316841
## 5  -0.64043796 17.16574 0.938139754 0.333307574 0.6523643     5  0.6374941
## 6   0.87158980 16.38952 1.200473905 0.273847471 0.6523643     6  0.6374941
## 7   0.45620670 16.05041 0.282045320 0.595641190 0.7445515     7  0.7394779
## 8   0.85601965 16.07016 0.995053720 0.319077928 0.6523643     8  0.6374941
## 9  -0.21745072 16.46159 0.084932192 0.770863677 0.8029830     9  0.8047100
## 10  0.81347730 16.21101 1.013164715 0.314718590 0.6523643    10  0.6374941
## 11 -0.46114541 16.50519 0.403782243 0.525484367 0.7204313    11  0.7144220
## 12  0.47423839 16.76038 0.486986526 0.485656241 0.7204313    12  0.7144220
## 13 -0.55836592 16.02348 0.362344895 0.547527799 0.7204313    13  0.7144220
## 14 -0.21340434 16.56459 0.091283823 0.762699138 0.8029830    14  0.8047100
## 15  0.43501076 16.92443 0.441236720 0.506886362 0.7204313    15  0.7144220
## 16  0.05556532 16.29265 0.006010301 0.938241487 0.9382415    16  0.9382415
## 17  0.81963700 16.37543 1.081230057 0.299013730 0.6523643    17  0.6374941
## 18 -0.81251391 16.51875 1.328156494 0.249781256 0.6523643    18  0.6374941
## 19 -0.31093916 15.98324 0.112366359 0.737631380 0.8029830    19  0.8047100
## 20  0.31647233 16.68290 0.194981203 0.659027316 0.7845563    20  0.7811166
## 21  0.88851037 15.87929 0.849651066 0.357174019 0.6523643    21  0.6374941
## 22 -2.05566948 16.31521 6.419483269 0.011645859 0.1455732    22  0.1488096
## 23 -0.74578605 15.89027 0.639563959 0.424315490 0.7071925    23  0.7003203
## 24  1.16094284 16.13823 1.880131943 0.171042717 0.6523643    24  0.6374941
## 25  0.74738904 16.16277 0.821265230 0.365323993 0.6523643    25  0.6374941
```

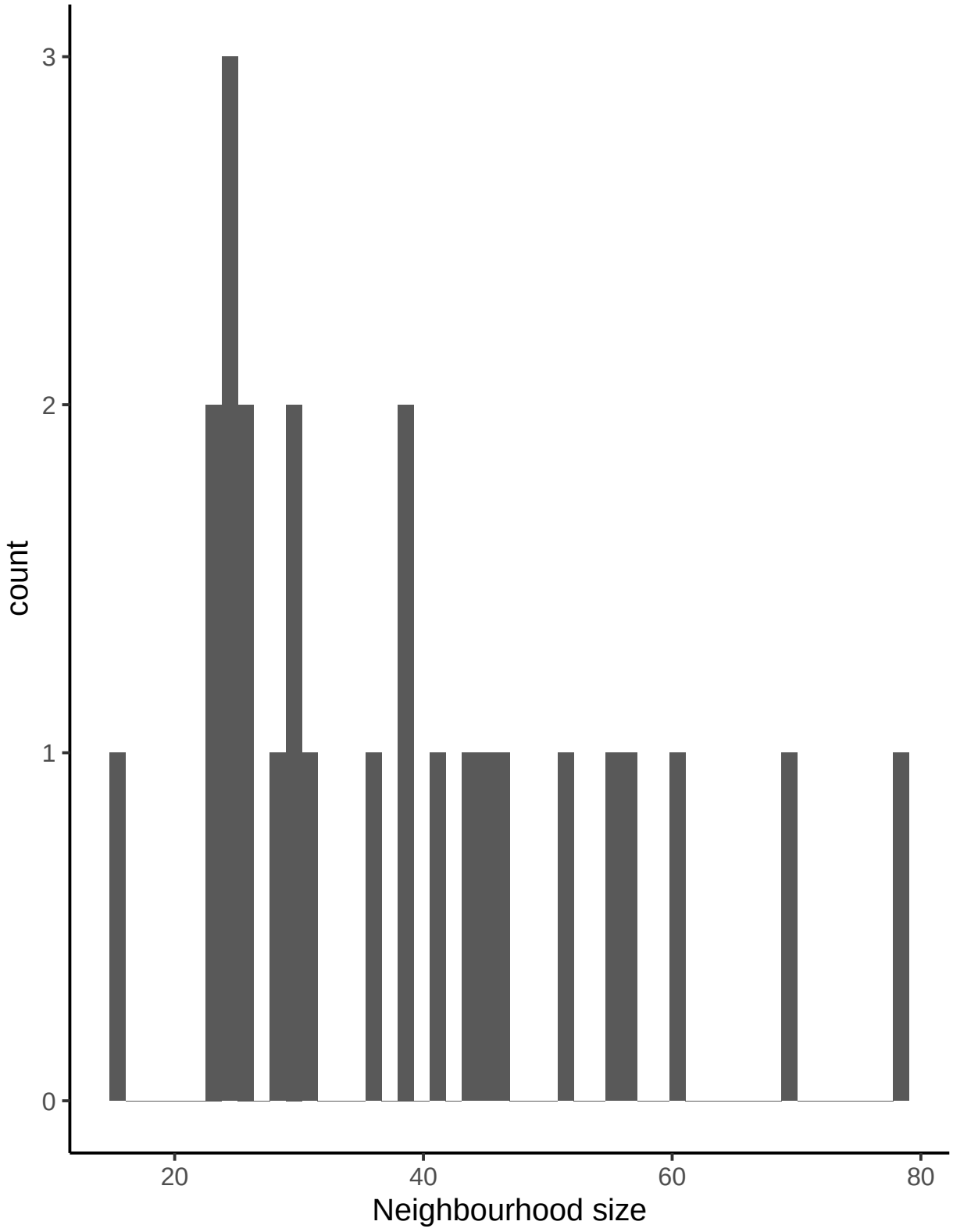
```
##         logFC   logCPM         F      PValue       FDR Nhood SpatialFDR
## 4   2.5445768 16.41096 7.7738732 0.005538669 0.1384667     4  0.1316841
## 22 -2.0556695 16.31521 6.4194833 0.011645859 0.1455732    22  0.1488096
## 1   1.1550830 16.08472 1.8422547 0.175407242 0.6523643     1  0.6374941
## 2   0.6744102 16.60508 0.9251051 0.336685011 0.6523643     2  0.6374941
## 3   1.0291385 17.10194 2.3549718 0.125628214 0.6523643     3  0.6374941
## 5  -0.6404380 17.16574 0.9381398 0.333307574 0.6523643     5  0.6374941
```


1.5
1.0
0.5
0.0
density
0.00
0.25
0.50
0.75
PValue




```
## class: Milo
## dim: 58051 427
## metadata(0):
```

```
## assays(2): counts logcounts
## rownames(58051): ENSG00000223972 ENSG00000227232 ... ENSG00000277475
##   ENSG00000268674
## rowData names(0):
## colnames(427):
##   lane6963.AAGAGGCA.AAGGAGTA.cDNA190807.D9.594V.d42.L001.GRCh38.hisat2.bam
##   lane6963.AAGAGGCA.ACTGCATA.cDNA190807.E9.594V.d42.L001.GRCh38.hisat2.bam
##   ...
##   lane7048.TCCTGAGC.TATCCTCT.cDNA190921.G4.637R.d42.L001.GRCh38.hisat2.bam
##   lane7048.TCCTGAGC.TCTCTCCG.cDNA190921.A4.637R.d42.L001.GRCh38.hisat2.bam
## colData names(46): lane i5 ... clusters sample
## reducedDimNames(2): PCA UMAP
## altExpNames(0):
## nhoods dimensions(2): 1 1
## nhoodCounts dimensions(2): 1 1
## nhoodDistances dimension(1): 0
## graph names(0):
## nhoodIndex names(1): 0
## nhoodExpression dimension(2): 1 1
## nhoodReducedDim names(0):
## nhoodGraph names(0):
## nhoodAdjacency dimension(2): 1 1
```



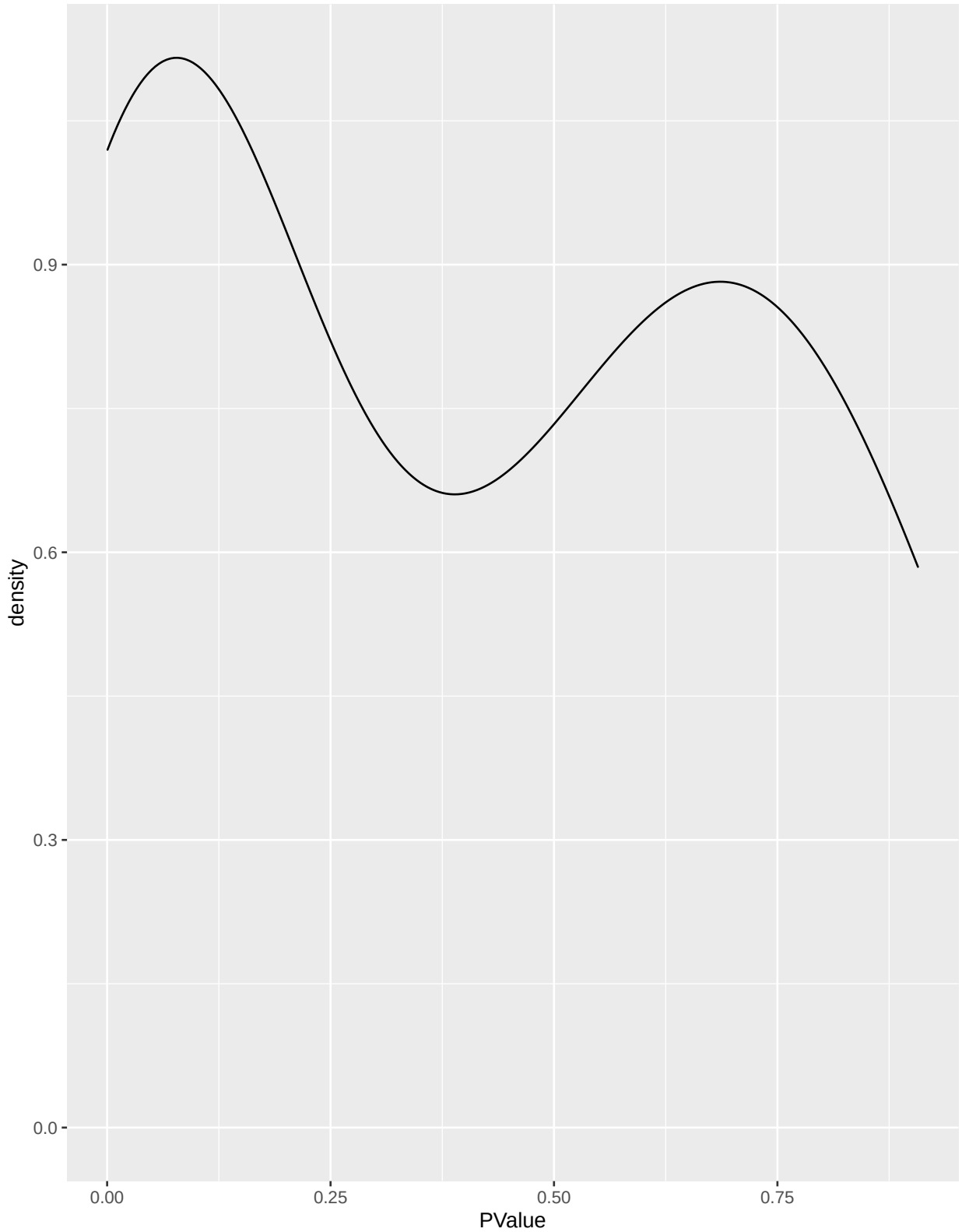

```
## 6 x 19 sparse Matrix of class "dgCMatrix"
##
## 1 5 2 9 10  8 7 3 3 . .  4  4 . 6 2 3 1 11 1
```

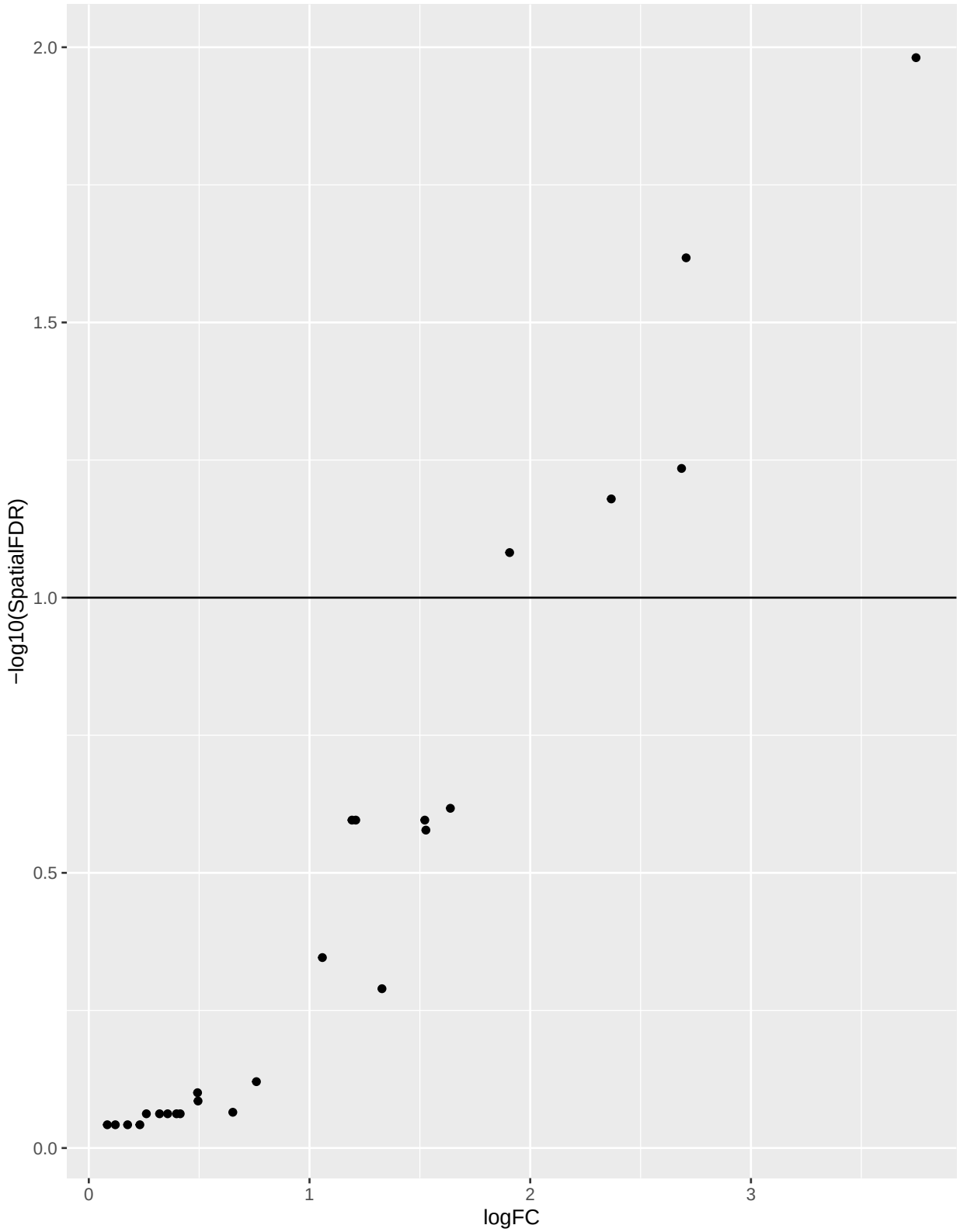
```
## 2 1 3 1  .  8 2 3 . . .  .  1 . 2 . 3 .  4 1
## 3 2 1 3  3 10 1 1 . . .  .  2 . 4 2 4 .  8 .
## 4 2 5 3  1 17 8 3 2 . .  .  . . 3 4 . .  8 .
## 5 1 . .  .  . . 1 . . . 12  6 1 3 1 3 .  . .
## 6 4 3 1  2  3 5 2 2 4 .  8 11 . 3 3 7 . 11 .
```

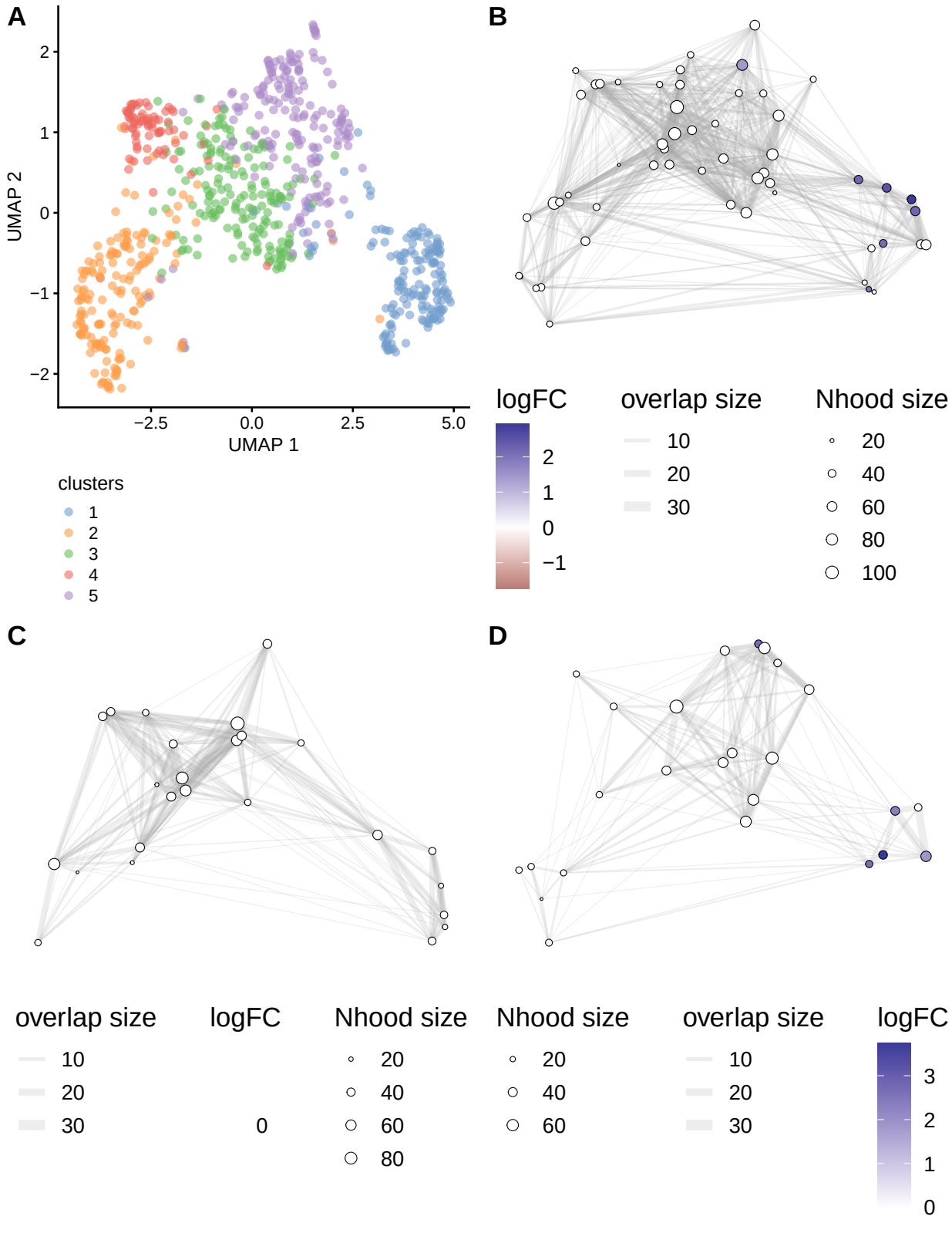
```
##          phenotype  PID   age day   sample
## 594V d42 young d42 594V young d42 594V d42
## 594V d0   young d0 594V young  d0  594V d0
## 562K d42 young d42 562K young d42 562K d42
## 562K d0   young d0 562K young  d0  562K d0
## 559G d42 young d42 559G young d42 559G d42
## 559G d0   young d0 559G young  d0  559G d0
```

```
##         logFC   logCPM           F       PValue        FDR Nhood SpatialFDR
## 1  0.49284949 17.01518  0.57350051 0.4492908982 0.80230518     1 0.79341956
## 2  1.05836127 16.18792  1.60785738 0.2054874504 0.46701693     2 0.45078508
## 3  1.52229566 16.35357  2.89938355 0.0893445910 0.26232740     3 0.25362099
## 4  0.08387314 16.62815  0.01360434 0.9072133026 0.90721330     4 0.90721330
## 5  2.68555110 16.16286  7.37244618 0.0068929677 0.05744140     5 0.05824362
## 6  1.19234574 16.83845  2.96542390 0.0857897334 0.26232740     6 0.25362099
## 7  2.70631459 16.21344  9.69357856 0.0019741302 0.02467663     7 0.02412983
## 8  0.17586508 16.09796  0.02642172 0.8709519026 0.90721330     8 0.90721330
## 9  0.49496205 16.58362  0.45332184 0.5011276282 0.83521271     9 0.82142901
## 10 1.63820395 16.46095  3.55987869 0.0598734338 0.24947264    10 0.24140780
## 11 0.12026216 16.37996  0.01819920 0.8927513204 0.90721330    11 0.90721330
## 12 1.90666668 16.78303  5.82435552 0.0170215265 0.08510763    12 0.08281560
## 13 2.36719651 16.46834  6.57771682 0.0106687825 0.06667989    13 0.06616737
## 14 0.39742602 16.15326  0.19276601 0.6608475198 0.86654891    14 0.86649659
## 15 0.26091962 16.21897  0.12120733 0.7279010874 0.86654891    15 0.86649659
## 16 1.20950220 16.71673  2.80958774 0.0944378644 0.26232740    16 0.25362099
## 17 0.23141078 16.13155  0.05646653 0.8122850114 0.90721330    17 0.90721330
## 18 0.32065664 16.51250  0.17013965 0.6801957126 0.86654891    18 0.86649659
## 19 0.65250325 16.07680  0.34770098 0.5557307808 0.86654891    19 0.86102214
## 20 1.52731522 16.39303  2.56655315 0.1100364578 0.27509114    20 0.26446042
## 21 3.74787154 16.33893 12.58967775 0.0004311177 0.01077794    21 0.01044575
## 22 0.75943155 16.15686  0.71809019 0.3972480238 0.76393851    22 0.75753897
## 23 0.41425448 16.09301  0.15247374 0.6963781236 0.86654891    23 0.86649659
## 24 0.35721128 16.54915  0.21656886 0.6419051735 0.86654891    24 0.86649659
## 25 1.32831324 15.92018  1.32340359 0.2506289913 0.52214373    25 0.51351180
```

```
##       logFC   logCPM         F       PValue        FDR Nhood SpatialFDR
## 21 3.747872 16.33893 12.589678 0.0004311177 0.01077794    21 0.01044575
## 7  2.706315 16.21344  9.693579 0.0019741302 0.02467663     7 0.02412983
## 5  2.685551 16.16286  7.372446 0.0068929677 0.05744140     5 0.05824362
## 13 2.367197 16.46834  6.577717 0.0106687825 0.06667989    13 0.06616737
## 12 1.906667 16.78303  5.824356 0.0170215265 0.08510763    12 0.08281560
## 10 1.638204 16.46095  3.559879 0.0598734338 0.24947264    10 0.24140780
```


0.9
0.6
0.3
0.0
density
0.00
0.25
0.50
0.75
PValue


2.0
1.5
1.0
0.5
0.0
−log10(SpatialFDR)
0
1
2
3
logFC


A
B
C
D
UMAP 2
UMAP 1
2
1
0
−1
−2
−2.5
0.0
2.5
5.0
clusters
1
2
3
4
5
logFC
2
1
0
−1
overlap size
10
20
30
Nhood size
20
40
60
80
100
overlap size
10
20
30
logFC
0
Nhood size
20
40
60
80
Nhood size
20
40
60
overlap size
10
20
30
logFC
3
2
1
0

FCRL5+ neighborhoods are enriched at day 42 after trivalent influenza vaccination in younger, but not older, individuals (A) UMAP as previously described Cluster 1 is referred to as FCRL5+ (B) MiloR analysis of all cells (both ages) with neighborhoods that are enriched at day 42 compared to day 0 with spatial FDR<0.10, shaded according to their logFC. The MiloR analysis is projected in UMAP embedding, such that cells in (A) have the same position in (B). (C) As in (B), for only individuals aged 67-86yo (zero neighborhoods reach significance threshold). (D) As in (B) for individuals aged 22-36yo. 4 neighborhoods within the FCRL5+ cluster (cluster 1), and a single neighborhood containing CD38intermediate cells are significantly enriched at day 42.

SessionInfo

```
## R version 4.0.4 (2021-02-15)
## Platform: x86_64-pc-linux-gnu (64-bit)
## Running under: CentOS Linux 7 (Core)
##
## Matrix products: default
## BLAS:   /bi/apps/R/4.0.4/lib64/R/lib/libRblas.so
## LAPACK: /bi/apps/R/4.0.4/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_GB.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_GB.UTF-8        LC_COLLATE=en_GB.UTF-8
##  [5] LC_MONETARY=en_GB.UTF-8    LC_MESSAGES=en_GB.UTF-8
##  [7] LC_PAPER=en_GB.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_GB.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] parallel  stats4    stats     graphics  grDevices utils     datasets
## [8] methods   base
##
## other attached packages:
##  [1] cowplot_1.1.1               ggplot2_3.3.3
##  [3] miloR_0.99.18               edgeR_3.32.1
##  [5] limma_3.46.0                SingleCellExperiment_1.12.0
##  [7] MultiAssayExperiment_1.16.0 SummarizedExperiment_1.20.0
##  [9] Biobase_2.50.0              GenomicRanges_1.42.0
## [11] GenomeInfoDb_1.26.7         IRanges_2.24.1
## [13] S4Vectors_0.28.1            BiocGenerics_0.36.1
## [15] MatrixGenerics_1.2.1        matrixStats_0.59.0
## [17] dplyr_1.0.6
##
## loaded via a namespace (and not attached):
##  [1] bitops_1.0-7             RColorBrewer_1.1-2
##  [3] tools_4.0.4              utf8_1.2.1
##  [5] R6_2.5.0                 irlba_2.3.3
##  [7] vipor_0.4.5              DBI_1.1.1
##  [9] colorspace_2.0-1         withr_2.4.2
## [11] tidyselect_1.1.1         gridExtra_2.3
## [13] compiler_4.0.4           BiocNeighbors_1.8.2
## [15] DelayedArray_0.16.3      labeling_0.4.2
## [17] scales_1.1.1             stringr_1.4.0
## [19] digest_0.6.27            rmarkdown_2.14
```

```
## [21] XVector_0.30.0            scater_1.18.6
## [23] pkgconfig_2.0.3           htmltools_0.5.2
## [25] sparseMatrixStats_1.2.1   highr_0.8
## [27] fastmap_1.1.0             rlang_0.4.11
## [29] DelayedMatrixStats_1.12.3 farver_2.1.0
## [31] generics_0.1.0            BiocParallel_1.24.1
## [33] gtools_3.8.2              RCurl_1.98-1.3
## [35] magrittr_2.0.1            BiocSingular_1.6.0
## [37] scuttle_1.0.4             GenomeInfoDbData_1.2.4
## [39] patchwork_1.1.1           Matrix_1.3-3
## [41] Rcpp_1.0.6                ggbeeswarm_0.6.0
## [43] munsell_0.5.0             fansi_0.5.0
## [45] viridis_0.6.1             lifecycle_1.0.0
## [47] stringi_1.6.2             yaml_2.2.1
## [49] ggraph_2.0.5              MASS_7.3-53.1
## [51] zlibbioc_1.36.0           grid_4.0.4
## [53] ggrepel_0.9.1             crayon_1.4.1
## [55] lattice_0.20-41           graphlayouts_0.7.1
## [57] beachmat_2.6.4            splines_4.0.4
## [59] locfit_1.5-9.4            knitr_1.31
## [61] pillar_1.6.1              igraph_1.2.6
## [63] glue_1.4.2                evaluate_0.14
## [65] vctrs_0.3.8               tweenr_1.0.2
## [67] gtable_0.3.0              purrr_0.3.4
## [69] polyclip_1.10-0           tidyr_1.1.3
## [71] assertthat_0.2.1          xfun_0.31
## [73] ggforce_0.3.3             rsvd_1.0.5
## [75] tidygraph_1.2.0           viridisLite_0.4.0
## [77] tibble_3.1.2              beeswarm_0.4.0
## [79] statmod_1.4.36            ellipsis_0.3.2
```