

Data Visualization R

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Some of the code from Chapter 3, Section 1.

In this chapter ggplot2 is introduced. We will discuss ggplot2 more in Stat. 651.

The main idea of making graphs with ggplot2 is the idea of mappings that are applied as aesthetics in a plot.

The ggplot2 package is part of the tidyverse. We will install and load the tidyverse.

```
library(mdsr)
library(tidyverse)
```

```
CIACountries
```

```
##           country      pop    area
## 1      Afghanistan 32564342 652230
## 2         Albania  3029278  28748
## 3         Algeria 39542166 2381741
## 4   American Samoa   54343    199
## 5         Andorra   85580    468
## 6         Angola 19625353 1246700
## 7       Anguilla   16418     91
## 8   Antigua and Barbuda 92436    443
## 9         Argentina 43431886 2780400
## 10        Armenia  3056382  29743
## 11         Aruba   112162    180
## 12        Australia 22751014 7741220
## 13         Austria  8665550  83871
## 14       Azerbaijan 9780780  86600
## 15   Bahamas, The   324597  13880
## 16         Bahrain 1346613    760
## 17       Bangladesh 168957745 143998
## 18        Barbados  290604    430
## 19        Belarus  9589689 207600
## 20        Belgium 11323973  30528
## 21         Belize  347369  22966
## 22         Benin 10448647 112622
## 23         Bermuda  70196     54
## 24         Bhutan   741919  38394
## 25         Bolivia 10800882 1098581
## 26   Bosnia and Herzegovina 3867055  51197
## 27         Botswana 2182719  581730
## 28         Brazil 204259812 8514877
## 29   British Virgin Islands  33454    151
## 30         Brunei  429646   5765
## 31         Bulgaria 7186893 110879
## 32       Burkina Faso 18931686 274200
## 33         Burma   56320206 676578
## 34         Burundi 10742276  27830
## 35         Cabo Verde  545993   4033
## 36         Cambodia 15708756 181035
## 37         Cameroon 23739218 475440
```

## 38	Canada	35099836	9984670
## 39	Cayman Islands	56092	264
## 40	Central African Republic	5391539	622984
## 41	Chad	11631456	1284000
## 42	Chile	17508260	756102
## 43	China	1367485388	9596960
## 44	Christmas Island	1530	135
## 45	Cocos (Keeling) Islands	596	14
## 46	Colombia	46736728	1138910
## 47	Comoros	780971	2235
## 48	Congo, Democratic Republic of the	79375136	2344858
## 49	Congo, Republic of the	4755097	342000
## 50	Cook Islands	9838	236
## 51	Costa Rica	4814144	51100
## 52	Cote d'Ivoire	23295302	322463
## 53	Croatia	4464844	56594
## 54	Cuba	11031433	110860
## 55	Curacao	146836	444
## 56	Cyprus	1189197	9251
## 57	Czechia	10644842	78867
## 58	Denmark	5581503	43094
## 59	Djibouti	828324	23200
## 60	Dominica	73607	751
## 61	Dominican Republic	10478756	48670
## 62	Ecuador	15868396	283561
## 63	Egypt	88487396	1001450
## 64	El Salvador	6141350	21041
## 65	Equatorial Guinea	740743	28051
## 66	Eritrea	6527689	117600
## 67	Estonia	1265420	45228
## 68	Ethiopia	99465819	1104300
## 69	Falkland Islands (Islas Malvinas)	3361	12173
## 70	Faroe Islands	50196	1393
## 71	Fiji	909389	18274
## 72	Finland	5476922	338145
## 73	France	66553766	643801
## 74	French Polynesia	282703	4167
## 75	Gabon	1705336	267667
## 76	Gambia, The	1967709	11295
## 77	Gaza Strip	1869055	360
## 78	Georgia	4931226	69700
## 79	Germany	80854408	357022
## 80	Ghana	26327649	238533
## 81	Gibraltar	29258	7
## 82	Greece	10775643	131957
## 83	Greenland	57733	2166086
## 84	Grenada	110694	344
## 85	Guam	161785	544
## 86	Guatemala	14918999	108889
## 87	Guernsey	66080	78
## 88	Guinea	11780162	245857
## 89	Guinea-Bissau	1726170	36125
## 90	Guyana	735222	214969
## 91	Haiti	10110019	27750

## 92	Holy See (Vatican City)	842	0
## 93	Honduras	8746673	112090
## 94	Hong Kong	7141106	1108
## 95	Hungary	9897541	93028
## 96	Iceland	331918	103000
## 97	India	1251695584	3287263
## 98	Indonesia	255993674	1904569
## 99	Iran	81824270	1648195
## 100	Iraq	37056169	438317
## 101	Ireland	4892305	70273
## 102	Isle of Man	87545	572
## 103	Israel	8049314	20770
## 104	Italy	61855120	301340
## 105	Jamaica	2950210	10991
## 106	Japan	126919659	377915
## 107	Jersey	97294	116
## 108	Jordan	8117564	89342
## 109	Kazakhstan	18157122	2724900
## 110	Kenya	45925301	580367
## 111	Kiribati	105711	811
## 112	Korea, North	24983205	120538
## 113	Korea, South	49115196	99720
## 114	Kosovo	1870981	10887
## 115	Kuwait	2788534	17818
## 116	Kyrgyzstan	5664939	199951
## 117	Laos	6911544	236800
## 118	Latvia	1986705	64589
## 119	Lebanon	6184701	10400
## 120	Lesotho	1947701	30355
## 121	Liberia	4195666	111369
## 122	Libya	6411776	1759540
## 123	Liechtenstein	37624	160
## 124	Lithuania	2884433	65300
## 125	Luxembourg	570252	2586
## 126	Macau	592731	28
## 127	Macedonia	2096015	25713
## 128	Madagascar	23812681	587041
## 129	Malawi	17964697	118484
## 130	Malaysia	30513848	329847
## 131	Maldives	393253	298
## 132	Mali	16955536	1240192
## 133	Malta	413965	316
## 134	Marshall Islands	72191	181
## 135	Mauritania	3596702	1030700
## 136	Mauritius	1339827	2040
## 137	Mexico	121736809	1964375
## 138	Micronesia, Federated States of	105216	702
## 139	Moldova	3546847	33851
## 140	Monaco	30535	2
## 141	Mongolia	2992908	1564116
## 142	Montenegro	647073	13812
## 143	Montserrat	5241	102
## 144	Morocco	33322699	446550
## 145	Mozambique	25303113	799380

## 146	Namibia	2212307	824292
## 147	Nauru	9540	21
## 148	Nepal	31551305	147181
## 149	Netherlands	16947904	41543
## 150	New Caledonia	271615	18575
## 151	New Zealand	4438393	267710
## 152	Nicaragua	5907881	130370
## 153	Niger	18045729	1267000
## 154	Nigeria	181562056	923768
## 155	Niue	1190	260
## 156	Norfolk Island	2210	36
## 157	Northern Mariana Islands	52344	464
## 158	Norway	5207689	323802
## 159	Oman	3286936	309500
## 160	Pakistan	199085847	796095
## 161	Palau	21265	459
## 162	Panama	3657024	75420
## 163	Papua New Guinea	6672429	462840
## 164	Paraguay	6783272	406752
## 165	Peru	30444999	1285216
## 166	Philippines	100998376	300000
## 167	Pitcairn Islands	48	47
## 168	Poland	38562189	312685
## 169	Portugal	10825309	92090
## 170	Puerto Rico	3598357	13790
## 171	Qatar	2194817	11586
## 172	Romania	21666350	238391
## 173	Russia	142423773	17098242
## 174	Rwanda	12661733	26338
## 175	Saint Helena, Ascension, and Tristan da Cunha	7795	308
## 176	Saint Kitts and Nevis	51936	261
## 177	Saint Lucia	163922	616
## 178	Saint Martin	31754	54
## 179	Saint Pierre and Miquelon	5657	242
## 180	Saint Vincent and the Grenadines	102627	389
## 181	Samoa	197773	2831
## 182	San Marino	33020	61
## 183	Sao Tome and Principe	194006	964
## 184	Saudi Arabia	27752316	2149690
## 185	Senegal	13975834	196722
## 186	Serbia	7176794	77474
## 187	Seychelles	92430	455
## 188	Sierra Leone	5879098	71740
## 189	Singapore	5674472	697
## 190	Sint Maarten	39689	34
## 191	Slovakia	5445027	49035
## 192	Slovenia	1983412	20273
## 193	Solomon Islands	622469	28896
## 194	Somalia	10616380	637657
## 195	South Africa	53675563	1219090
## 196	South Sudan	12042910	644329
## 197	Spain	48146134	505370
## 198	Sri Lanka	22053488	65610
## 199	Sudan	36108853	1861484

## 200	Suriname	579633	163820
## 201	Svalbard	1872	62045
## 202	Swaziland	1435613	17364
## 203	Sweden	9801616	450295
## 204	Switzerland	8121830	41277
## 205	Syria	17064854	185180
## 206	Taiwan	23415126	35980
## 207	Tajikistan	8191958	143100
## 208	Tanzania	51045882	947300
## 209	Thailand	67976405	513120
## 210	Timor-Leste	1231116	14874
## 211	Togo	7552318	56785
## 212	Tokelau	1337	12
## 213	Tonga	106501	747
## 214	Trinidad and Tobago	1222363	5128
## 215	Tunisia	11037225	163610
## 216	Turkey	79414269	783562
## 217	Turkmenistan	5231422	488100
## 218	Turks and Caicos Islands	50280	948
## 219	Tuvalu	10869	26
## 220	Uganda	37101745	241038
## 221	Ukraine	44429471	603550
## 222	United Arab Emirates	5779760	83600
## 223	United Kingdom	64088222	243610
## 224	United States	321368864	9826675
## 225	Uruguay	3341893	176215
## 226	Uzbekistan	29199942	447400
## 227	Vanuatu	272264	12189
## 228	Venezuela	29275460	912050
## 229	Vietnam	94348835	331210
## 230	Virgin Islands	103574	1910
## 231	Wallis and Futuna	15613	142
## 232	West Bank	2785366	5860
## 233	Western Sahara	570866	266000
## 234	Yemen	26737317	527968
## 235	Zambia	15066266	752618
## 236	Zimbabwe	14229541	390757

##	oil_prod	gdp	educ	roadways	net_users
## 1	0	1900	NA	0.064624442	>5%
## 2	20510	11900	3.3	0.626130513	>35%
## 3	1420000	14500	4.3	0.047719294	>15%
## 4	0	13000	NA	1.211055276	<NA>
## 5	NA	37200	NA	0.683760684	>60%
## 6	1742000	7300	3.5	0.041252106	>15%
## 7	NA	12200	2.8	1.923076923	>15%
## 8	0	23600	2.4	2.641083521	>60%
## 9	532100	22600	6.3	0.083216084	>35%
## 10	0	8500	3.3	0.259052550	>35%
## 11	0	25300	6.0	NA	>60%
## 12	354300	65400	5.6	0.106342024	>60%
## 13	21760	47300	5.9	1.484517891	>60%
## 14	845900	18000	2.4	0.611339492	>35%
## 15	0	25200	NA	0.194524496	>60%
## 16	49500	50100	2.6	5.423684211	>60%

## 17	4000	3600	2.2	0.147703440	>5%
## 18	1000	16600	5.6	3.720930233	>60%
## 19	30000	17700	5.1	0.416146435	>35%
## 20	0	43600	6.6	5.044942348	>60%
## 21	1818	8400	6.6	0.124967343	>15%
## 22	0	2100	5.3	0.142068157	>0%
## 23	0	85700	2.6	8.277777778	>60%
## 24	0	8200	4.7	0.275511799	>15%
## 25	51130	6500	6.9	0.073265421	>35%
## 26	0	10500	NA	0.447799676	>60%
## 27	0	16400	9.5	0.030797793	>5%
## 28	2255000	15600	5.8	0.185670797	>35%
## 29	0	42300	4.4	1.324503311	>5%
## 30	126500	79700	3.5	0.525411969	>60%
## 31	1000	19100	4.1	0.175975613	>35%
## 32	0	1700	3.4	0.055696572	>0%
## 33	20000	5500	0.8	0.050810106	>0%
## 34	0	800	5.8	0.442759612	>0%
## 35	0	6500	5.0	0.334738408	>35%
## 36	0	3500	2.6	0.218841660	>5%
## 37	80830	3100	3.2	0.108005216	>5%
## 38	3890000	45600	5.4	0.104390030	>60%
## 39	0	43800	NA	2.973484848	>60%
## 40	0	600	1.2	0.032549793	>0%
## 41	103400	2600	2.3	0.031152648	>0%
## 42	6666	23500	4.5	0.102848557	>60%
## 43	4189000	14100	NA	0.427884142	>35%
## 44	NA	NA	NA	1.037037037	>15%
## 45	NA	NA	NA	1.571428571	<NA>
## 46	989900	13800	4.4	0.124130967	>35%
## 47	0	1500	7.6	0.393736018	>5%
## 48	20000	800	2.5	0.065461107	>0%
## 49	250000	6700	6.2	0.050552632	>0%
## 50	0	12300	3.1	1.355932203	>5%
## 51	0	15500	6.3	0.763561644	>35%
## 52	36000	3300	4.6	0.254280336	>0%
## 53	10070	21600	4.3	0.519666396	>60%
## 54	50000	10200	12.8	0.548962656	>15%
## 55	NA	15000	NA	1.238738739	<NA>
## 56	0	32800	7.3	2.162577019	>60%
## 57	3000	31600	4.2	1.656852676	>60%
## 58	165200	45700	8.7	1.715528844	>60%
## 59	0	3200	8.4	0.132112069	>5%
## 60	0	10700	3.5	2.013315579	>35%
## 61	0	15000	2.2	0.404869529	>35%
## 62	556400	11300	4.4	0.154005664	>35%
## 63	478400	11800	3.8	0.137231015	>35%
## 64	0	8300	3.4	0.328786655	>15%
## 65	248000	31800	0.6	0.102670137	>15%
## 66	0	1300	2.1	0.034098639	>0%
## 67	0	28600	5.7	1.291500840	>60%
## 68	0	1800	4.7	0.040169338	>0%
## 69	0	55400	NA	0.036145568	>60%
## 70	0	36600	NA	0.332376167	>60%

## 71	0	9000	4.2	0.188245595	>35%
## 72	0	41100	6.8	0.230670275	>60%
## 73	15340	41200	5.9	1.597459463	>60%
## 74	0	26100	NA	0.621550276	>35%
## 75	240000	18600	NA	0.034258986	>5%
## 76	0	1600	4.1	0.331119965	>5%
## 77	NA	NA	NA	NA	<NA>
## 78	1000	9600	2.0	0.274160689	>35%
## 79	48830	46900	5.1	1.806611357	>60%
## 80	105000	4300	8.1	0.459118864	>15%
## 81	0	43000	NA	4.142857143	>60%
## 82	1162	26400	4.1	0.886349341	>35%
## 83	0	37900	NA	NA	>60%
## 84	0	13100	3.9	3.276162791	>35%
## 85	0	30500	NA	1.920955882	>60%
## 86	10040	7700	3.0	0.105621321	>15%
## 87	NA	52300	NA	NA	>60%
## 88	0	1200	2.5	0.180381279	>0%
## 89	0	1500	NA	0.095640138	>0%
## 90	0	7500	3.2	0.037075113	>35%
## 91	0	1800	NA	0.153729730	>5%
## 92	NA	NA	NA	NA	<NA>
## 93	0	4900	NA	0.131519315	>15%
## 94	0	56700	3.5	1.886281588	>60%
## 95	11410	26200	4.9	2.145235843	>60%
## 96	0	46100	7.6	0.125145631	>60%
## 97	767600	6200	3.2	1.426670759	>15%
## 98	789800	11100	2.8	0.260745082	>15%
## 99	3614000	17300	3.7	0.120656840	>15%
## 100	3368000	15500	NA	0.136027122	>5%
## 101	0	55500	6.4	1.366613066	>60%
## 102	NA	83100	NA	0.874125874	<NA>
## 103	390	33700	5.6	0.893885412	>60%
## 104	105700	35700	4.5	1.618437645	>35%
## 105	0	8800	6.1	2.012646711	>35%
## 106	4666	38100	3.8	3.202442348	>60%
## 107	NA	57000	NA	4.965517241	>15%
## 108	22	12100	NA	0.080622775	>35%
## 109	1632000	24300	3.1	0.035751037	>35%
## 110	0	3200	6.7	0.277200461	>35%
## 111	0	1800	12.0	0.826140567	>5%
## 112	0	1800	NA	0.211999535	<NA>
## 113	0	36500	5.0	1.052777778	>60%
## 114	NA	NA	4.3	0.638835308	<NA>
## 115	2619000	70200	3.8	0.370860927	>60%
## 116	1000	3400	6.8	0.170041660	>15%
## 117	0	5300	2.8	0.167094595	>0%
## 118	0	24700	5.0	1.121553206	>60%
## 119	0	18200	2.2	0.670192308	>60%
## 120	0	3000	13.0	0.195684401	>5%
## 121	0	900	2.8	0.095179089	>0%
## 122	470000	14600	NA	0.056846676	>15%
## 123	NA	89400	2.1	2.375000000	>60%
## 124	2000	28400	5.4	1.288912711	>60%

## 125	0	99000	3.7	1.121036350	>60%
## 126	0	98200	2.7	14.750000000	>35%
## 127	0	14000	NA	0.545949520	>35%
## 128	0	1500	2.7	0.058728436	>60%
## 129	0	1100	5.4	0.130397353	>0%
## 130	597500	26300	5.9	0.437787823	>35%
## 131	0	14900	6.8	0.295302013	>0%
## 132	0	2200	4.8	0.018121388	>60%
## 133	0	35900	6.9	9.797468354	>35%
## 134	NA	3200	12.2	11.204419890	>0%
## 135	6003	4400	3.7	0.010311439	>5%
## 136	0	19500	3.5	1.053431373	>5%
## 137	2459000	17500	5.1	0.192254534	>35%
## 138	0	3000	NA	0.341880342	>15%
## 139	0	5000	8.4	0.276269534	>35%
## 140	NA	78700	1.6	38.500000000	>60%
## 141	20850	12100	5.5	0.031486795	>15%
## 142	0	16100	NA	0.562047495	>35%
## 143	0	8500	NA	NA	>15%
## 144	500	8200	5.4	0.130769231	>35%
## 145	0	1200	5.0	0.037943156	>5%
## 146	0	11400	8.4	0.053546559	>5%
## 147	0	14800	NA	1.428571429	<NA>
## 148	0	2500	4.7	0.073677988	>5%
## 149	28120	49200	5.9	3.353031798	>60%
## 150	0	38800	NA	0.302664872	>60%
## 151	39860	36200	7.4	0.351723880	>60%
## 152	0	5000	4.6	0.183301373	>5%
## 153	20000	1100	4.2	0.014955801	>0%
## 154	2423000	6100	NA	0.209143421	>35%
## 155	0	5800	NA	0.461538462	>60%
## 156	NA	NA	NA	2.222222222	<NA>
## 157	NA	13300	NA	1.155172414	<NA>
## 158	1568000	68400	6.9	0.289899383	>60%
## 159	943500	44600	4.3	0.194636511	>60%
## 160	98000	5000	2.1	0.329428021	>5%
## 161	NA	15100	7.3	NA	<NA>
## 162	0	21800	3.5	0.200702731	>35%
## 163	34210	2700	NA	0.020199205	>0%
## 164	0	8700	4.8	0.078817068	>15%
## 165	69300	12200	2.8	0.109453975	>35%
## 166	21000	7300	2.7	0.710503333	>35%
## 167	NA	NA	NA	NA	<NA>
## 168	19260	26500	5.2	1.317731903	>60%
## 169	0	27800	5.6	0.900206320	>60%
## 170	0	38000	NA	1.947933285	>35%
## 171	1540000	132100	2.5	0.848437770	>60%
## 172	83350	20800	4.2	0.353138332	>35%
## 173	10840000	25400	4.1	0.075059588	>35%
## 174	0	1800	5.1	0.178449389	>5%
## 175	0	7800	NA	0.642857143	>5%
## 176	0	24600	4.2	1.467432950	>15%
## 177	0	11700	4.1	1.964285714	>60%
## 178	NA	19300	NA	NA	<NA>

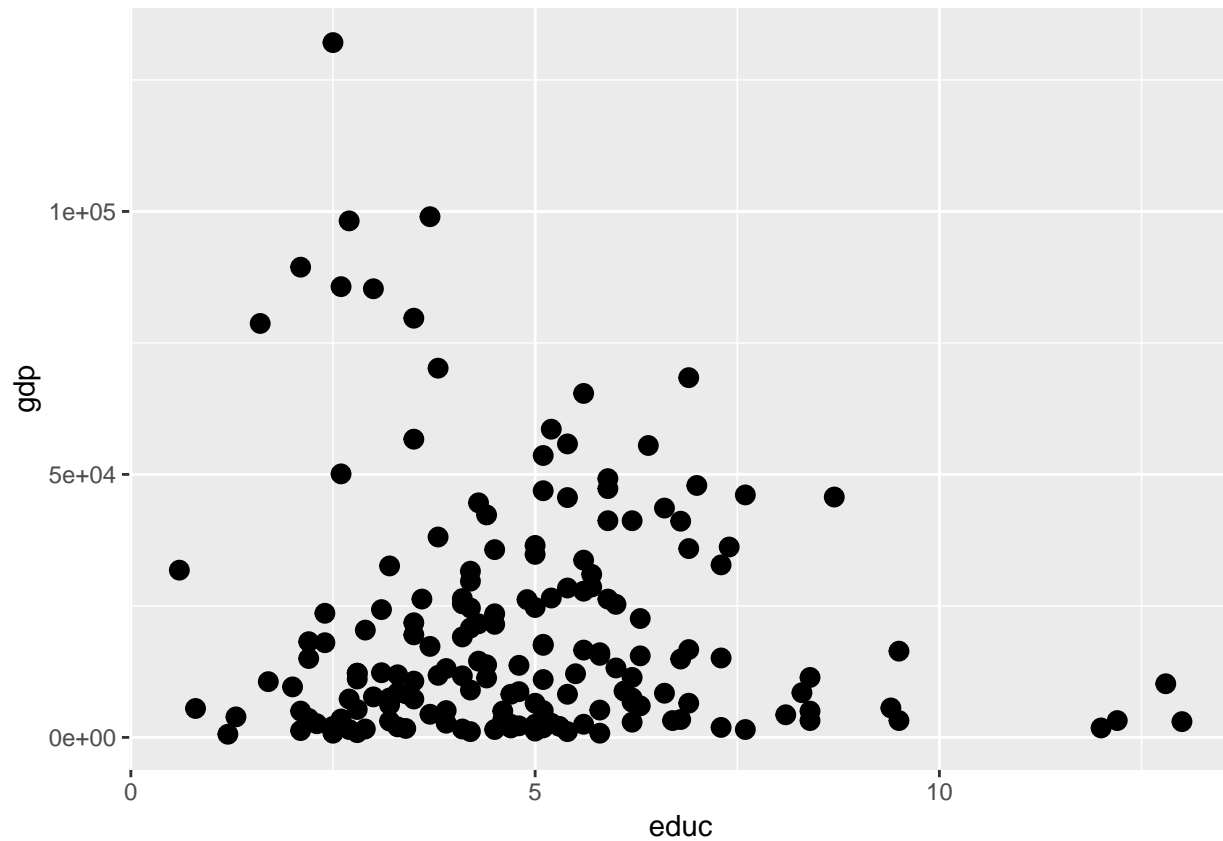
## 179	0	34900	NA	0.483471074	<NA>
## 180	0	11000	5.1	2.131105398	>60%
## 181	0	5200	5.8	0.825503356	>5%
## 182	NA	63900	NA	4.786885246	>35%
## 183	0	3200	9.5	0.331950207	>15%
## 184	9735000	53600	5.1	0.102978569	>35%
## 185	0	2500	5.6	0.071207084	>15%
## 186	16840	13700	4.8	0.571133542	>35%
## 187	0	26300	3.6	1.116483516	>35%
## 188	0	1600	2.9	0.157513242	>0%
## 189	0	85300	3.0	4.913916786	>60%
## 190	NA	66800	NA	1.558823529	<NA>
## 191	200	29700	4.2	0.895605180	>60%
## 192	5	31000	5.7	1.923001036	>60%
## 193	0	1900	7.3	0.048103544	>5%
## 194	0	400	NA	0.034658131	>0%
## 195	3000	13200	6.0	0.612763619	>35%
## 196	220000	2000	NA	0.010864015	<NA>
## 197	6419	34800	5.0	1.351831331	>60%
## 198	0	10600	1.7	1.738957476	>15%
## 199	64770	4300	NA	0.006392749	>15%
## 200	15000	16300	NA	0.026272738	>35%
## 201	194300	NA	NA	NA	<NA>
## 202	0	8500	8.3	0.206979959	>15%
## 203	0	47900	7.0	1.287076250	>60%
## 204	0	58600	5.2	1.731327374	>60%
## 205	22660	5100	5.1	0.377324765	>15%
## 206	159	46800	NA	1.152723735	>60%
## 207	206	2700	3.9	0.194039133	>15%
## 208	0	2900	6.2	0.091282593	>5%
## 209	232900	16100	5.8	0.350898425	>15%
## 210	76490	5600	9.4	0.406077720	>0%
## 211	0	1500	4.5	0.205195034	>0%
## 212	NA	1000	NA	NA	>35%
## 213	0	5100	3.9	0.910307898	>35%
## 214	81260	32600	3.2	1.622464899	>60%
## 215	55050	11400	6.2	0.118684677	>35%
## 216	47670	20400	2.9	0.492300545	>35%
## 217	242900	16400	NA	0.120040975	>5%
## 218	0	29100	NA	0.127637131	<NA>
## 219	0	3400	NA	0.307692308	>35%
## 220	0	2000	3.3	0.082974469	>15%
## 221	40490	7500	6.2	0.281159804	>35%
## 222	2820000	67600	NA	0.048803828	>60%
## 223	787200	41200	6.2	1.619096096	>60%
## 224	8653000	55800	5.4	0.670278604	>60%
## 225	0	21500	4.5	0.441120222	>35%
## 226	64810	6100	NA	0.193330353	>35%
## 227	0	2500	5.0	0.087784068	>5%
## 228	2500000	16700	6.9	0.105427334	>35%
## 229	298400	6000	6.3	0.623873071	>35%
## 230	0	36100	NA	0.659685864	>15%
## 231	NA	3800	NA	NA	>5%
## 232	0	4300	NA	0.799658703	>35%

```
## 233      0  2500  NA          NA      <NA>
## 234 125100  2700  5.2  0.135046063  >15%
## 235      0  3900  1.3  0.053751040  >15%
## 236      0  2100  2.5  0.248919405  >15%
```

Aesthetics

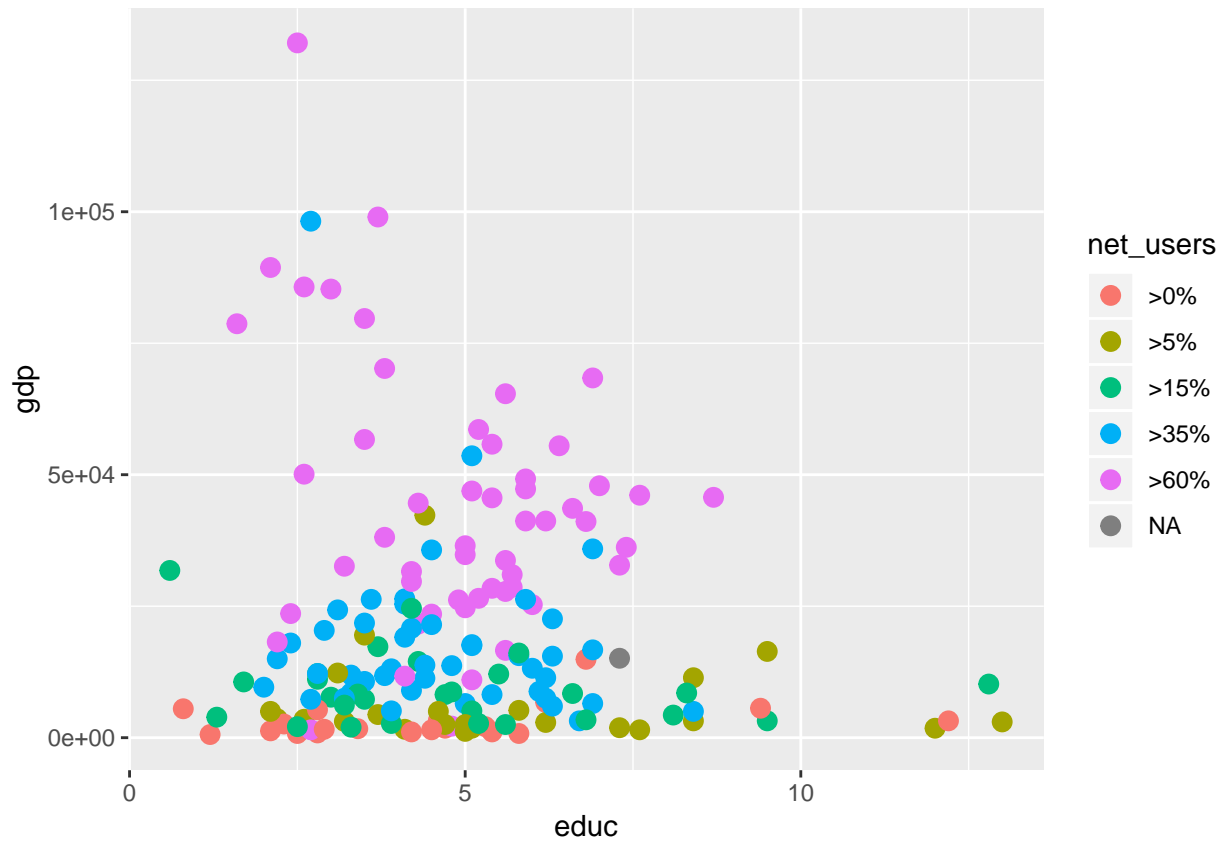
```
g <- ggplot(data = CIACountries, aes(y = gdp, x = educ))
g + geom_point(size = 3)
```

```
## Warning: Removed 64 rows containing missing values (geom_point).
```



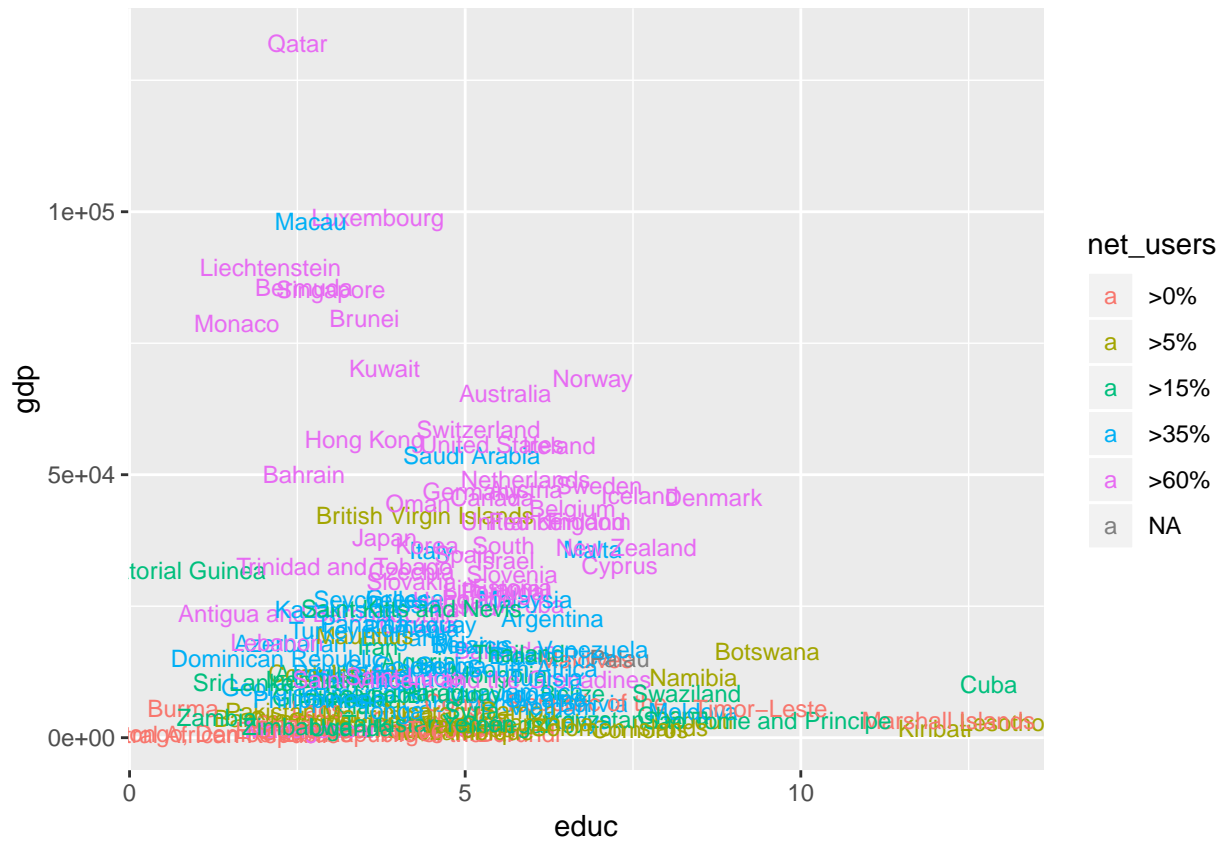
```
g + geom_point(aes(color = net_users), size = 3)
```

```
## Warning: Removed 64 rows containing missing values (geom_point).
```



```
g <- ggplot(data = CIACountries, aes(y = gdp, x = educ, label = country, color = net_users))
g + geom_text(size = 3)
```

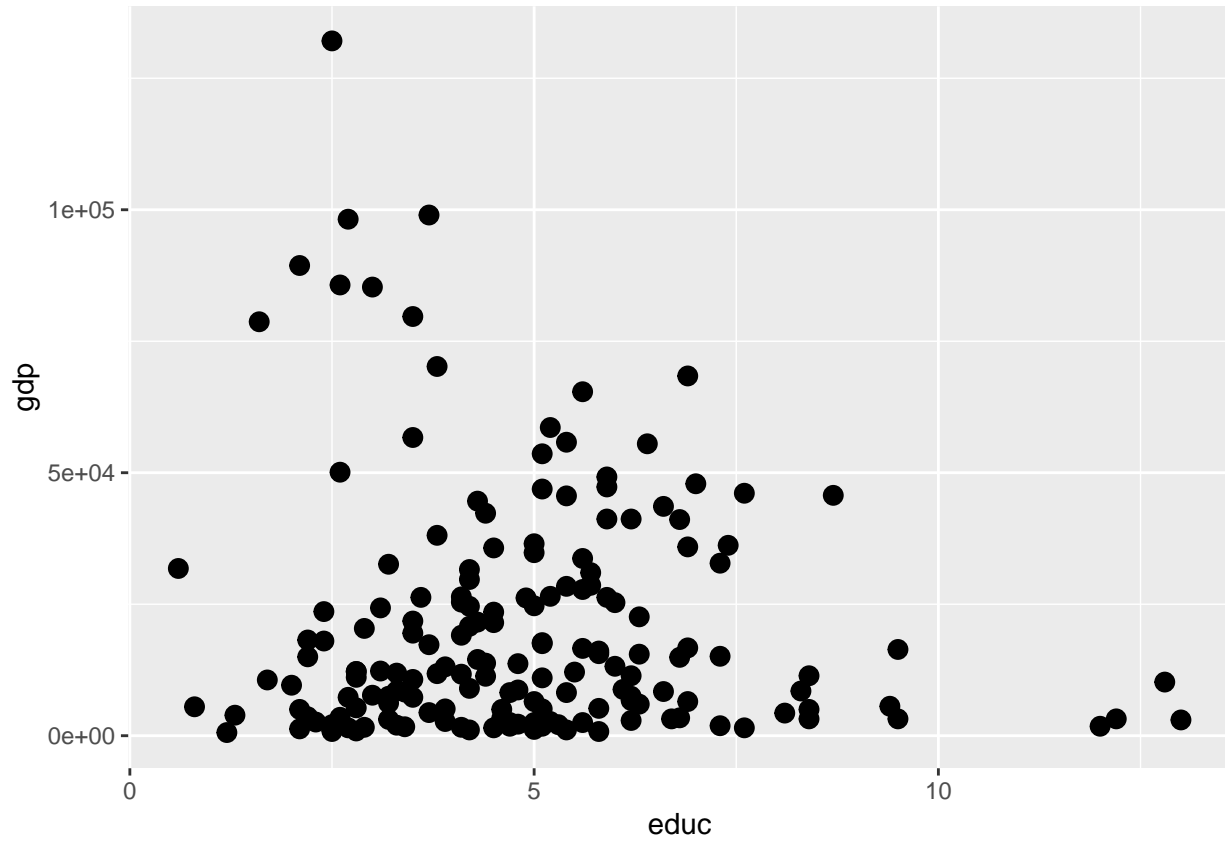
```
## Warning: Removed 64 rows containing missing values (geom_text).
```



Scale

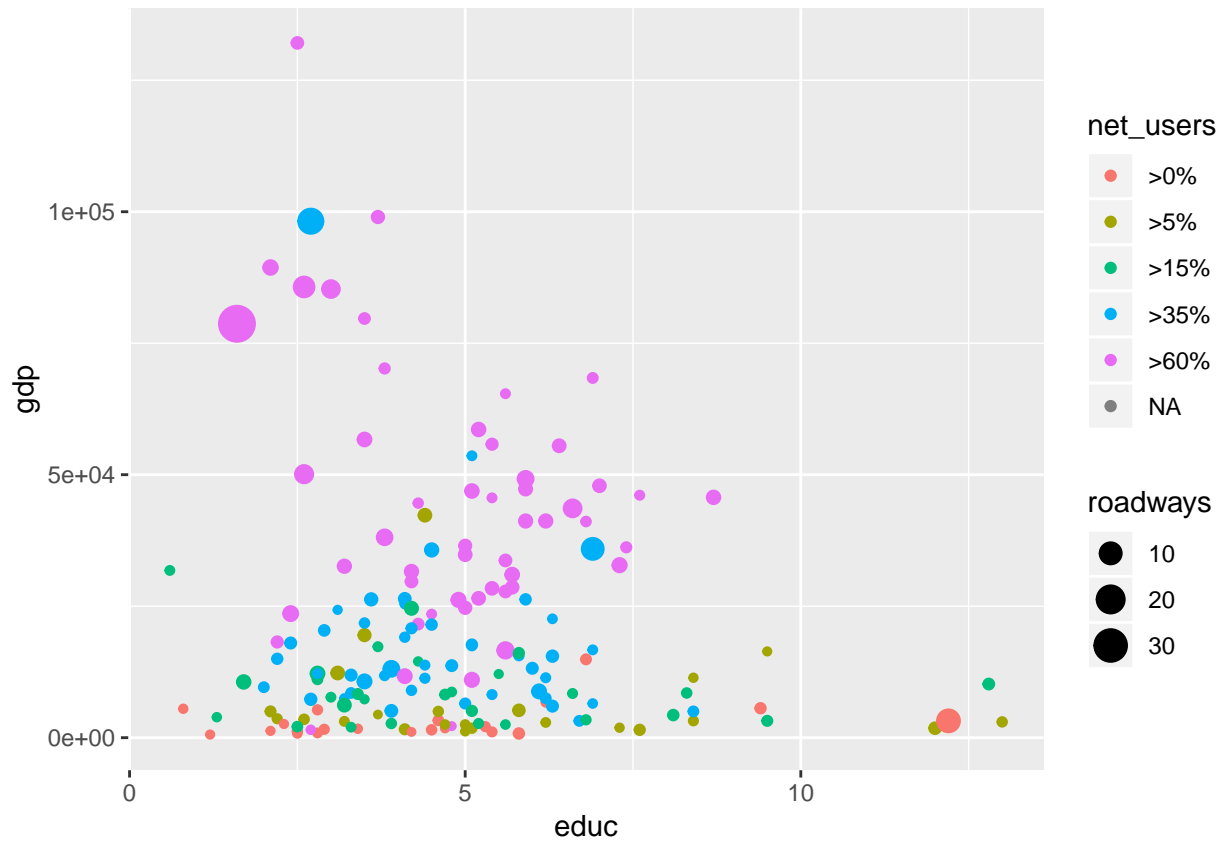
```
g <- ggplot(data = CIACountries, aes(y = gdp, x = educ))
g + geom_point(size = 3)
```

Warning: Removed 64 rows containing missing values (geom_point).



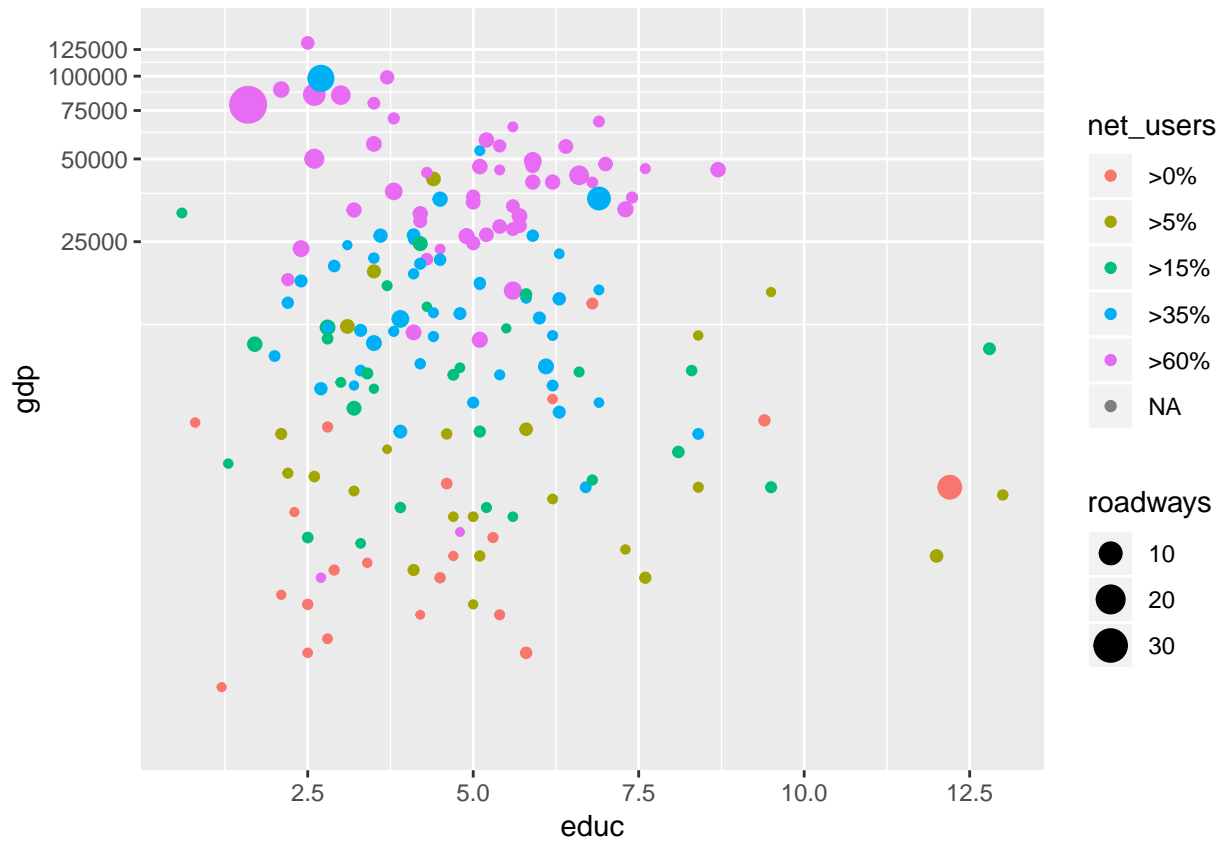
```
g + geom_point(aes(color = net_users, size = roadways))
```

```
## Warning: Removed 66 rows containing missing values (geom_point).
```



```
g + geom_point(aes(color = net_users, size = roadways)) +
  coord_trans(y = "log10")
```

Warning: Removed 66 rows containing missing values (geom_point).



Facets

```
g + geom_point(alpha = 0.9, aes(size = roadways)) +
  coord_trans(y = "log10") +
  facet_wrap(~ net_users, nrow = 1) +
  theme(legend.position = "top")
```

Warning: Removed 66 rows containing missing values (geom_point).

