

EDA-LA2

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Submitted by: ‘Pratyush Sharma(1NT19IS118),Harshit Shahi(1NT19IS057)’ Github Link: ‘https://github.com/Hrahsit45/EDA_LA_2.git’ output: pdf_document

```
df<-read.csv(file.choose())
library(ggplot2)
```

```
df
```

```
##           Entity Year Life.expectancy
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## 47	Australia 1848	34.049999
## 48	Australia 1849	34.049999
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## 64	Australia 1865	34.049999
## 65	Australia 1866	34.049999
## 66	Australia 1867	34.049999
## 67	Australia 1868	34.049999
## 68	Australia 1869	34.049999
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## 74	Australia 1875	36.696079
## 75	Australia 1876	37.225296
## 76	Australia 1877	37.754509
## 77	Australia 1878	38.283726
## 78	Australia 1879	38.812943
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## 80	Australia 1881	39.871372
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## 104	Australia 1905	52.572548
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## 151	Australia 1952	69.120003
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## 166	Australia 1967	71.099998
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## 619	Canada 1986	76.559998
## 620	Canada 1987	76.860001
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## 623	Canada 1990	77.430000
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## 625	Canada 1992	77.760002
## 626	Canada 1993	77.820000
## 627	Canada 1994	77.930000
## 628	Canada 1995	78.070000
## 629	Canada 1996	78.309998

## 630	Canada	1997	78.570000
## 631	Canada	1998	78.779999
## 632	Canada	1999	79.010002
## 633	Canada	2000	79.260002
## 634	Canada	2001	79.480003
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## 636	Canada	2003	79.839996
## 637	Canada	2004	80.050003
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## 640	Canada	2007	80.650002
## 641	Canada	2008	80.870003
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## 644	Canada	2011	81.529999
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## 649	Canada	2016	81.849998
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## 705	China 1855	27.000000
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## 712	China 1862	30.275000
## 713	China 1863	30.987499
## 714	China 1864	31.700001
## 715	China 1865	31.742857
## 716	China 1866	31.785715
## 717	China 1867	31.828571
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## 719	China 1869	31.914286
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## 722	China 1872	32.000000
## 723	China 1873	32.000000
## 724	China 1874	32.000000
## 725	China 1875	32.000000
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## 772	China 1922	32.000000
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## 774	China 1924	32.000000
## 775	China 1925	32.000000
## 776	China 1926	32.360001
## 777	China 1927	25.650000
## 778	China 1928	33.080002
## 779	China 1929	29.850000
## 780	China 1930	33.799999
## 781	China 1931	34.200001
## 782	China 1932	34.599998
## 783	China 1933	35.000000
## 784	China 1934	35.400002
## 785	China 1935	35.799999
## 786	China 1936	36.200001
## 787	China 1937	34.000000
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## 794	China 1944	35.000000
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## 801	China 1951	42.579762
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## 805	China 1955	48.022160
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## 807	China 1957	50.548962
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## 811	China 1961	34.104481
## 812	China 1962	44.501362
## 813	China 1963	51.899120
## 814	China 1964	53.320721
## 815	China 1965	55.646801
## 816	China 1966	56.803200
## 817	China 1967	58.381119
## 818	China 1968	59.405201
## 819	China 1969	60.965199
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## 821	China 1971	63.737358
## 822	China 1972	63.118881
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## 824	China 1974	62.499599
## 825	China 1975	62.698879
## 826	China 1976	62.437359
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## 829	China 1979	65.085358
## 830	China 1980	66.122162
## 831	China 1981	66.449760
## 832	China 1982	67.587997
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## 838	China 1988	69.031998
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## 840	China 1990	66.959999
## 841	China 1991	67.230003
## 842	China 1992	67.430000
## 843	China 1993	67.669998
## 844	China 1994	67.940002
## 845	China 1995	68.290001

## 846	China 1996	68.620003
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## 850	China 2000	69.940002
## 851	China 2001	70.220001
## 852	China 2002	70.519997
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## 857	China 2007	73.379997
## 858	China 2008	73.599998
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## 886	France 1819	37.250000
## 887	France 1820	39.209999
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## 904	France 1837	39.380001
## 905	France 1838	39.330002
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## 907	France 1840	40.369999
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## 909	France 1842	40.009998
## 910	France 1843	40.750000
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## 912	France 1845	43.580002
## 913	France 1846	40.669998
## 914	France 1847	40.410000
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## 916	France 1849	35.910000
## 917	France 1850	43.279999
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## 919	France 1852	41.320000
## 920	France 1853	42.520000
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## 923	France 1856	40.180000
## 924	France 1857	39.590000
## 925	France 1858	39.669998
## 926	France 1859	35.259998
## 927	France 1860	43.330002
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## 929	France 1862	42.700001
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## 931	France 1864	42.009998
## 932	France 1865	40.160000
## 933	France 1866	41.830002
## 934	France 1867	42.330002
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## 936	France 1869	41.139999
## 937	France 1870	36.410000
## 938	France 1871	29.590000
## 939	France 1872	42.639999
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## 941	France 1874	44.299999
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## 943	France 1876	43.549999
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## 1206	Germany 1922	55.615715
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## 1220	Germany 1936	61.786667
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## 1222	Germany 1938	62.360001
## 1223	Germany 1939	61.000000

## 1224	Germany 1940	60.659874
## 1225	Germany 1941	59.000000
## 1226	Germany 1942	55.000000
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## 1230	Germany 1946	60.511360
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## 1233	Germany 1949	65.305840
## 1234	Germany 1950	66.903999
## 1235	Germany 1951	67.066002
## 1236	Germany 1952	67.385002
## 1237	Germany 1953	67.692001
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## 1239	Germany 1955	68.271004
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## 1241	Germany 1957	68.480408
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## 1247	Germany 1963	70.092888
## 1248	Germany 1964	70.651100
## 1249	Germany 1965	70.634499
## 1250	Germany 1966	70.748108
## 1251	Germany 1967	70.969948
## 1252	Germany 1968	70.615448
## 1253	Germany 1969	70.464897
## 1254	Germany 1970	70.704155
## 1255	Germany 1971	70.920242
## 1256	Germany 1972	71.144203
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## 1258	Germany 1974	71.692909
## 1259	Germany 1975	71.538567
## 1260	Germany 1976	71.999985
## 1261	Germany 1977	72.610657
## 1262	Germany 1978	72.584106
## 1263	Germany 1979	72.943237
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## 1265	Germany 1981	73.353973
## 1266	Germany 1982	73.656998
## 1267	Germany 1983	73.935532
## 1268	Germany 1984	74.413895
## 1269	Germany 1985	74.517555
## 1270	Germany 1986	74.724960
## 1271	Germany 1987	75.122932
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## 1273	Germany 1989	75.478043
## 1274	Germany 1990	75.470001
## 1275	Germany 1991	75.709999
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## 1277	Germany 1993	76.169998

## 1278	Germany 1994	76.400002
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## 1280	Germany 1996	76.889999
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## 1283	Germany 1999	77.730003
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## 1287	Germany 2003	78.720001
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## 1289	Germany 2005	79.250000
## 1290	Germany 2006	79.489998
## 1291	Germany 2007	79.669998
## 1292	Germany 2008	79.830002
## 1293	Germany 2009	79.970001
## 1294	Germany 2010	80.139999
## 1295	Germany 2011	80.320000
## 1296	Germany 2012	80.480003
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## 1299	Germany 2015	80.870003
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## 1313	India 1812	23.000000
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## 1329	India 1828	25.442400
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## 1363	India 1862	25.442400
## 1364	India 1863	25.442400
## 1365	India 1864	25.252296
## 1366	India 1865	25.252296
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## 1369	India 1868	25.252296
## 1370	India 1869	21.304474
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## 1372	India 1871	25.442400
## 1373	India 1872	25.442400
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## 1375	India 1874	25.442400
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## 1381	India 1880	25.442400
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## 1383	India 1882	25.324800
## 1384	India 1883	25.207199
## 1385	India 1884	25.089600

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## 1387	India 1886	24.854401
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## 1389	India 1888	24.417561
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## 1391	India 1890	24.384001
## 1392	India 1891	23.025278
## 1393	India 1892	22.654757
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## 1395	India 1894	24.032160
## 1396	India 1895	23.950001
## 1397	India 1896	22.750000
## 1398	India 1897	19.850000
## 1399	India 1898	25.750000
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## 1402	India 1901	23.049999
## 1403	India 1902	23.600000
## 1404	India 1903	23.417761
## 1405	India 1904	22.000000
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## 1408	India 1907	19.238894
## 1409	India 1908	23.248159
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## 1412	India 1911	23.146400
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## 1415	India 1914	23.722933
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## 1418	India 1917	24.299467
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## 1422	India 1921	24.858400
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## 1424	India 1923	25.749599
## 1425	India 1924	26.195200
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## 1427	India 1926	27.086399
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## 1429	India 1928	27.977600
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## 1431	India 1930	28.868799
## 1432	India 1931	29.314400
## 1433	India 1932	29.642241
## 1434	India 1933	29.970079
## 1435	India 1934	30.297920
## 1436	India 1935	30.625759
## 1437	India 1936	30.953600
## 1438	India 1937	31.281441
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## 1440	India 1939	31.937120
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## 1443	India 1942	32.841377
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## 1447	India 1946	33.835690
## 1448	India 1947	32.378502
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## 1455	India 1954	37.203999
## 1456	India 1955	37.889000
## 1457	India 1956	38.577999
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## 1459	India 1958	39.969002
## 1460	India 1959	40.674999
## 1461	India 1960	41.390999
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## 1471	India 1970	48.835999
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## 1489	India 1988	57.964001
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## 1509	India 2008	65.320000
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## 1513	India 2012	66.910004
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## 1543	Italy 1825	29.690001
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## 1545	Italy 1827	29.690001
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## 1565	Italy 1847	29.690001
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## 1743	Japan 1808	36.403179
## 1744	Japan 1809	36.403580
## 1745	Japan 1810	36.403976
## 1746	Japan 1811	36.404373
## 1747	Japan 1812	36.404770
## 1748	Japan 1813	36.405167
## 1749	Japan 1814	36.405567
## 1750	Japan 1815	36.405964
## 1751	Japan 1816	36.406361
## 1752	Japan 1817	36.406757
## 1753	Japan 1818	36.407154
## 1754	Japan 1819	36.407555
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## 1757	Japan 1822	36.408745
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## 1762	Japan 1827	36.410732
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## 1764	Japan 1829	36.411530
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## 1770	Japan 1835	36.413914
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## 1782	Japan 1847	36.418686
## 1783	Japan 1848	36.419083
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## 1786	Japan 1851	36.420273
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## 1789	Japan 1854	36.421467
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## 1793	Japan 1858	36.423058
## 1794	Japan 1859	36.423454
## 1795	Japan 1860	36.423851
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## 1797	Japan 1862	36.424648
## 1798	Japan 1863	36.425045
## 1799	Japan 1864	36.425442
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## 1801	Japan 1866	36.459202
## 1802	Japan 1867	36.492561
## 1803	Japan 1868	36.525921
## 1804	Japan 1869	36.559280
## 1805	Japan 1870	36.592640
## 1806	Japan 1871	36.633999
## 1807	Japan 1872	36.675362
## 1808	Japan 1873	36.716721
## 1809	Japan 1874	36.758080
## 1810	Japan 1875	36.799438
## 1811	Japan 1876	36.846848
## 1812	Japan 1877	36.894257
## 1813	Japan 1878	36.941666
## 1814	Japan 1879	36.989071
## 1815	Japan 1880	37.036480
## 1816	Japan 1881	37.094864
## 1817	Japan 1882	37.153248

## 1818	Japan 1883	37.211632
## 1819	Japan 1884	37.270016
## 1820	Japan 1885	37.328400
## 1821	Japan 1886	37.397858
## 1822	Japan 1887	37.467312
## 1823	Japan 1888	37.536770
## 1824	Japan 1889	37.606224
## 1825	Japan 1890	37.675678
## 1826	Japan 1891	37.760113
## 1827	Japan 1892	37.844543
## 1828	Japan 1893	37.928974
## 1829	Japan 1894	38.013409
## 1830	Japan 1895	38.097839
## 1831	Japan 1896	38.198273
## 1832	Japan 1897	38.298702
## 1833	Japan 1898	38.399136
## 1834	Japan 1899	38.499569
## 1835	Japan 1900	38.599998
## 1836	Japan 1901	38.724384
## 1837	Japan 1902	38.848766
## 1838	Japan 1903	38.973152
## 1839	Japan 1904	39.097534
## 1840	Japan 1905	39.221920
## 1841	Japan 1906	39.372257
## 1842	Japan 1907	39.522591
## 1843	Japan 1908	39.672928
## 1844	Japan 1909	39.823265
## 1845	Japan 1910	39.973598
## 1846	Japan 1911	40.158768
## 1847	Japan 1912	40.343937
## 1848	Japan 1913	40.529102
## 1849	Japan 1914	40.714272
## 1850	Japan 1915	40.899441
## 1851	Japan 1916	41.128414
## 1852	Japan 1917	41.357391
## 1853	Japan 1918	32.695950
## 1854	Japan 1919	41.815346
## 1855	Japan 1920	42.044319
## 1856	Japan 1921	42.330318
## 1857	Japan 1922	42.616322
## 1858	Japan 1923	43.224930
## 1859	Japan 1924	43.833534
## 1860	Japan 1925	44.442142
## 1861	Japan 1926	45.050751
## 1862	Japan 1927	45.659359
## 1863	Japan 1928	45.982250
## 1864	Japan 1929	46.305141
## 1865	Japan 1930	46.628029
## 1866	Japan 1931	46.950920
## 1867	Japan 1932	47.273811
## 1868	Japan 1933	47.596699
## 1869	Japan 1934	47.919590
## 1870	Japan 1935	48.242481
## 1871	Japan 1936	48.621239

## 1872	Japan 1937	49.000000
## 1873	Japan 1938	49.000000
## 1874	Japan 1939	49.000000
## 1875	Japan 1940	49.000000
## 1876	Japan 1941	48.750000
## 1877	Japan 1942	48.500000
## 1878	Japan 1943	46.000000
## 1879	Japan 1944	40.000000
## 1880	Japan 1945	30.536800
## 1881	Japan 1946	46.500000
## 1882	Japan 1947	51.750000
## 1883	Japan 1948	56.889999
## 1884	Japan 1949	57.759998
## 1885	Japan 1950	59.299999
## 1886	Japan 1951	60.990002
## 1887	Japan 1952	63.029999
## 1888	Japan 1953	63.369999
## 1889	Japan 1954	64.610001
## 1890	Japan 1955	65.769997
## 1891	Japan 1956	65.629997
## 1892	Japan 1957	65.500000
## 1893	Japan 1958	67.120003
## 1894	Japan 1959	67.510002
## 1895	Japan 1960	67.800003
## 1896	Japan 1961	68.449997
## 1897	Japan 1962	68.730003
## 1898	Japan 1963	69.809998
## 1899	Japan 1964	70.279999
## 1900	Japan 1965	70.330002
## 1901	Japan 1966	71.139999
## 1902	Japan 1967	71.430000
## 1903	Japan 1968	71.750000
## 1904	Japan 1969	71.980003
## 1905	Japan 1970	72.070000
## 1906	Japan 1971	72.889999
## 1907	Japan 1972	73.419998
## 1908	Japan 1973	73.480003
## 1909	Japan 1974	73.910004
## 1910	Japan 1975	74.410004
## 1911	Japan 1976	74.809998
## 1912	Japan 1977	75.379997
## 1913	Japan 1978	75.699997
## 1914	Japan 1979	76.209999
## 1915	Japan 1980	76.190002
## 1916	Japan 1981	76.599998
## 1917	Japan 1982	77.110001
## 1918	Japan 1983	77.139999
## 1919	Japan 1984	77.540001
## 1920	Japan 1985	77.839996
## 1921	Japan 1986	78.260002
## 1922	Japan 1987	78.669998
## 1923	Japan 1988	78.580002
## 1924	Japan 1989	79.010002
## 1925	Japan 1990	78.940002

## 1926	Japan 1991	79.139999
## 1927	Japan 1992	79.290001
## 1928	Japan 1993	79.459999
## 1929	Japan 1994	79.699997
## 1930	Japan 1995	79.750000
## 1931	Japan 1996	80.169998
## 1932	Japan 1997	80.389999
## 1933	Japan 1998	80.550003
## 1934	Japan 1999	80.720001
## 1935	Japan 2000	81.029999
## 1936	Japan 2001	81.309998
## 1937	Japan 2002	81.559998
## 1938	Japan 2003	81.750000
## 1939	Japan 2004	81.930000
## 1940	Japan 2005	82.050003
## 1941	Japan 2006	82.239998
## 1942	Japan 2007	82.410004
## 1943	Japan 2008	82.570000
## 1944	Japan 2009	82.769997
## 1945	Japan 2010	82.910004
## 1946	Japan 2011	82.660004
## 1947	Japan 2012	83.230003
## 1948	Japan 2013	83.440002
## 1949	Japan 2014	83.690002
## 1950	Japan 2015	83.830002
## 1951	Japan 2016	83.940002
## 1952	Mexico 1800	26.900000
## 1953	Mexico 1801	26.900000
## 1954	Mexico 1802	26.900000
## 1955	Mexico 1803	26.900000
## 1956	Mexico 1804	26.900000
## 1957	Mexico 1805	26.900000
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## 1959	Mexico 1807	26.900000
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## 1961	Mexico 1809	26.900000
## 1962	Mexico 1810	26.900000
## 1963	Mexico 1811	26.900000
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## 1974	Mexico 1822	26.900000
## 1975	Mexico 1823	26.900000
## 1976	Mexico 1824	26.900000
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## 1991	Mexico 1839	26.900000
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## 2000	Mexico 1848	26.900000
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## 2002	Mexico 1850	26.900000
## 2003	Mexico 1851	26.900000
## 2004	Mexico 1852	26.900000
## 2005	Mexico 1853	26.900000
## 2006	Mexico 1854	26.900000
## 2007	Mexico 1855	26.900000
## 2008	Mexico 1856	26.900000
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## 2010	Mexico 1858	26.900000
## 2011	Mexico 1859	26.900000
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## 2013	Mexico 1861	26.900000
## 2014	Mexico 1862	26.900000
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## 2017	Mexico 1865	26.900000
## 2018	Mexico 1866	26.900000
## 2019	Mexico 1867	26.900000
## 2020	Mexico 1868	26.900000
## 2021	Mexico 1869	26.900000
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## 2037	Mexico 1885	26.900000
## 2038	Mexico 1886	26.900000
## 2039	Mexico 1887	26.900000
## 2040	Mexico 1888	26.900000
## 2041	Mexico 1889	26.900000
## 2042	Mexico 1890	26.900000
## 2043	Mexico 1891	25.696667
## 2044	Mexico 1892	24.493334
## 2045	Mexico 1893	23.290001
## 2046	Mexico 1894	26.620001
## 2047	Mexico 1895	29.520000
## 2048	Mexico 1896	28.799999
## 2049	Mexico 1897	26.240000
## 2050	Mexico 1898	27.030001
## 2051	Mexico 1899	24.980000
## 2052	Mexico 1900	27.580000
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## 2056	Mexico 1904	29.090000
## 2057	Mexico 1905	26.799999
## 2058	Mexico 1906	27.879999
## 2059	Mexico 1907	27.969999
## 2060	Mexico 1908	28.719999
## 2061	Mexico 1909	29.209999
## 2062	Mexico 1910	27.410000
## 2063	Mexico 1911	27.842501
## 2064	Mexico 1912	28.275000
## 2065	Mexico 1913	28.707500
## 2066	Mexico 1914	29.139999
## 2067	Mexico 1915	29.572500
## 2068	Mexico 1916	30.004999
## 2069	Mexico 1917	30.437500
## 2070	Mexico 1918	18.186424
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## 2072	Mexico 1920	31.735001
## 2073	Mexico 1921	32.167500
## 2074	Mexico 1922	32.599998
## 2075	Mexico 1923	33.500000
## 2076	Mexico 1924	32.799999
## 2077	Mexico 1925	32.099998
## 2078	Mexico 1926	34.200001
## 2079	Mexico 1927	40.299999
## 2080	Mexico 1928	34.500000
## 2081	Mexico 1929	35.400002
## 2082	Mexico 1930	36.200001
## 2083	Mexico 1931	37.700001
## 2084	Mexico 1932	38.400002
## 2085	Mexico 1933	37.299999
## 2086	Mexico 1934	38.200001
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## 2088	Mexico 1936	38.299999
## 2089	Mexico 1937	36.799999
## 2090	Mexico 1938	39.400002
## 2091	Mexico 1939	45.500000
## 2092	Mexico 1940	39.200001
## 2093	Mexico 1941	42.599998
## 2094	Mexico 1942	39.799999
## 2095	Mexico 1943	42.799999
## 2096	Mexico 1944	43.200001
## 2097	Mexico 1945	44.200001
## 2098	Mexico 1946	44.799999
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## 2100	Mexico 1948	48.299999
## 2101	Mexico 1949	45.799999
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## 2103	Mexico 1951	49.115002
## 2104	Mexico 1952	50.209999
## 2105	Mexico 1953	51.254002
## 2106	Mexico 1954	52.247002
## 2107	Mexico 1955	53.189999
## 2108	Mexico 1956	54.081001
## 2109	Mexico 1957	54.918999
## 2110	Mexico 1958	55.702000
## 2111	Mexico 1959	56.424000
## 2112	Mexico 1960	57.083000
## 2113	Mexico 1961	57.674000
## 2114	Mexico 1962	58.199001
## 2115	Mexico 1963	58.661999
## 2116	Mexico 1964	59.076000
## 2117	Mexico 1965	59.453999
## 2118	Mexico 1966	59.813999
## 2119	Mexico 1967	60.172001
## 2120	Mexico 1968	60.542999
## 2121	Mexico 1969	60.938999
## 2122	Mexico 1970	61.368999
## 2123	Mexico 1971	61.835999
## 2124	Mexico 1972	62.333000
## 2125	Mexico 1973	62.851002
## 2126	Mexico 1974	63.383999
## 2127	Mexico 1975	63.928001
## 2128	Mexico 1976	64.473999
## 2129	Mexico 1977	65.015999
## 2130	Mexico 1978	65.547997
## 2131	Mexico 1979	66.065002
## 2132	Mexico 1980	66.563004
## 2133	Mexico 1981	67.041000
## 2134	Mexico 1982	67.502998
## 2135	Mexico 1983	67.950996
## 2136	Mexico 1984	68.387001
## 2137	Mexico 1985	68.811996
## 2138	Mexico 1986	69.227997
## 2139	Mexico 1987	69.637001
## 2140	Mexico 1988	70.040001
## 2141	Mexico 1989	70.440002

## 2142	Mexico 1990	71.510002
## 2143	Mexico 1991	71.879997
## 2144	Mexico 1992	72.089996
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## 2153	Mexico 2001	74.870003
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## 2157	Mexico 2005	75.209999
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## 2159	Mexico 2007	75.660004
## 2160	Mexico 2008	75.440002
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## 2162	Mexico 2010	75.440002
## 2163	Mexico 2011	75.720001
## 2164	Mexico 2012	75.879997
## 2165	Mexico 2013	75.790001
## 2166	Mexico 2014	75.900002
## 2167	Mexico 2015	76.190002
## 2168	Mexico 2016	76.379997
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## 2170	Russia 1801	29.573458
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## 2198	Russia 1829	29.573458
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## 2207	Russia 1838	29.573458
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## 2211	Russia 1842	29.573458
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## 2213	Russia 1844	29.573458
## 2214	Russia 1845	29.573458
## 2215	Russia 1846	29.573458
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## 2220	Russia 1851	29.573458
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## 2222	Russia 1853	29.500000
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## 2232	Russia 1863	29.573458
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## 2235	Russia 1866	29.573458
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## 2243	Russia 1874	30.474104
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## 2246	Russia 1877	31.308113
## 2247	Russia 1878	27.767805
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## 2461	Spain 1875	29.500000
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## 2471	Spain 1885	30.280001
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## 2475	Spain 1889	31.320000
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## 2480	Spain 1894	32.775002
## 2481	Spain 1895	33.112499
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## 2497	Spain 1911	39.799999
## 2498	Spain 1912	43.529999
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## 2503	Spain 1917	42.630001
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## 2523	Spain 1937	47.220001
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## 2686	Switzerland	1883	44.939999
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## 2692	Switzerland	1889	45.139999
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## 2697	Switzerland	1894	45.790001
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## 2725	Switzerland	1922	58.500000
## 2726	Switzerland	1923	60.040001
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## 2728	Switzerland	1925	59.950001
## 2729	Switzerland	1926	60.639999
## 2730	Switzerland	1927	60.099998
## 2731	Switzerland	1928	60.470001
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## 2740	Switzerland	1937	63.509998
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## 2755	Switzerland	1952	69.620003
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## 2765	Switzerland	1962	71.320000
## 2766	Switzerland	1963	71.309998
## 2767	Switzerland	1964	72.199997
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## 2779	Switzerland	1976	74.940002
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## 2781	Switzerland	1978	75.339996
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## 2813	Switzerland	2010	82.300003
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## 2824	United Kingdom	1804	41.436916
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## 2840	United Kingdom	1820	41.312477
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## 2847 United Kingdom 1827	41.138859
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## 2851 United Kingdom 1831	40.843559
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## 2855 United Kingdom 1835	41.104195
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## 2857 United Kingdom 1837	40.203598
## 2858 United Kingdom 1838	40.301132
## 2859 United Kingdom 1839	40.879307
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## 2886 United Kingdom 1866	40.410000
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## 2985 United Kingdom 1965	71.610001
## 2986 United Kingdom 1966	71.529999
## 2987 United Kingdom 1967	72.160004
## 2988 United Kingdom 1968	71.790001
## 2989 United Kingdom 1969	71.750000
## 2990 United Kingdom 1970	72.000000
## 2991 United Kingdom 1971	72.320000
## 2992 United Kingdom 1972	72.099998
## 2993 United Kingdom 1973	72.309998
## 2994 United Kingdom 1974	72.510002
## 2995 United Kingdom 1975	72.779999
## 2996 United Kingdom 1976	72.760002
## 2997 United Kingdom 1977	73.250000
## 2998 United Kingdom 1978	73.180000
## 2999 United Kingdom 1979	73.290001
## 3000 United Kingdom 1980	73.720001
## 3001 United Kingdom 1981	74.059998
## 3002 United Kingdom 1982	74.190002
## 3003 United Kingdom 1983	74.440002
## 3004 United Kingdom 1984	74.830002
## 3005 United Kingdom 1985	74.680000

## 3006 United Kingdom 1986	74.949997
## 3007 United Kingdom 1987	75.300003
## 3008 United Kingdom 1988	75.410004
## 3009 United Kingdom 1989	75.550003
## 3010 United Kingdom 1990	75.720001
## 3011 United Kingdom 1991	75.940002
## 3012 United Kingdom 1992	76.169998
## 3013 United Kingdom 1993	76.300003
## 3014 United Kingdom 1994	76.550003
## 3015 United Kingdom 1995	76.690002
## 3016 United Kingdom 1996	76.910004
## 3017 United Kingdom 1997	77.139999
## 3018 United Kingdom 1998	77.339996
## 3019 United Kingdom 1999	77.529999
## 3020 United Kingdom 2000	77.839996
## 3021 United Kingdom 2001	78.099998
## 3022 United Kingdom 2002	78.309998
## 3023 United Kingdom 2003	78.449997
## 3024 United Kingdom 2004	78.820000
## 3025 United Kingdom 2005	79.099998
## 3026 United Kingdom 2006	79.379997
## 3027 United Kingdom 2007	79.639999
## 3028 United Kingdom 2008	79.879997
## 3029 United Kingdom 2009	80.169998
## 3030 United Kingdom 2010	80.389999
## 3031 United Kingdom 2011	80.580002
## 3032 United Kingdom 2012	80.680000
## 3033 United Kingdom 2013	80.769997
## 3034 United Kingdom 2014	80.820000
## 3035 United Kingdom 2015	80.860001
## 3036 United Kingdom 2016	80.900002
## 3037 United States 1800	39.410000
## 3038 United States 1801	39.410000
## 3039 United States 1802	39.410000
## 3040 United States 1803	39.410000
## 3041 United States 1804	39.410000
## 3042 United States 1805	39.410000
## 3043 United States 1806	39.410000
## 3044 United States 1807	39.410000
## 3045 United States 1808	39.410000
## 3046 United States 1809	39.410000
## 3047 United States 1810	39.410000
## 3048 United States 1811	39.410000
## 3049 United States 1812	39.410000
## 3050 United States 1813	39.410000
## 3051 United States 1814	39.410000
## 3052 United States 1815	39.410000
## 3053 United States 1816	39.410000
## 3054 United States 1817	39.410000
## 3055 United States 1818	39.410000
## 3056 United States 1819	39.410000
## 3057 United States 1820	39.410000
## 3058 United States 1821	39.410000
## 3059 United States 1822	39.410000

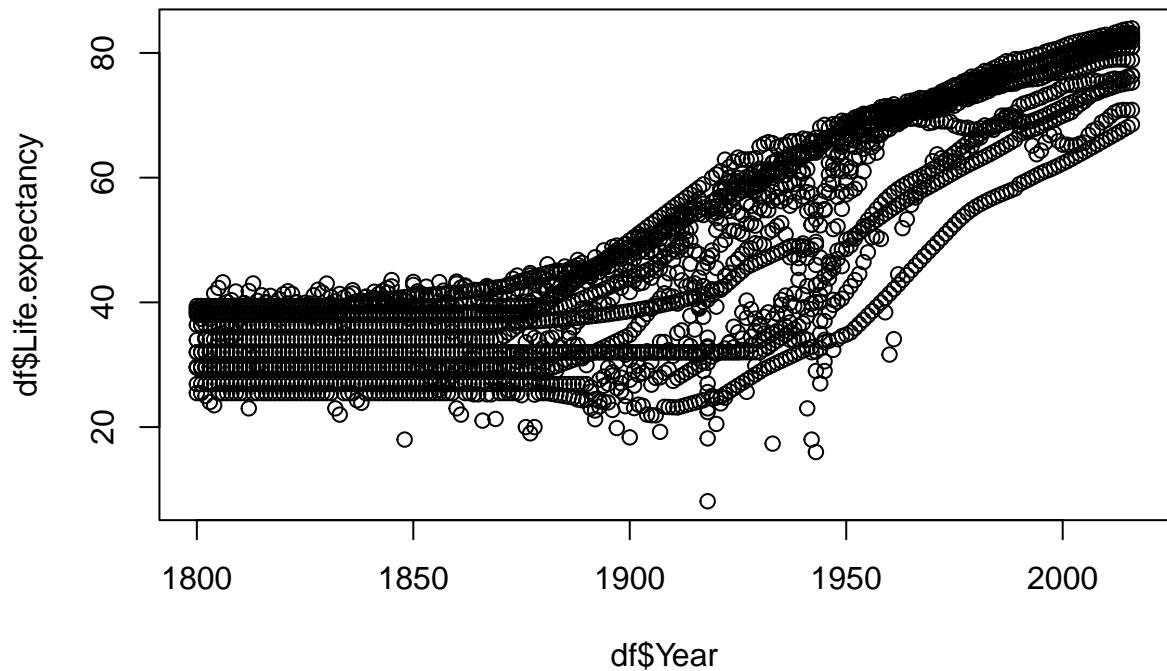
```
## 3060 United States 1823      39.410000
## 3061 United States 1824      39.410000
## 3062 United States 1825      39.410000
## 3063 United States 1826      39.410000
## 3064 United States 1827      39.410000
## 3065 United States 1828      39.410000
## 3066 United States 1829      39.410000
## 3067 United States 1830      39.410000
## 3068 United States 1831      39.410000
## 3069 United States 1832      39.410000
## 3070 United States 1833      39.410000
## 3071 United States 1834      39.410000
## 3072 United States 1835      39.410000
## 3073 United States 1836      39.410000
## 3074 United States 1837      39.410000
## 3075 United States 1838      39.410000
## 3076 United States 1839      39.410000
## 3077 United States 1840      39.410000
## 3078 United States 1841      39.410000
## 3079 United States 1842      39.410000
## 3080 United States 1843      39.410000
## 3081 United States 1844      39.410000
## 3082 United States 1845      39.410000
## 3083 United States 1846      39.410000
## 3084 United States 1847      39.410000
## 3085 United States 1848      39.410000
## 3086 United States 1849      39.410000
## 3087 United States 1850      39.410000
## 3088 United States 1851      39.410000
## 3089 United States 1852      39.410000
## 3090 United States 1853      39.410000
## 3091 United States 1854      39.410000
## 3092 United States 1855      39.410000
## 3093 United States 1856      39.410000
## 3094 United States 1857      39.410000
## 3095 United States 1858      39.410000
## 3096 United States 1859      39.410000
## 3097 United States 1860      39.410000
## 3098 United States 1861      38.000000
## 3099 United States 1862      34.500000
## 3100 United States 1863      34.000000
## 3101 United States 1864      31.000000
## 3102 United States 1865      38.000000
## 3103 United States 1866      39.410000
## 3104 United States 1867      39.410000
## 3105 United States 1868      39.410000
## 3106 United States 1869      39.410000
## 3107 United States 1870      39.410000
## 3108 United States 1871      39.410000
## 3109 United States 1872      39.410000
## 3110 United States 1873      39.410000
## 3111 United States 1874      39.410000
## 3112 United States 1875      39.410000
## 3113 United States 1876      39.410000
```

## 3114	United States	1877	39.410000
## 3115	United States	1878	39.410000
## 3116	United States	1879	39.410000
## 3117	United States	1880	39.410000
## 3118	United States	1881	39.990002
## 3119	United States	1882	40.570000
## 3120	United States	1883	41.150002
## 3121	United States	1884	41.730000
## 3122	United States	1885	42.310001
## 3123	United States	1886	42.889999
## 3124	United States	1887	43.470001
## 3125	United States	1888	44.049999
## 3126	United States	1889	44.630001
## 3127	United States	1890	45.209999
## 3128	United States	1891	45.581818
## 3129	United States	1892	45.953636
## 3130	United States	1893	46.325455
## 3131	United States	1894	46.697273
## 3132	United States	1895	47.069092
## 3133	United States	1896	47.440910
## 3134	United States	1897	47.812729
## 3135	United States	1898	48.184544
## 3136	United States	1899	48.556362
## 3137	United States	1900	48.928181
## 3138	United States	1901	49.299999
## 3139	United States	1902	50.500000
## 3140	United States	1903	50.599998
## 3141	United States	1904	49.599998
## 3142	United States	1905	50.299999
## 3143	United States	1906	50.099998
## 3144	United States	1907	50.200001
## 3145	United States	1908	51.900002
## 3146	United States	1909	52.799999
## 3147	United States	1910	51.799999
## 3148	United States	1911	53.400002
## 3149	United States	1912	54.099998
## 3150	United States	1913	53.500000
## 3151	United States	1914	54.599998
## 3152	United States	1915	55.099998
## 3153	United States	1916	54.200001
## 3154	United States	1917	54.000000
## 3155	United States	1918	47.200001
## 3156	United States	1919	55.299999
## 3157	United States	1920	55.400002
## 3158	United States	1921	58.200001
## 3159	United States	1922	58.099998
## 3160	United States	1923	57.500000
## 3161	United States	1924	58.500000
## 3162	United States	1925	58.500000
## 3163	United States	1926	57.900002
## 3164	United States	1927	59.400002
## 3165	United States	1928	58.299999
## 3166	United States	1929	58.500000
## 3167	United States	1930	59.599998

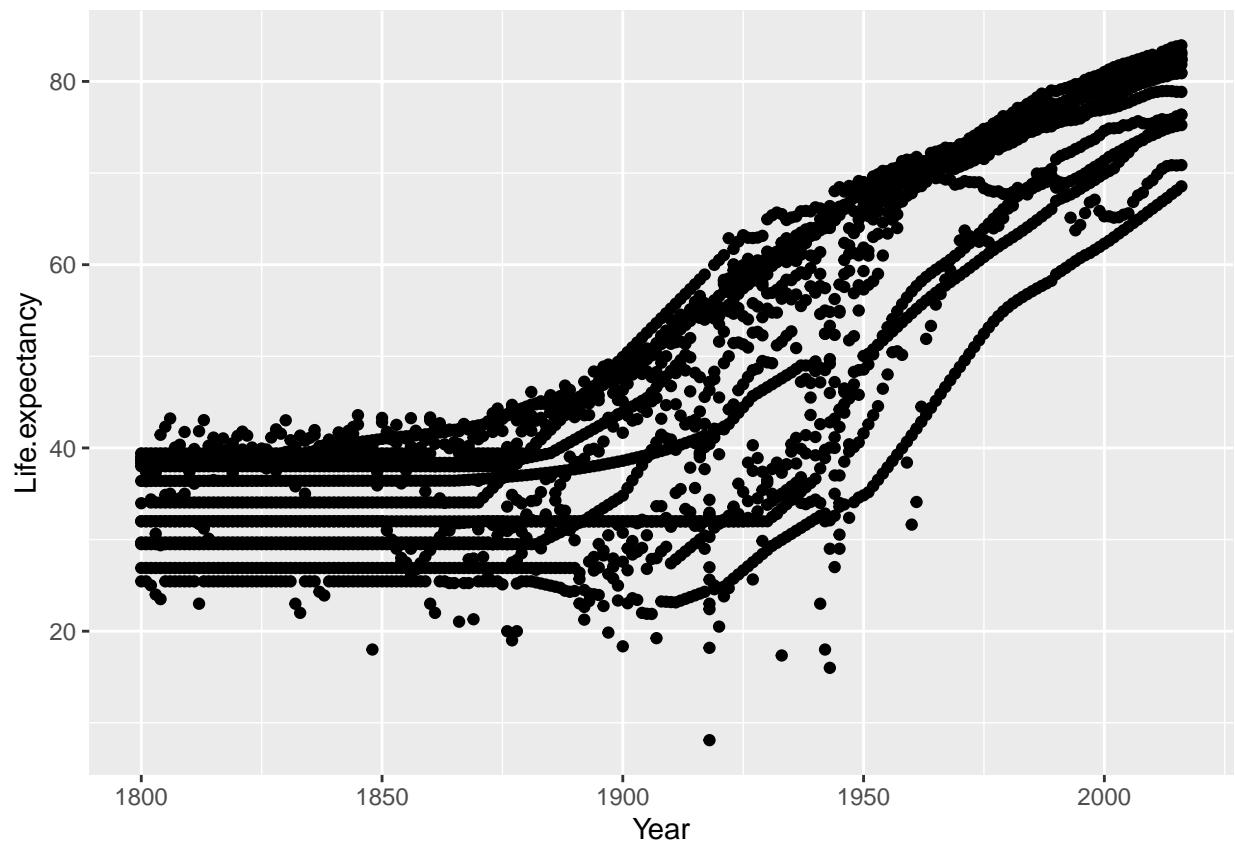
## 3168	United States	1931	60.299999
## 3169	United States	1932	61.000000
## 3170	United States	1933	60.959999
## 3171	United States	1934	60.290001
## 3172	United States	1935	60.939999
## 3173	United States	1936	60.400002
## 3174	United States	1937	61.099998
## 3175	United States	1938	62.430000
## 3176	United States	1939	63.119999
## 3177	United States	1940	63.279999
## 3178	United States	1941	63.840000
## 3179	United States	1942	64.629997
## 3180	United States	1943	64.339996
## 3181	United States	1944	65.129997
## 3182	United States	1945	65.629997
## 3183	United States	1946	66.330002
## 3184	United States	1947	66.730003
## 3185	United States	1948	67.300003
## 3186	United States	1949	67.680000
## 3187	United States	1950	68.120003
## 3188	United States	1951	68.220001
## 3189	United States	1952	68.440002
## 3190	United States	1953	68.790001
## 3191	United States	1954	69.580002
## 3192	United States	1955	69.629997
## 3193	United States	1956	69.709999
## 3194	United States	1957	69.489998
## 3195	United States	1958	69.760002
## 3196	United States	1959	69.980003
## 3197	United States	1960	69.910004
## 3198	United States	1961	70.320000
## 3199	United States	1962	70.209999
## 3200	United States	1963	70.040001
## 3201	United States	1964	70.330002
## 3202	United States	1965	70.410004
## 3203	United States	1966	70.430000
## 3204	United States	1967	70.760002
## 3205	United States	1968	70.419998
## 3206	United States	1969	70.660004
## 3207	United States	1970	70.919998
## 3208	United States	1971	71.239998
## 3209	United States	1972	71.339996
## 3210	United States	1973	71.540001
## 3211	United States	1974	72.080002
## 3212	United States	1975	72.680000
## 3213	United States	1976	72.989998
## 3214	United States	1977	73.379997
## 3215	United States	1978	73.580002
## 3216	United States	1979	74.029999
## 3217	United States	1980	73.930000
## 3218	United States	1981	74.360001
## 3219	United States	1982	74.650002
## 3220	United States	1983	74.709999
## 3221	United States	1984	74.809998

```
## 3222 United States 1985      74.790001
## 3223 United States 1986      74.870003
## 3224 United States 1987      75.010002
## 3225 United States 1988      75.019997
## 3226 United States 1989      75.099998
## 3227 United States 1990      75.449997
## 3228 United States 1991      75.599998
## 3229 United States 1992      75.750000
## 3230 United States 1993      75.769997
## 3231 United States 1994      75.830002
## 3232 United States 1995      75.959999
## 3233 United States 1996      76.290001
## 3234 United States 1997      76.669998
## 3235 United States 1998      76.800003
## 3236 United States 1999      76.839996
## 3237 United States 2000      76.959999
## 3238 United States 2001      77.040001
## 3239 United States 2002      77.169998
## 3240 United States 2003      77.320000
## 3241 United States 2004      77.540001
## 3242 United States 2005      77.699997
## 3243 United States 2006      77.949997
## 3244 United States 2007      78.169998
## 3245 United States 2008      78.370003
## 3246 United States 2009      78.599998
## 3247 United States 2010      78.779999
## 3248 United States 2011      78.870003
## 3249 United States 2012      78.940002
## 3250 United States 2013      78.959999
## 3251 United States 2014      78.940002
## 3252 United States 2015      78.870003
## 3253 United States 2016      78.860001
```

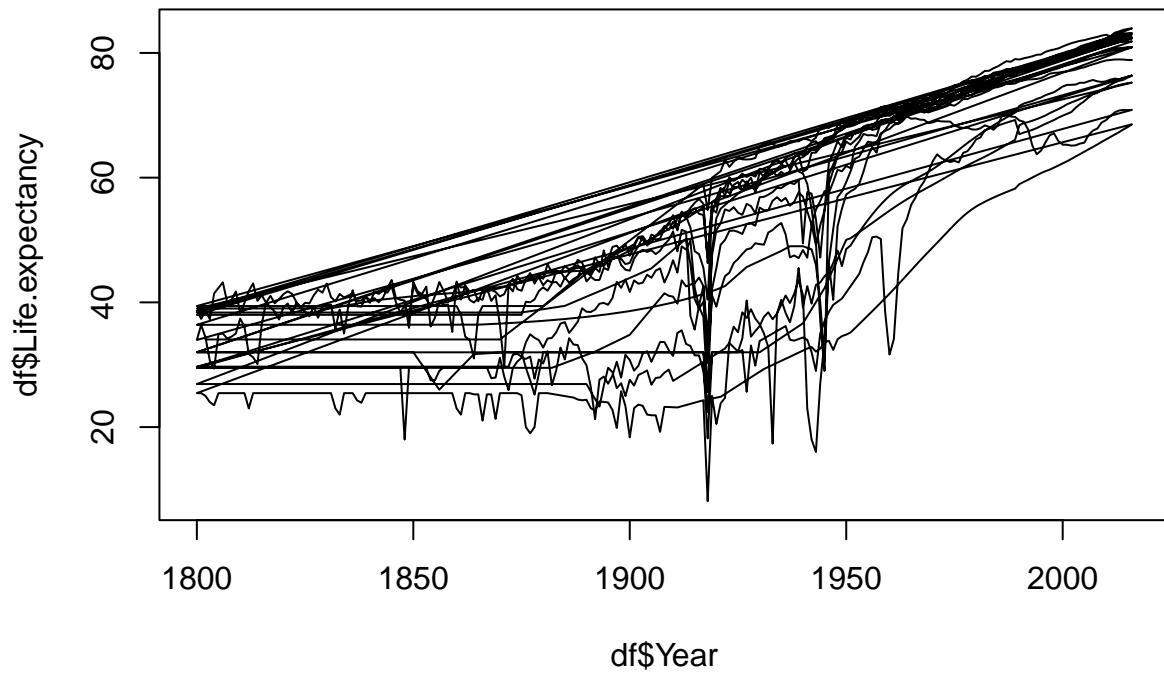
```
plot(df$Year,df$Life.expectancy)
```



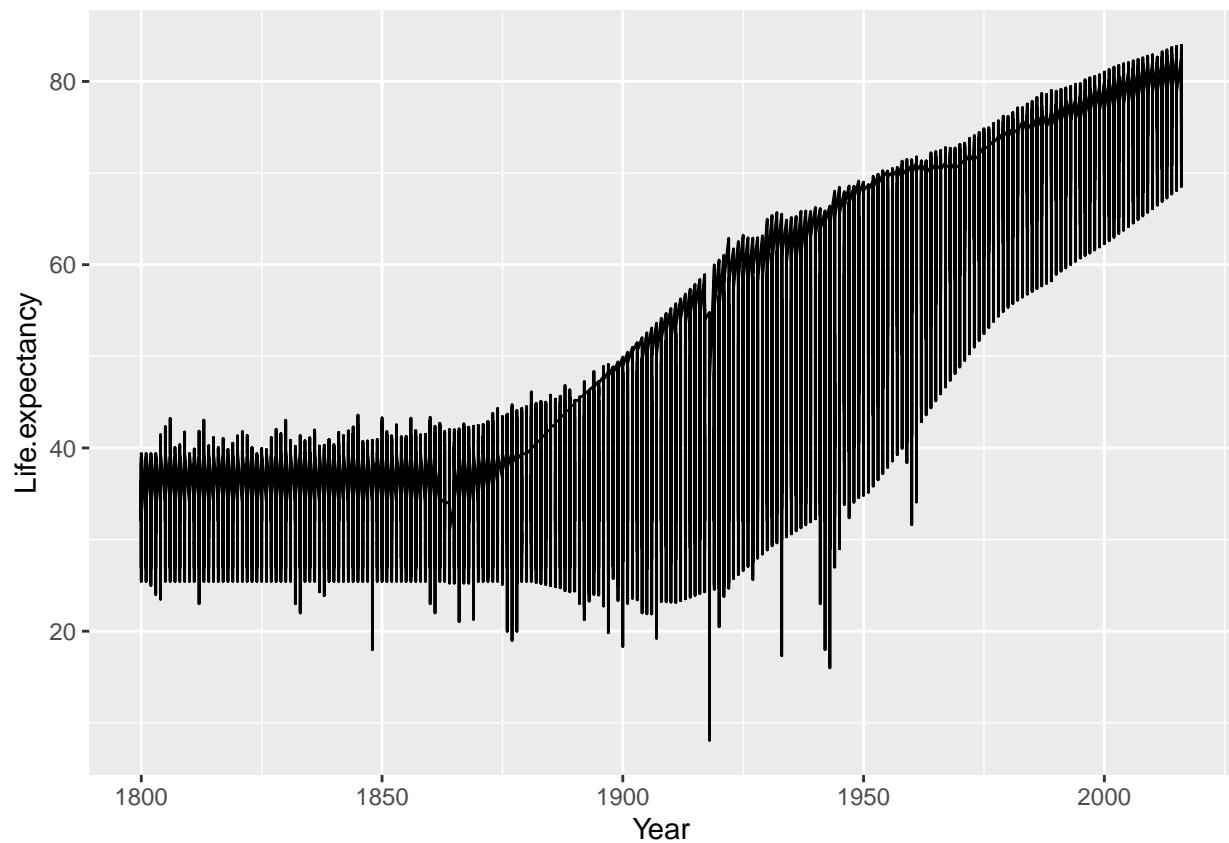
```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_point()
```



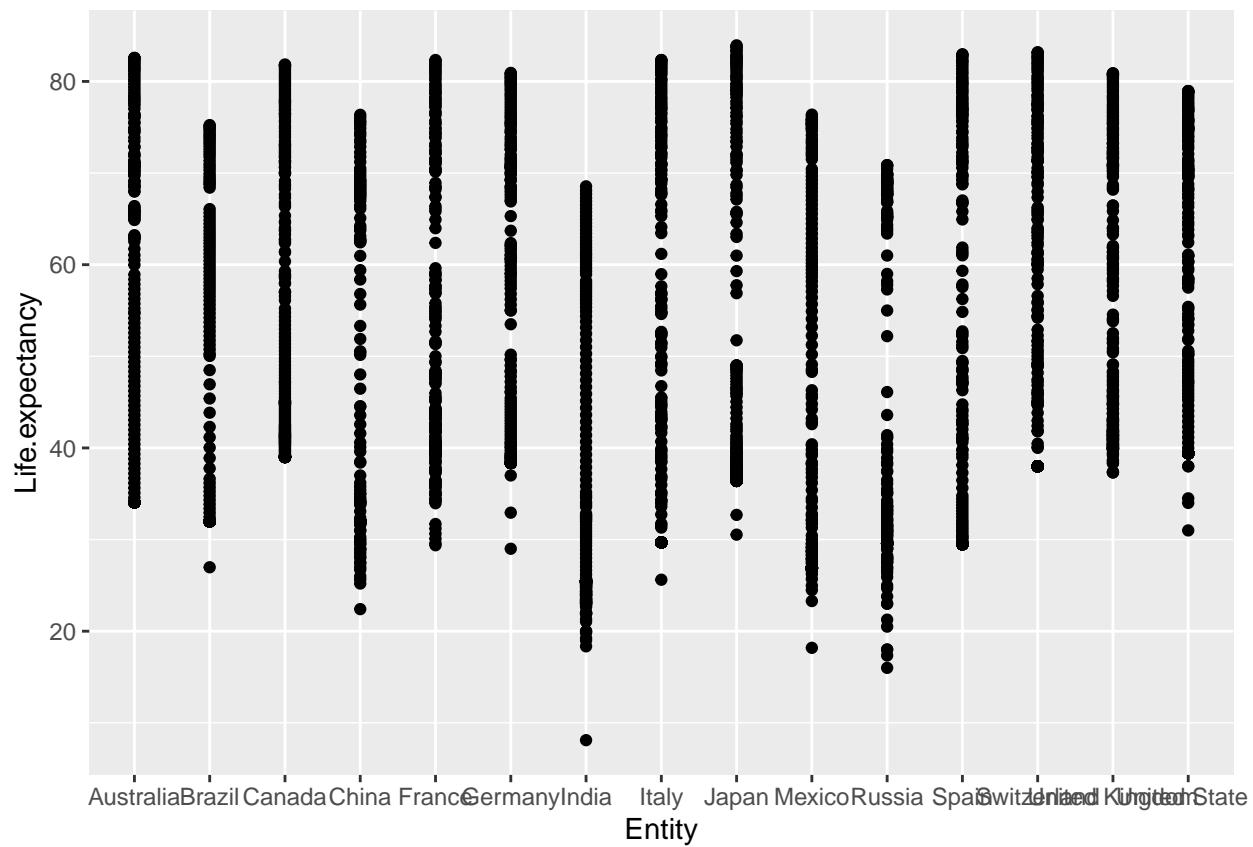
```
plot(df$Year,df$Life.expectancy,type = "l")
```



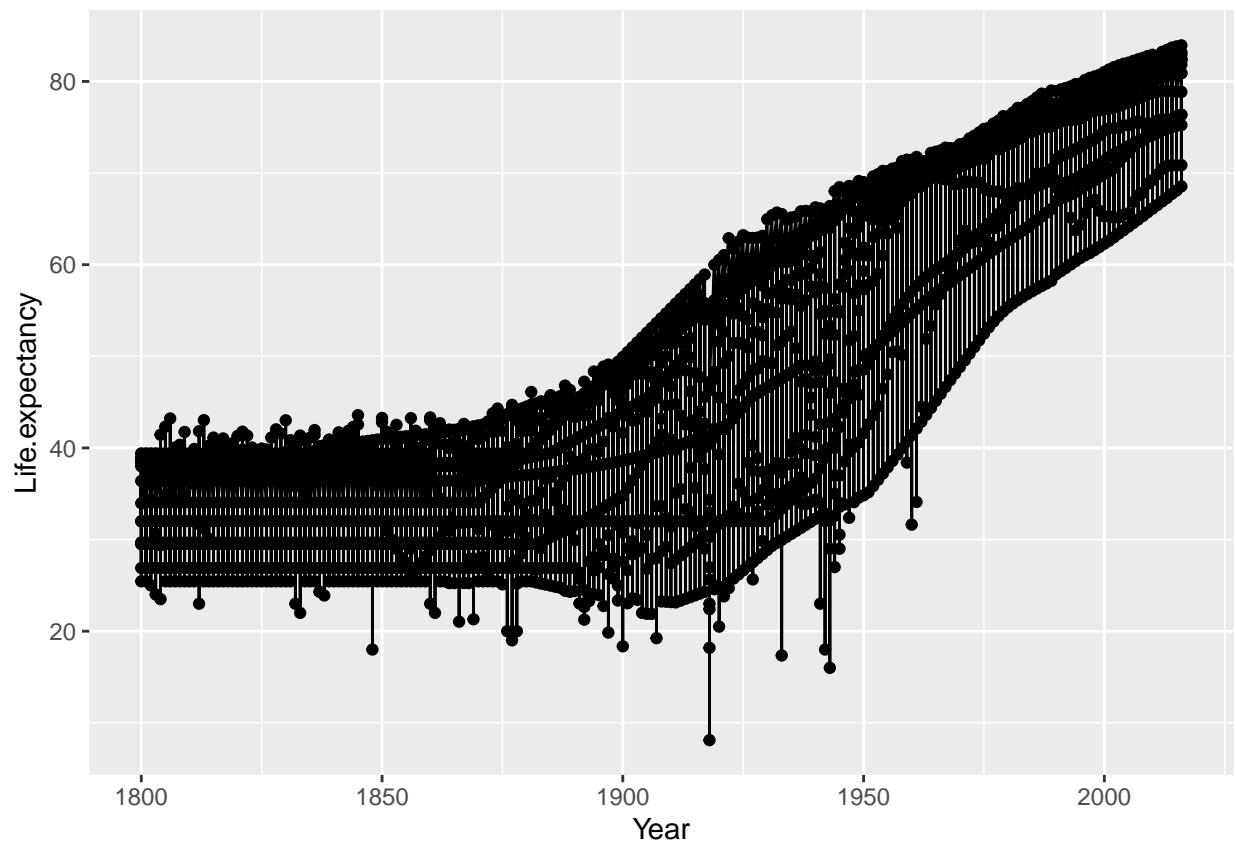
```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_line()
```



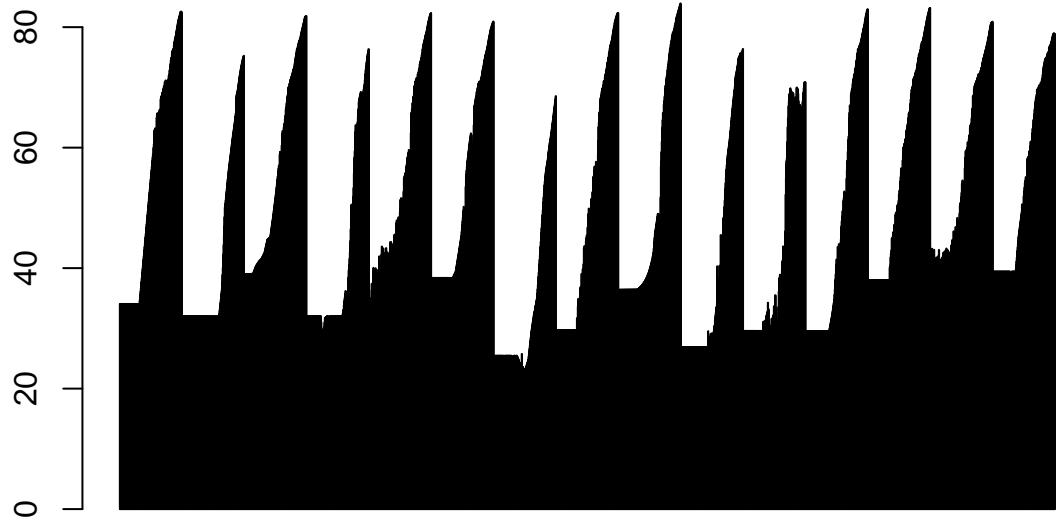
```
ggplot(df, aes(x = Entity, y = Life.expectancy)) +  
  geom_point()
```



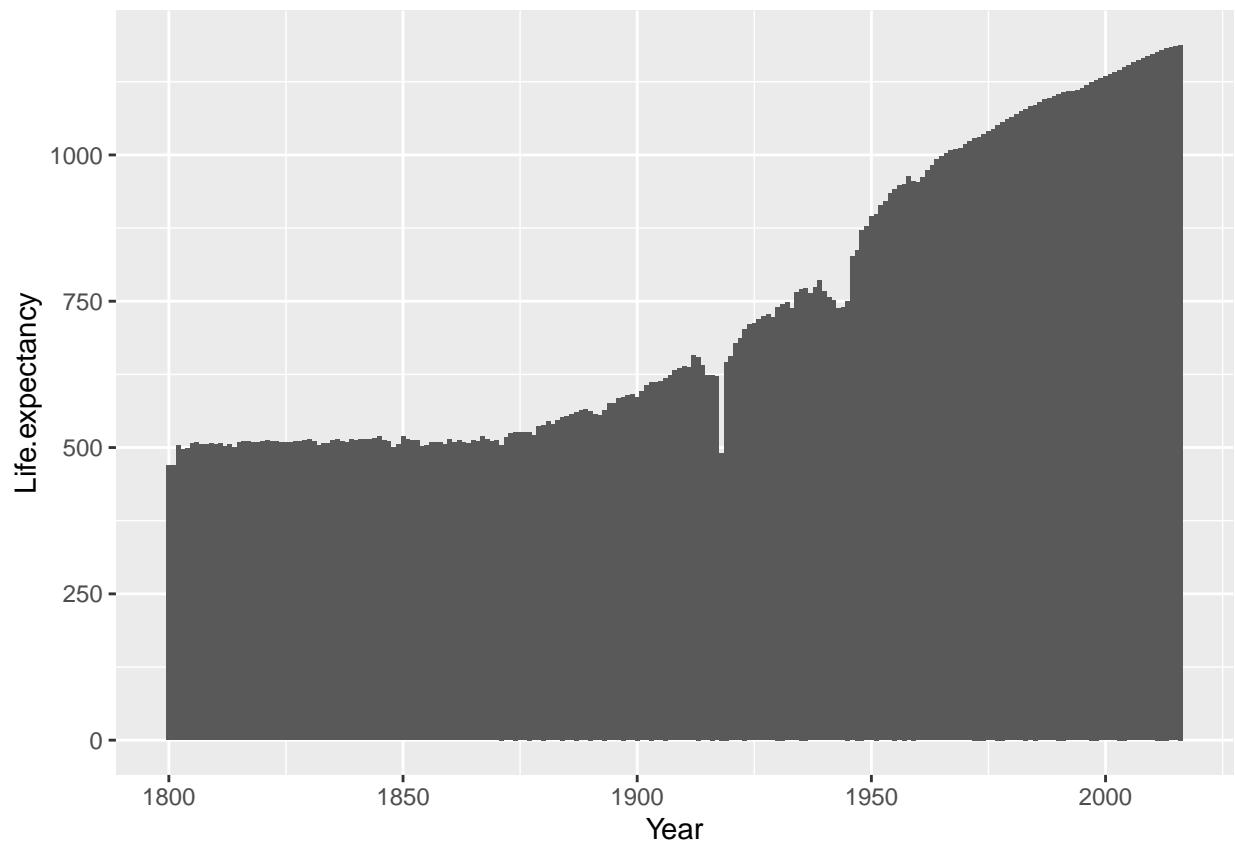
```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_line() +  
  geom_point()
```



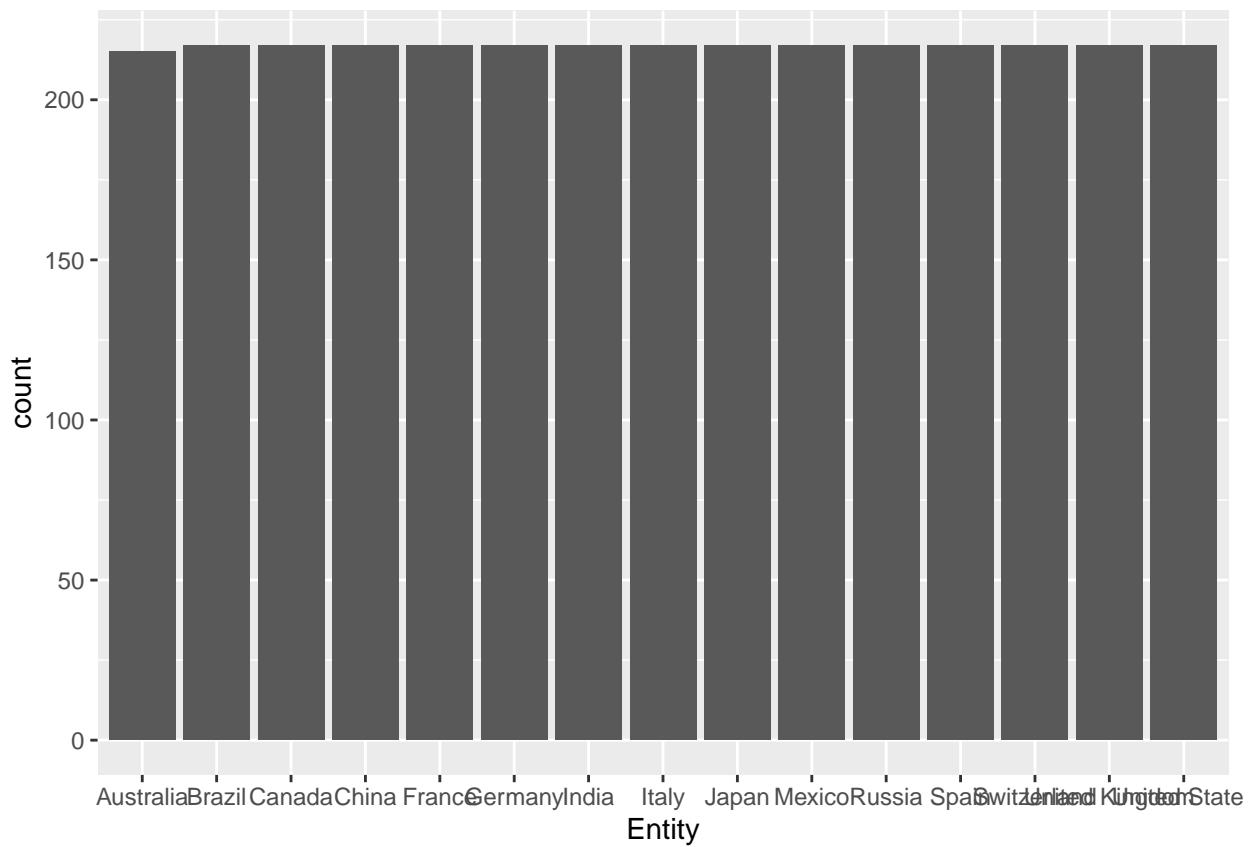
```
barplot(df$Life.expectancy)
```



```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_col()
```

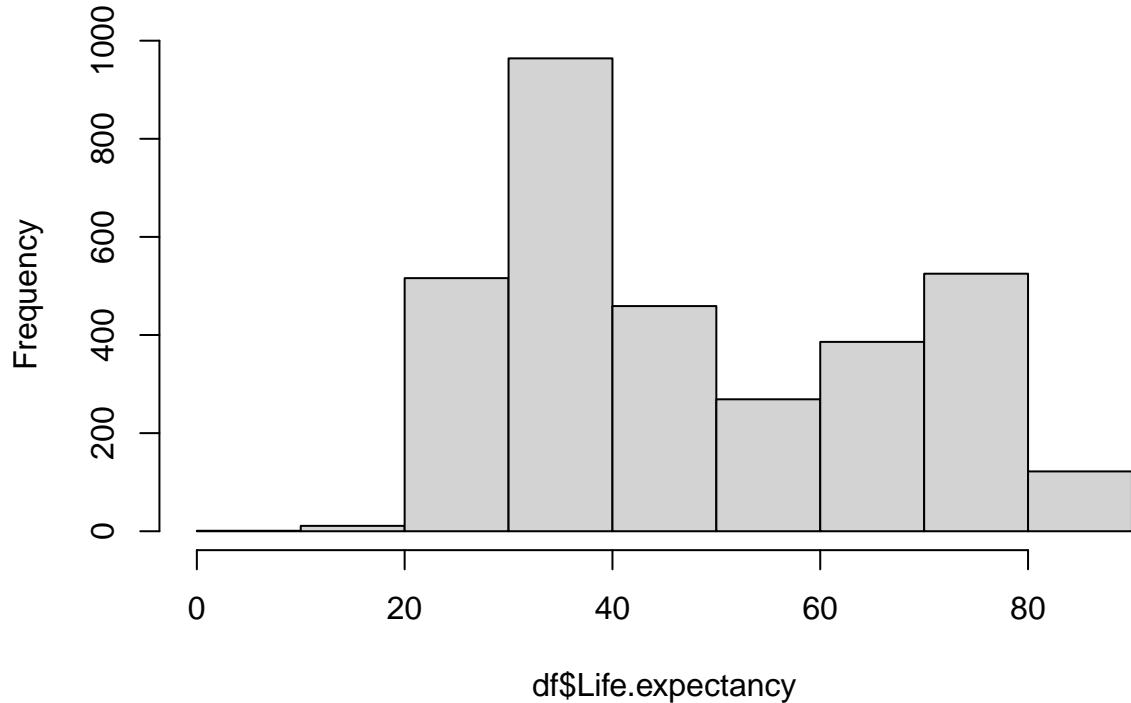


```
ggplot(df, aes(x =Entity)) +  
  geom_bar()
```

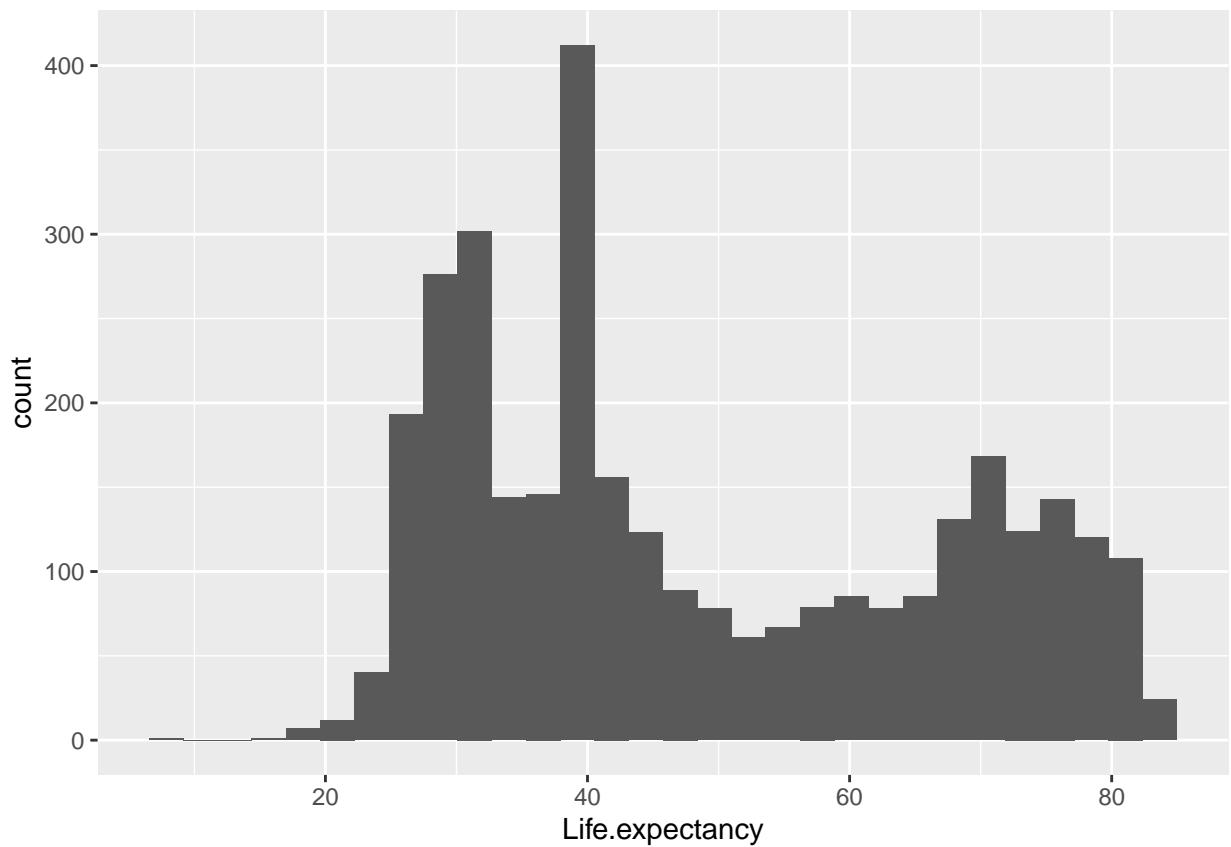


```
hist(df$Life.expectancy, breaks = 10)
```

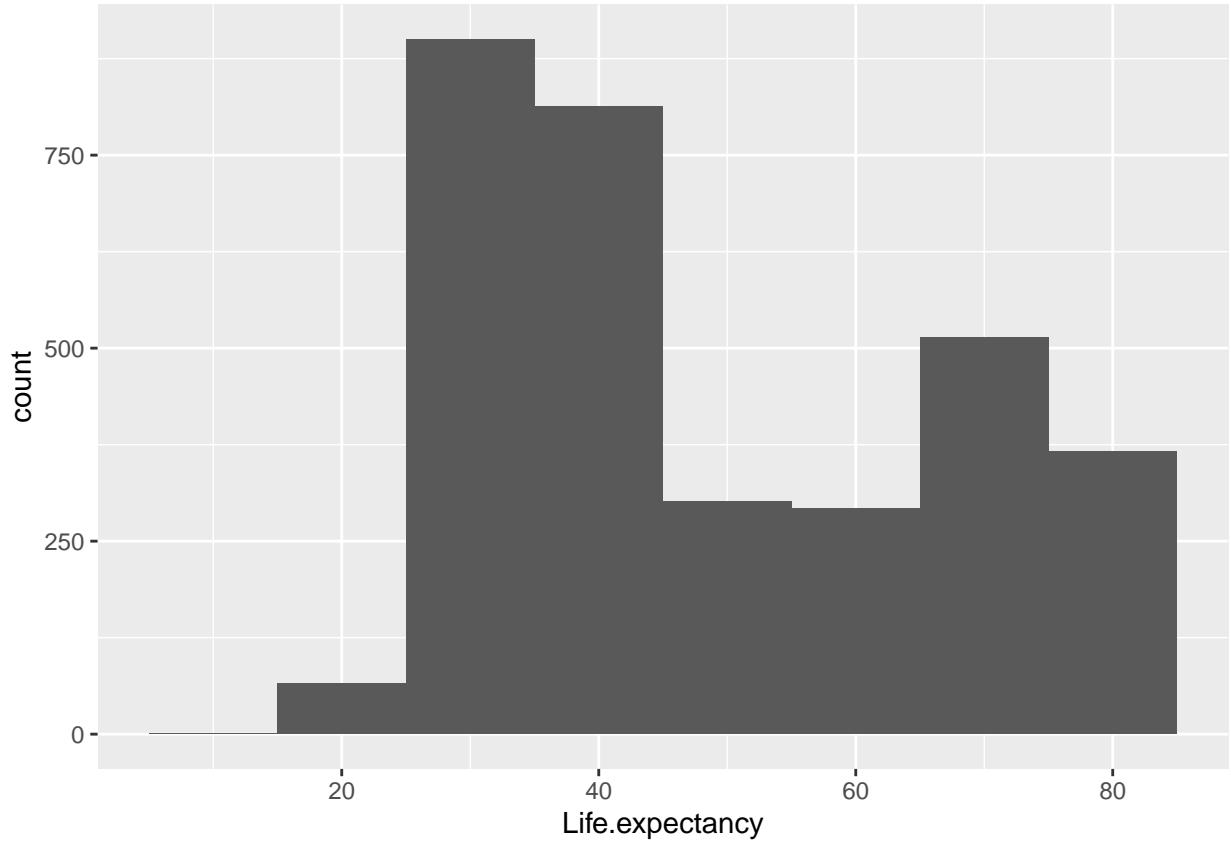
Histogram of df\$Life.expectancy



```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_histogram()  
  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

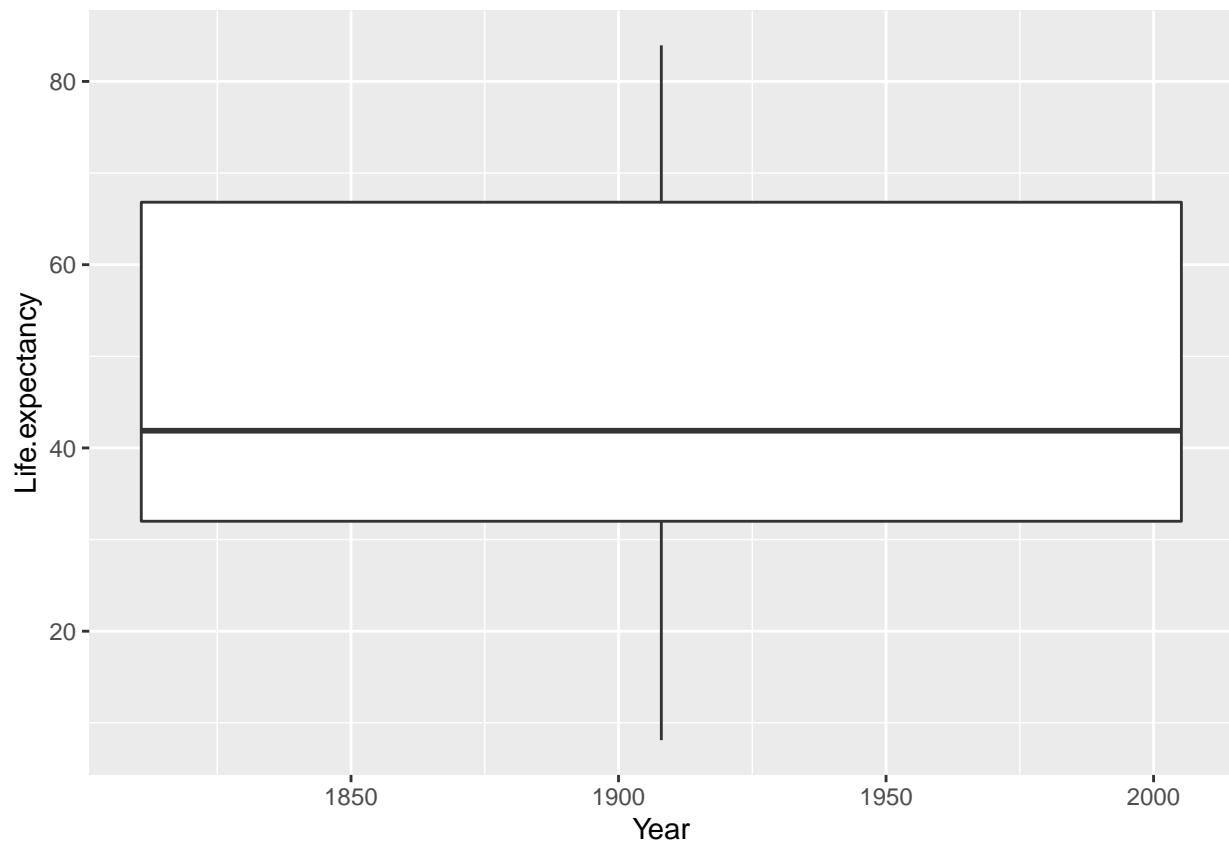


```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_histogram(binwidth=10)
```

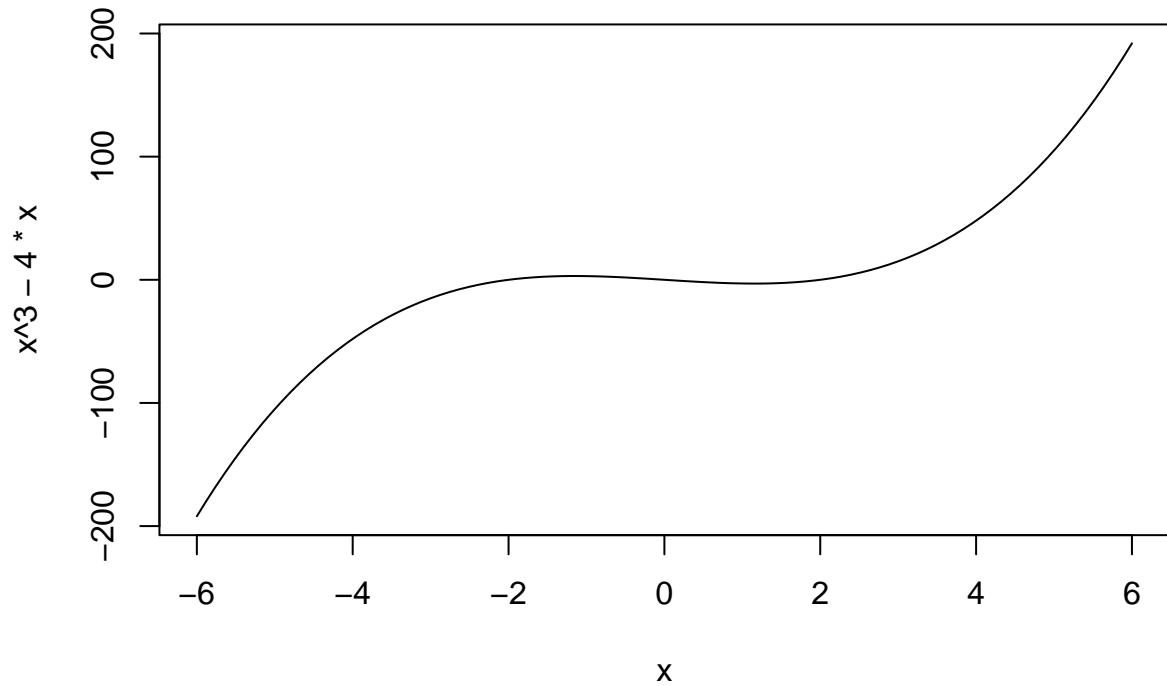


```
ggplot(df, aes(x = Year, y = Life.expectancy)) +geom_boxplot()
```

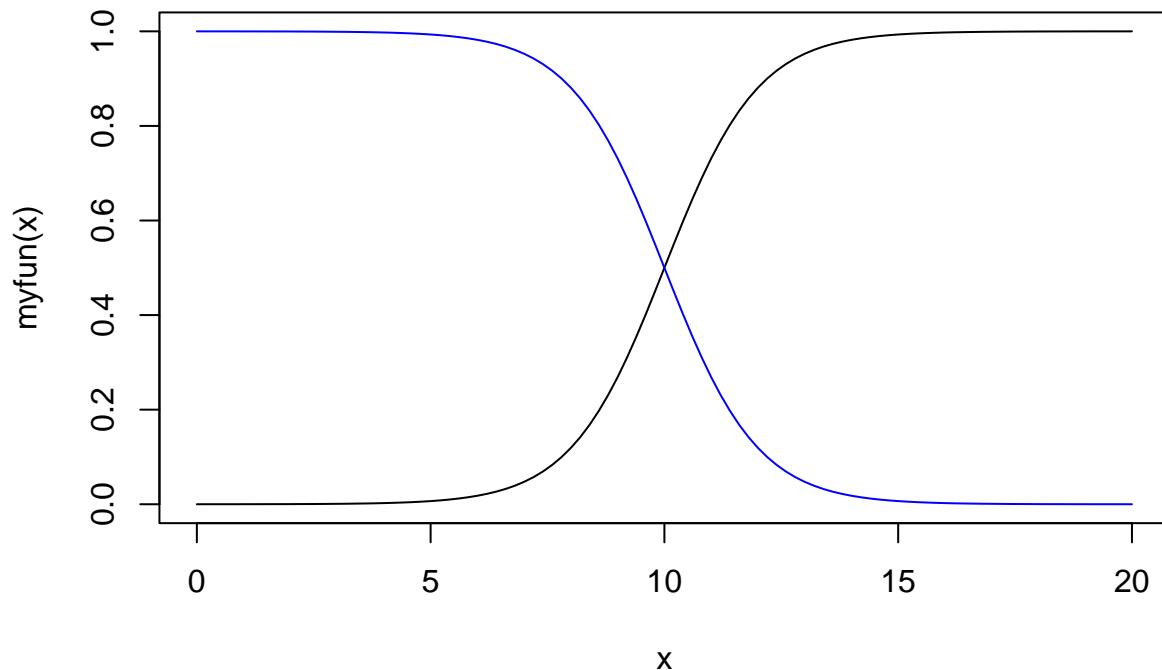
```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?
```



```
curve(x^3 - 4*x, from = -6, to = 6)
```



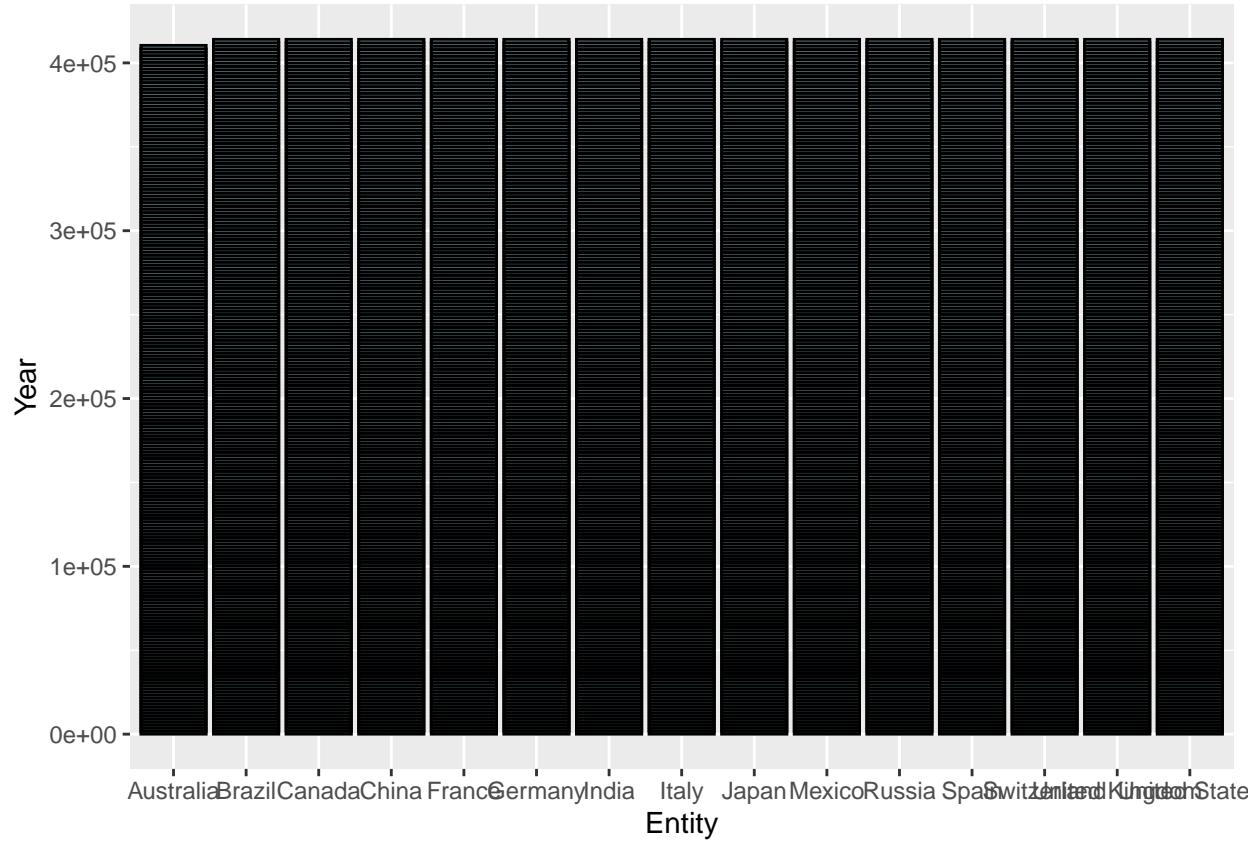
```
myfun <- function(xvar) {  
  1 / (1 + exp(-xvar + 10))  
}  
curve(myfun(x), from = 0, to = 20)  
curve(1 - myfun(x), add = TRUE, col = "blue")
```



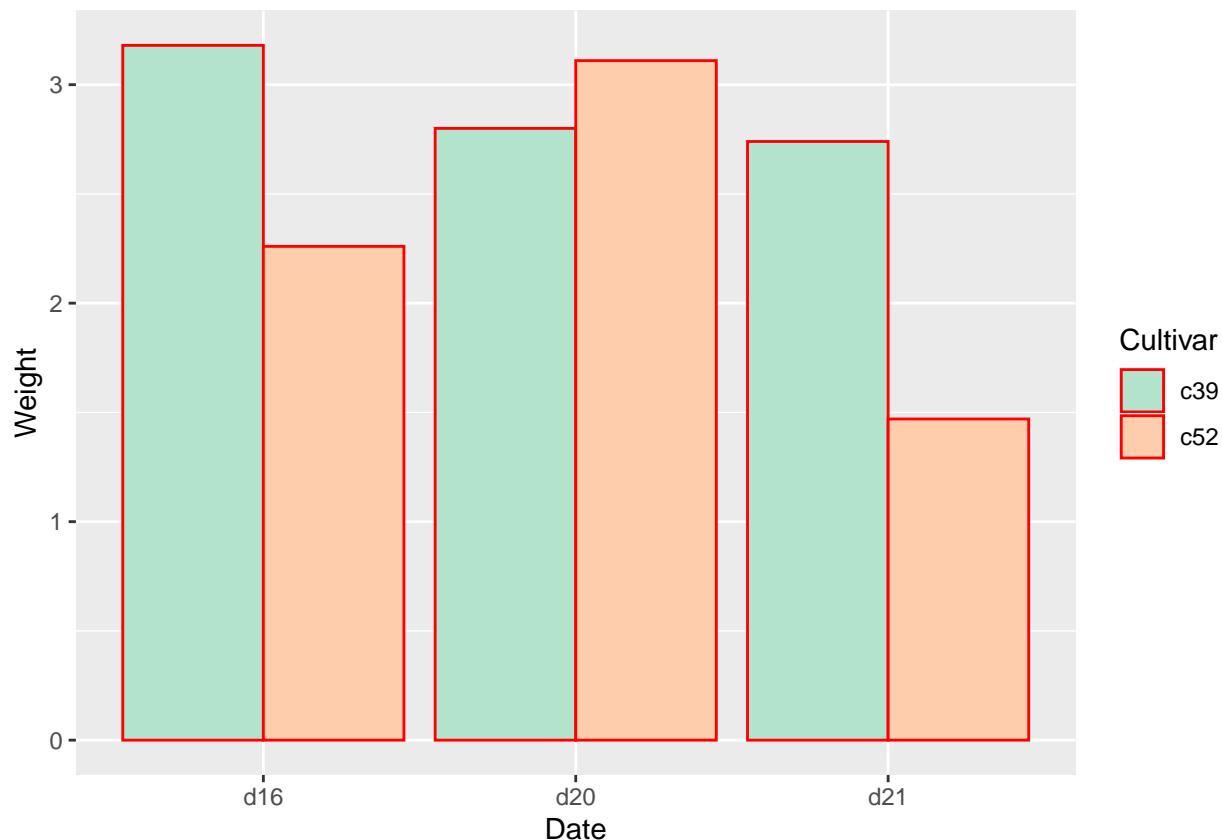
```
str(df)
```

```
## 'data.frame':    3253 obs. of  3 variables:
## $ Entity       : chr  "Australia" "Australia" "Australia" "Australia" ...
## $ Year         : int  1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 ...
## $ Life.expectancy: num  34 34 34 34 34 ...
```

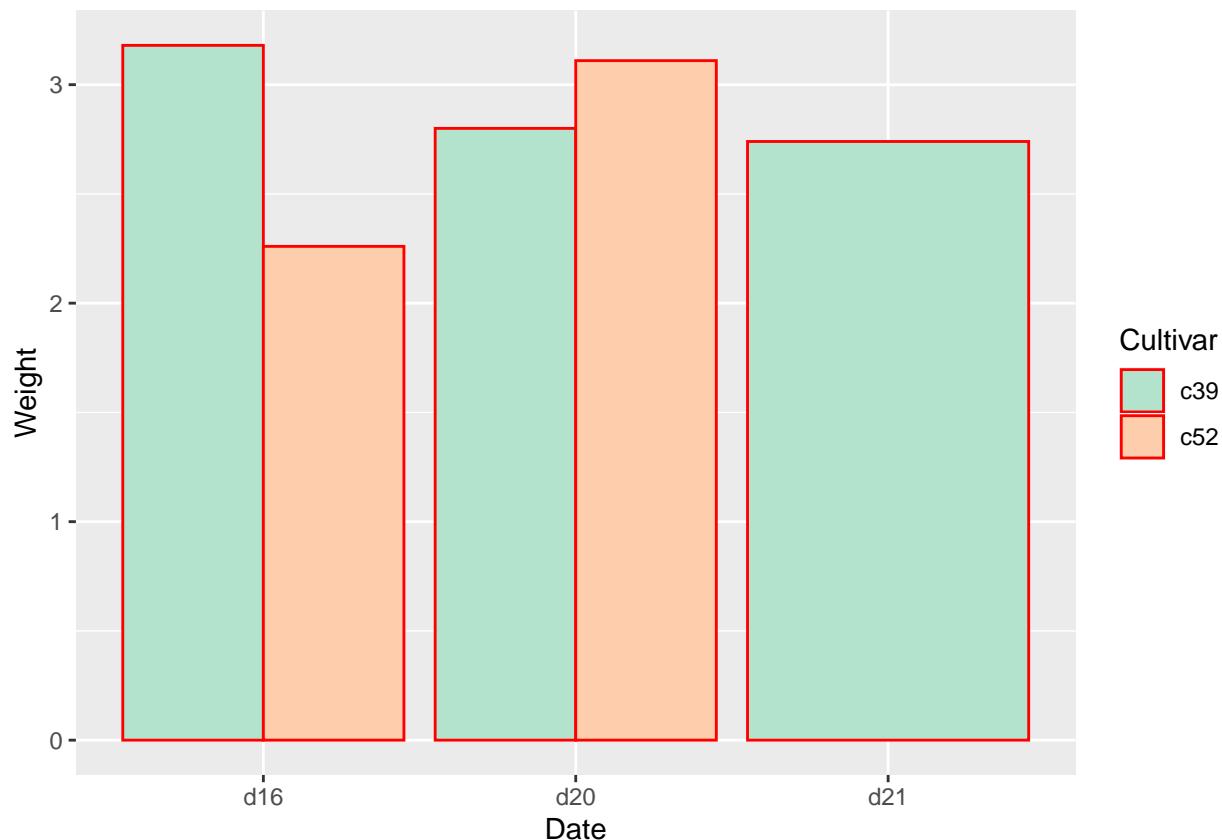
```
ggplot(df, aes(x = Entity, y = Year)) +
  geom_col(fill = "lightblue", colour = "black")
```



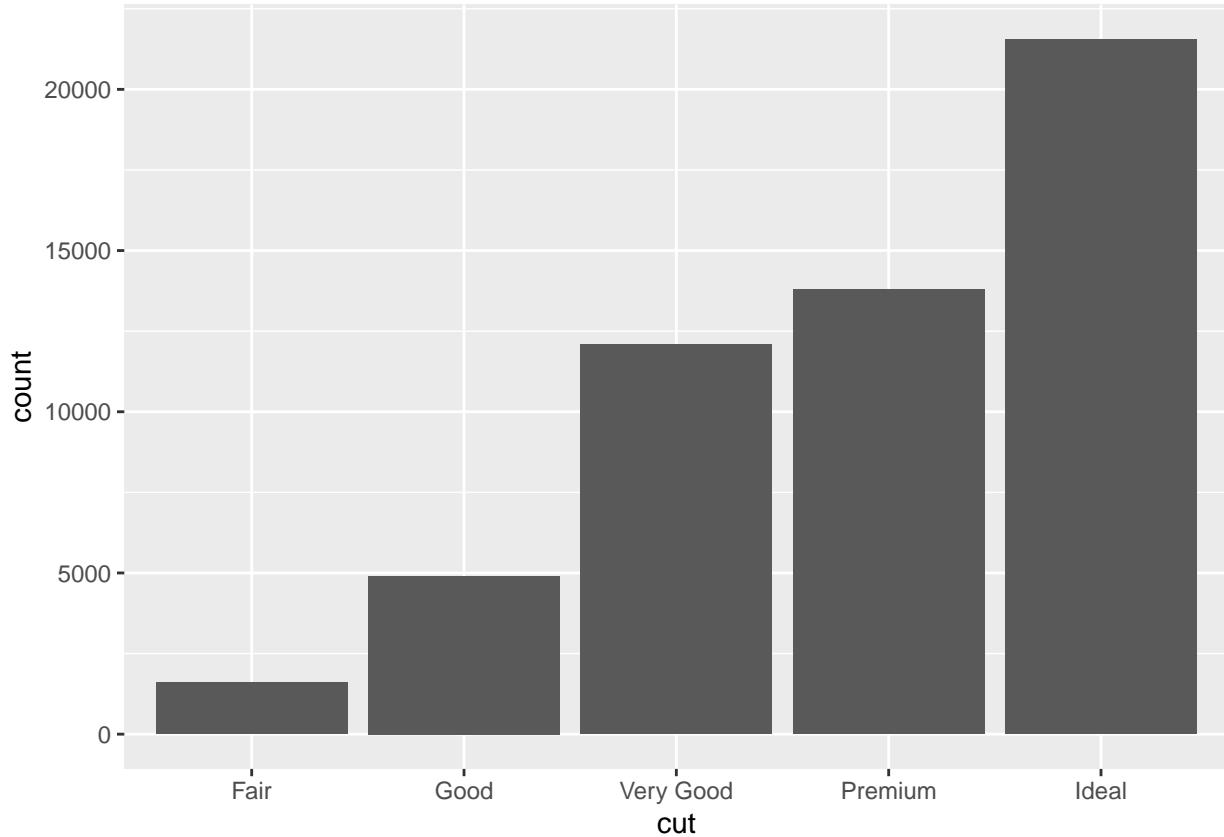
```
library(gcookbook)
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +
  geom_col(position = "dodge", colour = "red") +
  scale_fill_brewer(palette = "Pastel2")
```



```
ce <- cabbage_exp[1:5, ]
ggplot(ce, aes(x = Date, y = Weight, fill = Cultivar)) +
  geom_col(position = "dodge", colour = "red") +
  scale_fill_brewer(palette = "Pastel2")
```



```
ggplot(diamonds, aes(x = cut)) +  
  geom_bar()
```



```

library(dplyr)

##
## Attaching package: 'dplyr'

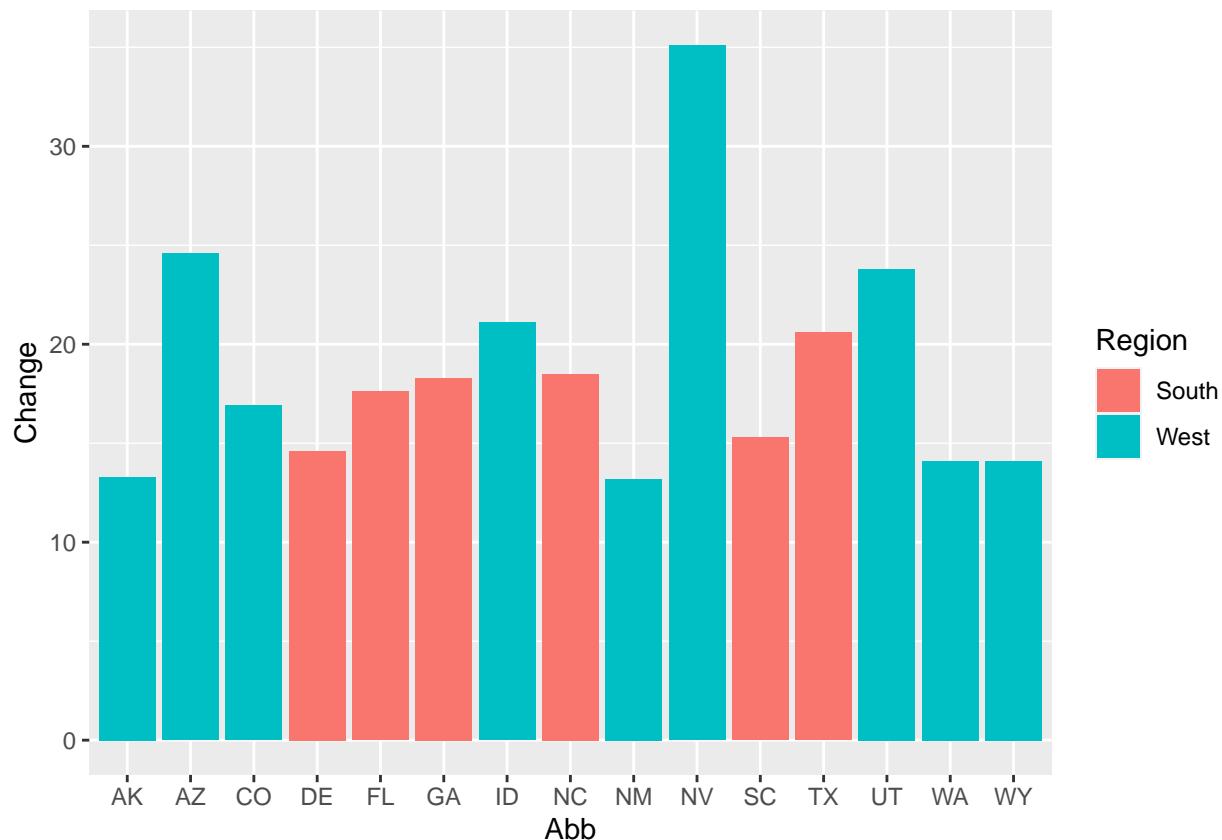
## The following objects are masked from 'package:stats':
## 
##     filter, lag

## The following objects are masked from 'package:base':
## 
##     intersect, setdiff, setequal, union

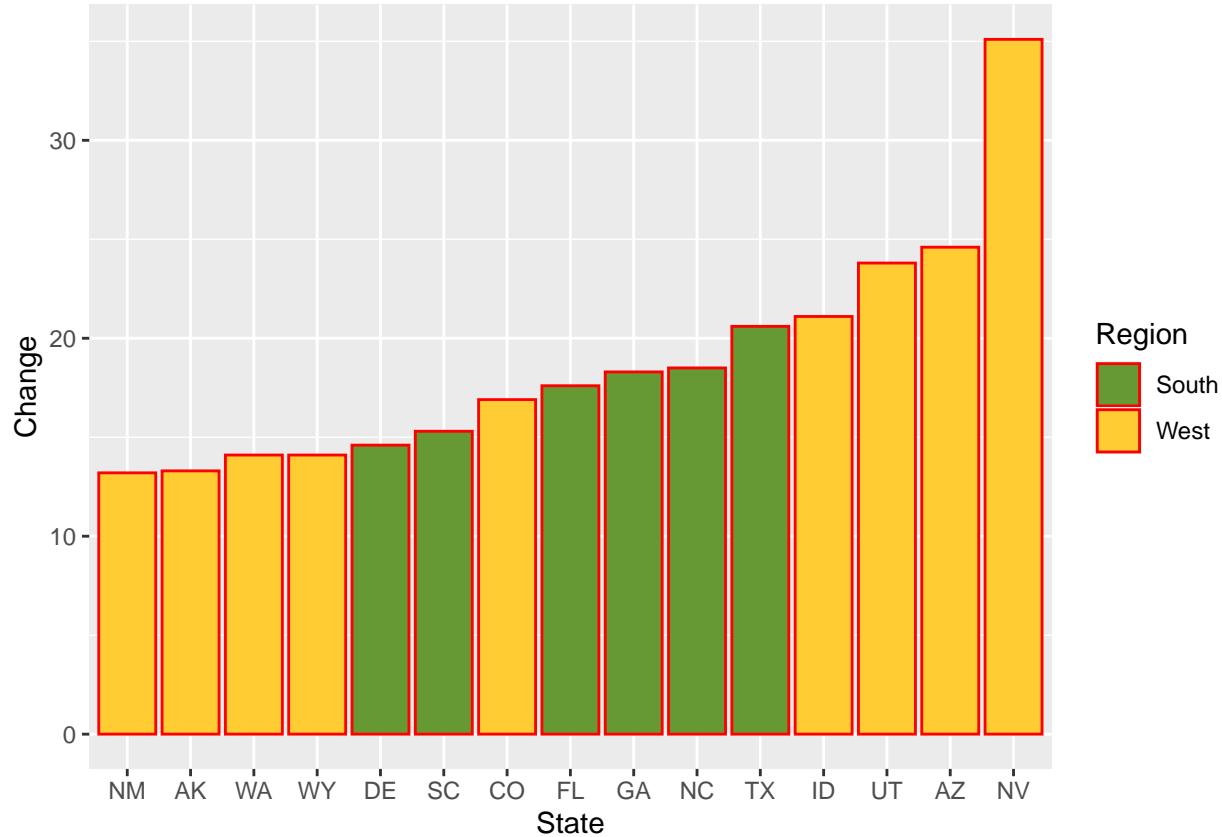
phn <- uspopchange %>%
arrange(desc(Change)) %>%
slice(1:15)

ggplot(phn, aes(x = Abb, y = Change, fill = Region)) +
geom_col()

```



```
ggplot(phn, aes(x = reorder(Abb, Change), y = Change, fill = Region)) +
  geom_col(colour = "red") +
  scale_fill_manual(values = c("#669933", "#FFCC34")) +
  xlab("State")
```



```
climate_sub <- climate %>%
  filter(Source == "Berkeley" & Year >= 1920) %>%
  mutate(pos = Anomaly10y >= 0)
climate_sub
```

```
##      Source Year Anomaly1y Anomaly5y Anomaly10y Unc10y   pos
## 1  Berkeley 1920      NA      NA -0.193  0.097 FALSE
## 2  Berkeley 1921      NA      NA -0.167  0.098 FALSE
## 3  Berkeley 1922      NA      NA -0.128  0.096 FALSE
## 4  Berkeley 1923      NA      NA -0.075  0.097 FALSE
## 5  Berkeley 1924      NA      NA -0.064  0.098 FALSE
## 6  Berkeley 1925      NA      NA -0.065  0.100 FALSE
## 7  Berkeley 1926      NA      NA -0.050  0.100 FALSE
## 8  Berkeley 1927      NA      NA -0.020  0.099 FALSE
## 9  Berkeley 1928      NA      NA -0.018  0.099 FALSE
## 10 Berkeley 1929      NA      NA -0.026  0.100 FALSE
## 11 Berkeley 1930      NA      NA -0.014  0.101 FALSE
## 12 Berkeley 1931      NA      NA -0.047  0.098 FALSE
## 13 Berkeley 1932      NA      NA -0.035  0.096 FALSE
## 14 Berkeley 1933      NA      NA -0.017  0.093 FALSE
## 15 Berkeley 1934      NA      NA  0.020  0.092  TRUE
## 16 Berkeley 1935      NA      NA  0.053  0.089  TRUE
## 17 Berkeley 1936      NA      NA  0.063  0.085  TRUE
## 18 Berkeley 1937      NA      NA  0.048  0.081  TRUE
## 19 Berkeley 1938      NA      NA  0.073  0.079  TRUE
```

## 20 Berkeley 1939	NA	NA	0.113	0.076	TRUE
## 21 Berkeley 1940	NA	NA	0.113	0.072	TRUE
## 22 Berkeley 1941	NA	NA	0.134	0.071	TRUE
## 23 Berkeley 1942	NA	NA	0.134	0.069	TRUE
## 24 Berkeley 1943	NA	NA	0.127	0.070	TRUE
## 25 Berkeley 1944	NA	NA	0.111	0.068	TRUE
## 26 Berkeley 1945	NA	NA	0.072	0.066	TRUE
## 27 Berkeley 1946	NA	NA	0.035	0.066	TRUE
## 28 Berkeley 1947	NA	NA	0.042	0.064	TRUE
## 29 Berkeley 1948	NA	NA	0.045	0.063	TRUE
## 30 Berkeley 1949	NA	NA	0.013	0.062	TRUE
## 31 Berkeley 1950	NA	NA	0.010	0.058	TRUE
## 32 Berkeley 1951	NA	NA	-0.017	0.054	FALSE
## 33 Berkeley 1952	NA	NA	-0.040	0.047	FALSE
## 34 Berkeley 1953	NA	NA	-0.040	0.043	FALSE
## 35 Berkeley 1954	NA	NA	-0.032	0.038	FALSE
## 36 Berkeley 1955	NA	NA	-0.022	0.035	FALSE
## 37 Berkeley 1956	NA	NA	0.012	0.031	TRUE
## 38 Berkeley 1957	NA	NA	0.007	0.028	TRUE
## 39 Berkeley 1958	NA	NA	0.002	0.027	TRUE
## 40 Berkeley 1959	NA	NA	0.002	0.026	TRUE
## 41 Berkeley 1960	NA	NA	-0.019	0.026	FALSE
## 42 Berkeley 1961	NA	NA	-0.001	0.021	FALSE
## 43 Berkeley 1962	NA	NA	0.017	0.018	TRUE
## 44 Berkeley 1963	NA	NA	0.004	0.016	TRUE
## 45 Berkeley 1964	NA	NA	-0.028	0.018	FALSE
## 46 Berkeley 1965	NA	NA	-0.006	0.017	FALSE
## 47 Berkeley 1966	NA	NA	-0.024	0.017	FALSE
## 48 Berkeley 1967	NA	NA	-0.041	0.019	FALSE
## 49 Berkeley 1968	NA	NA	-0.025	0.020	FALSE
## 50 Berkeley 1969	NA	NA	-0.019	0.024	FALSE
## 51 Berkeley 1970	NA	NA	0.010	0.026	TRUE
## 52 Berkeley 1971	NA	NA	0.007	0.022	TRUE
## 53 Berkeley 1972	NA	NA	0.015	0.015	TRUE
## 54 Berkeley 1973	NA	NA	0.028	0.012	TRUE
## 55 Berkeley 1974	NA	NA	0.049	0.014	TRUE
## 56 Berkeley 1975	NA	NA	0.068	0.012	TRUE
## 57 Berkeley 1976	NA	NA	0.128	0.011	TRUE
## 58 Berkeley 1977	NA	NA	0.158	0.012	TRUE
## 59 Berkeley 1978	NA	NA	0.167	0.013	TRUE
## 60 Berkeley 1979	NA	NA	0.193	0.012	TRUE
## 61 Berkeley 1980	NA	NA	0.186	0.016	TRUE
## 62 Berkeley 1981	NA	NA	0.217	0.016	TRUE
## 63 Berkeley 1982	NA	NA	0.235	0.014	TRUE
## 64 Berkeley 1983	NA	NA	0.270	0.014	TRUE
## 65 Berkeley 1984	NA	NA	0.318	0.014	TRUE
## 66 Berkeley 1985	NA	NA	0.344	0.013	TRUE
## 67 Berkeley 1986	NA	NA	0.352	0.012	TRUE
## 68 Berkeley 1987	NA	NA	0.380	0.011	TRUE
## 69 Berkeley 1988	NA	NA	0.370	0.013	TRUE
## 70 Berkeley 1989	NA	NA	0.366	0.017	TRUE
## 71 Berkeley 1990	NA	NA	0.433	0.019	TRUE
## 72 Berkeley 1991	NA	NA	0.467	0.018	TRUE
## 73 Berkeley 1992	NA	NA	0.496	0.017	TRUE

```

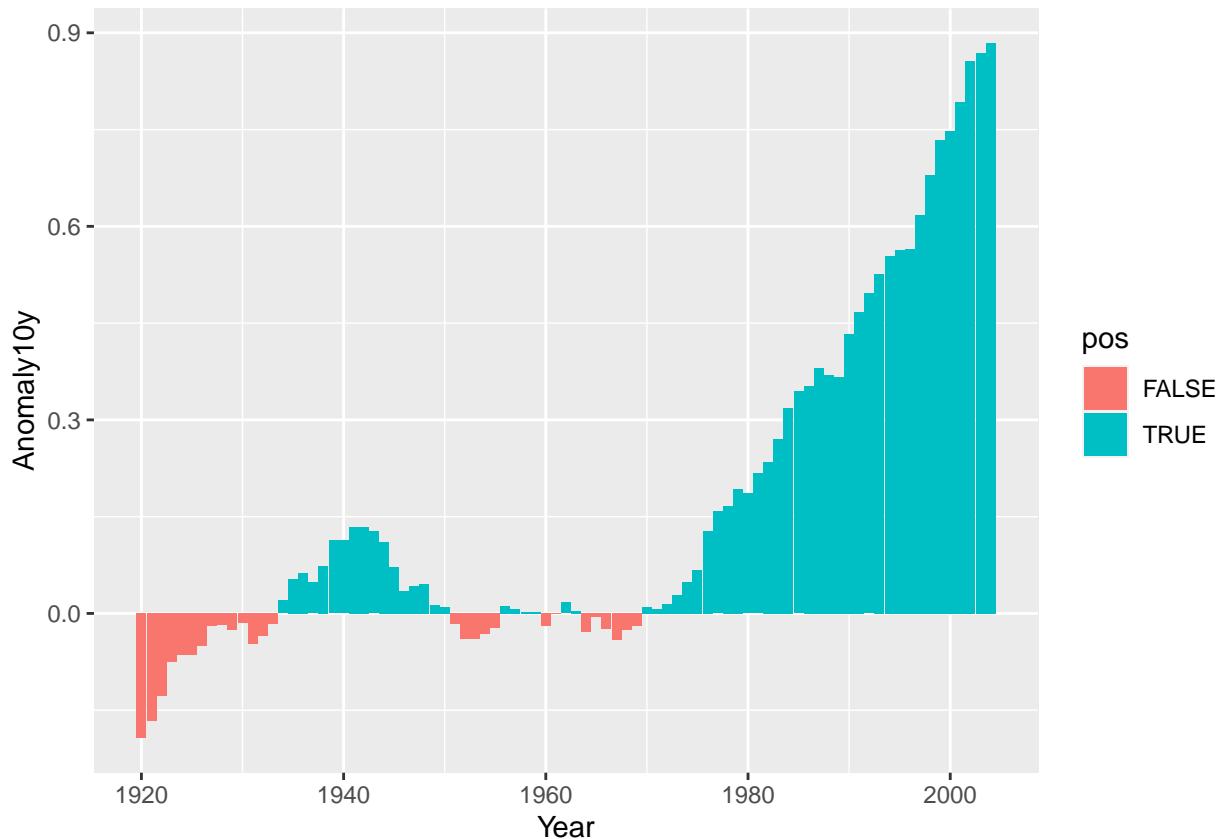
## 74 Berkeley 1993      NA      NA      0.526  0.019  TRUE
## 75 Berkeley 1994      NA      NA      0.554  0.020  TRUE
## 76 Berkeley 1995      NA      NA      0.563  0.019  TRUE
## 77 Berkeley 1996      NA      NA      0.565  0.022  TRUE
## 78 Berkeley 1997      NA      NA      0.618  0.022  TRUE
## 79 Berkeley 1998      NA      NA      0.680  0.023  TRUE
## 80 Berkeley 1999      NA      NA      0.734  0.025  TRUE
## 81 Berkeley 2000      NA      NA      0.748  0.026  TRUE
## 82 Berkeley 2001      NA      NA      0.793  0.027  TRUE
## 83 Berkeley 2002      NA      NA      0.856  0.028  TRUE
## 84 Berkeley 2003      NA      NA      0.869  0.028  TRUE
## 85 Berkeley 2004      NA      NA      0.884  0.029  TRUE

```

```

ggplot(climate_sub, aes(x = Year, y = Anomaly10y, fill = pos)) +
  geom_col(position = "identity")

```



```

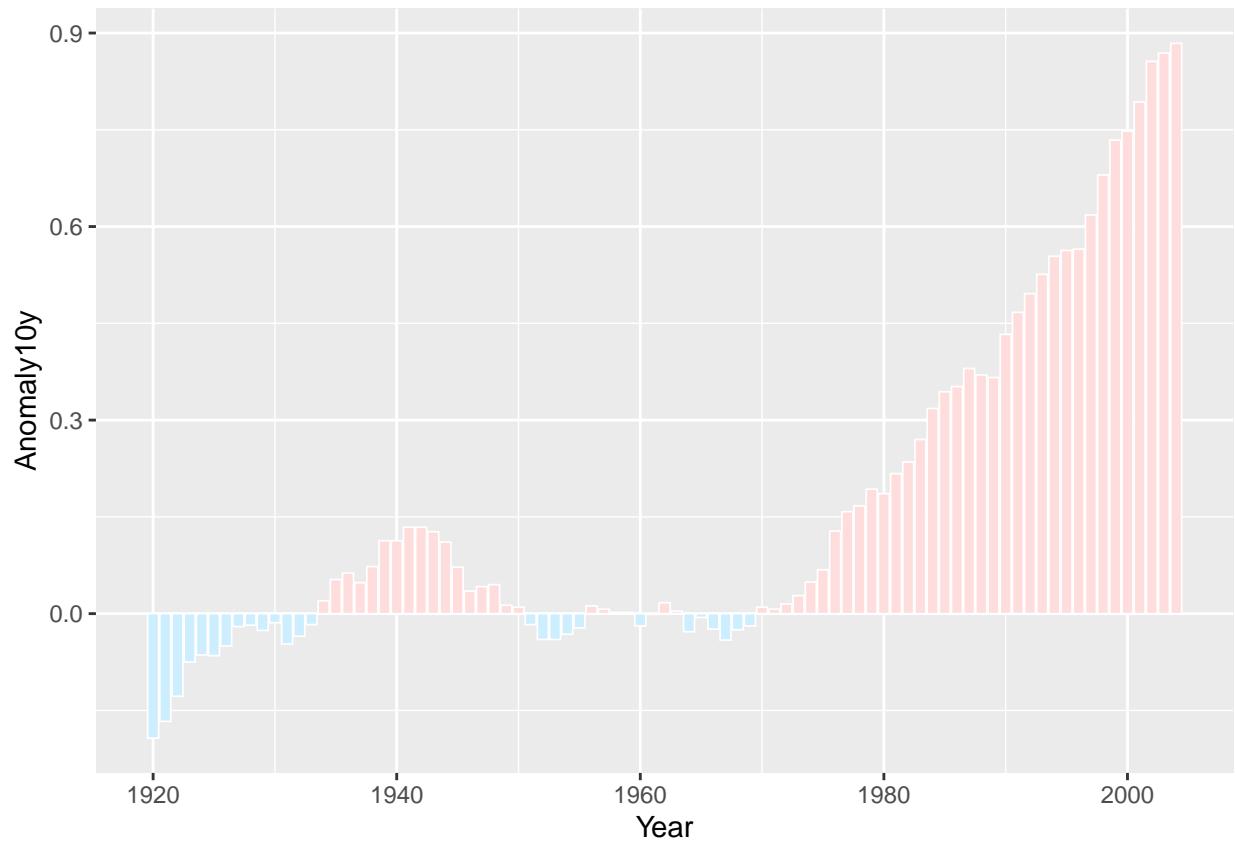
ggplot(climate_sub, aes(x = Year, y = Anomaly10y, fill = pos)) +
  geom_col(position = "identity", colour = "white", size = 0.30) +
  scale_fill_manual(values = c("#CCEEFF", "#FFDDDD"), guide = FALSE)

```

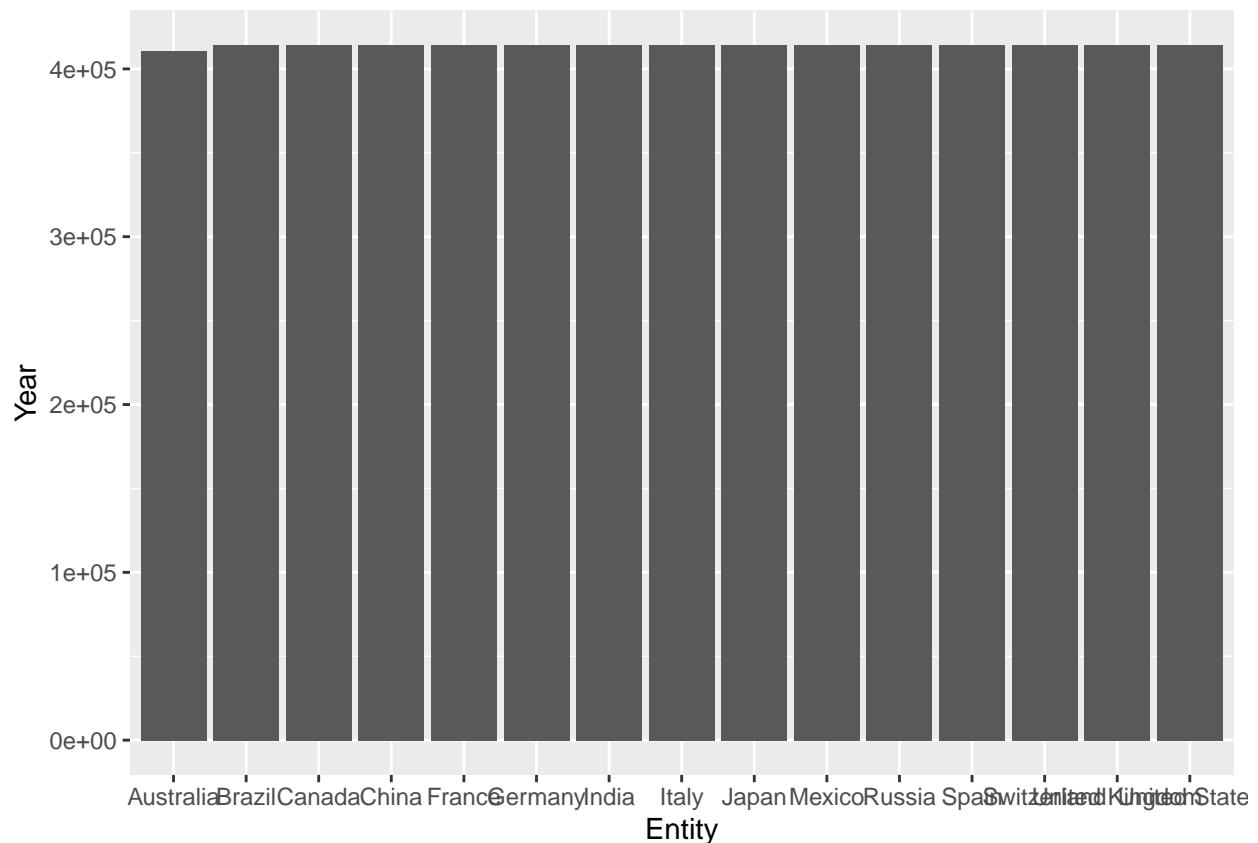
```

## Warning: It is deprecated to specify 'guide = FALSE' to remove a guide. Please
## use 'guide = "none"' instead.

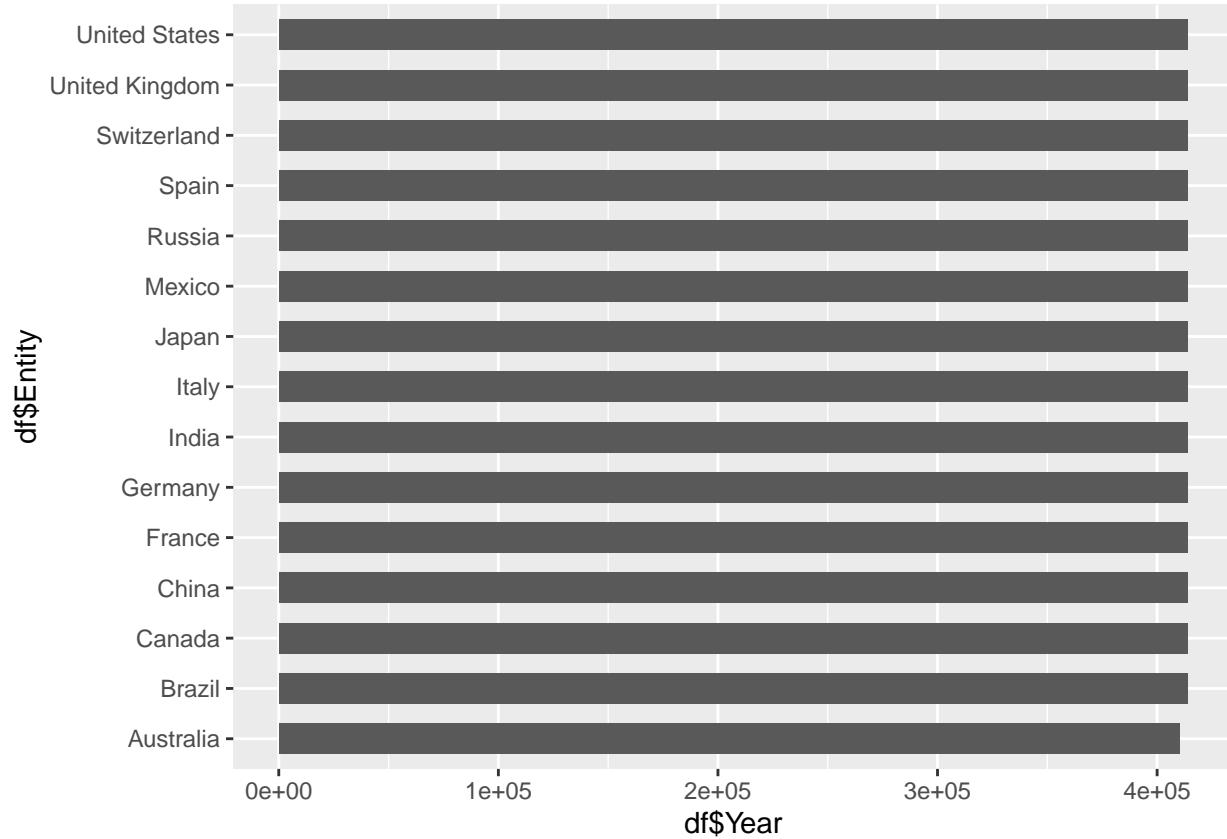
```



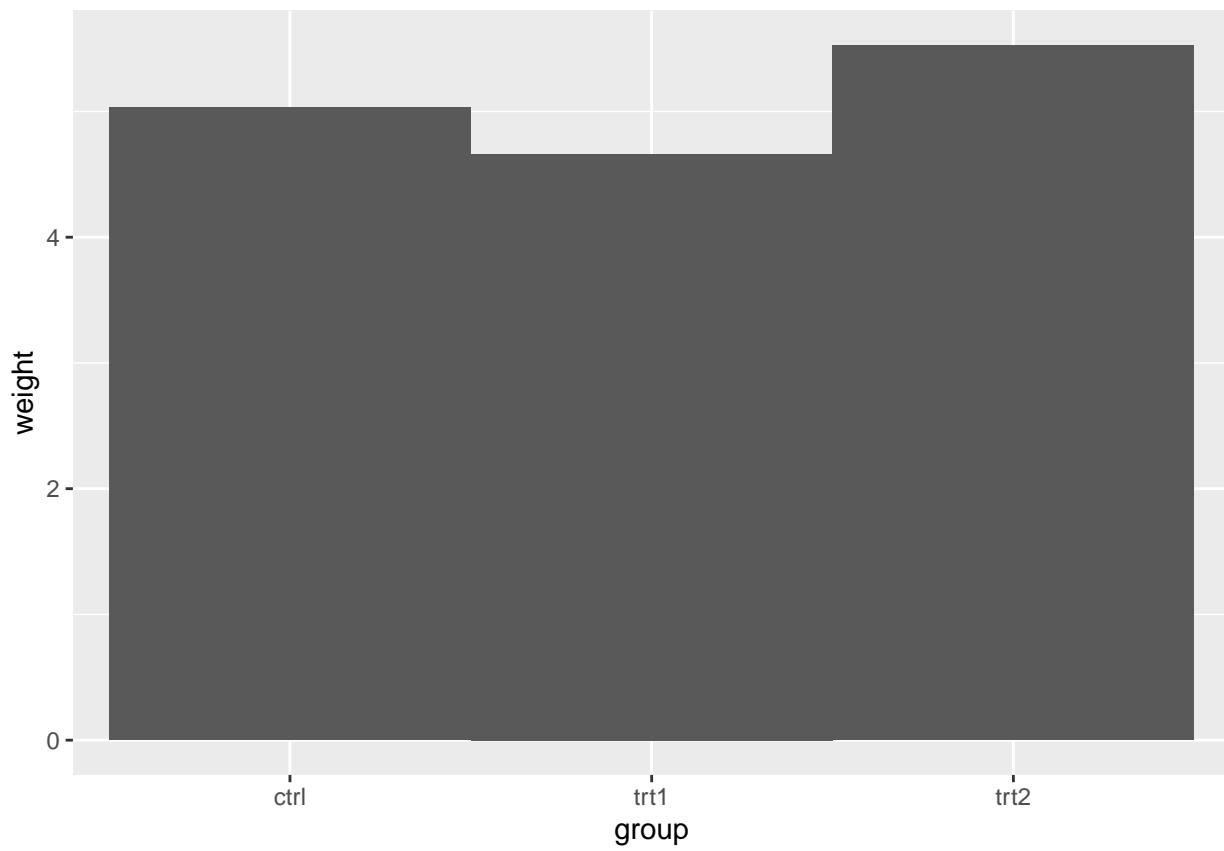
```
ggplot(df, aes(x = Entity, y = Year )) +  
  geom_col()
```



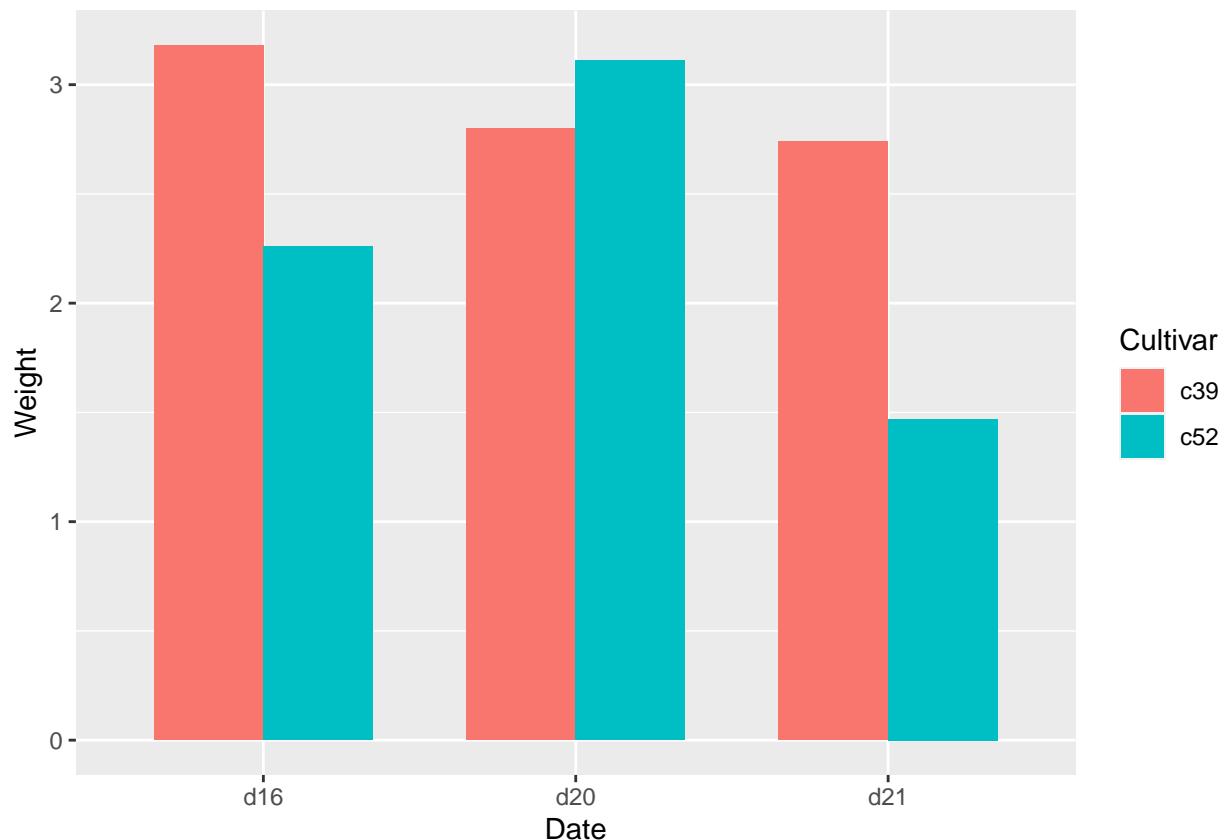
```
ggplot(df, aes(x = df$Year, y = df$Entity)) +  
  geom_col(width = 0.6)  
  
## Warning: Use of 'df$Year' is discouraged. Use 'Year' instead.  
  
## Warning: Use of 'df$Entity' is discouraged. Use 'Entity' instead.
```



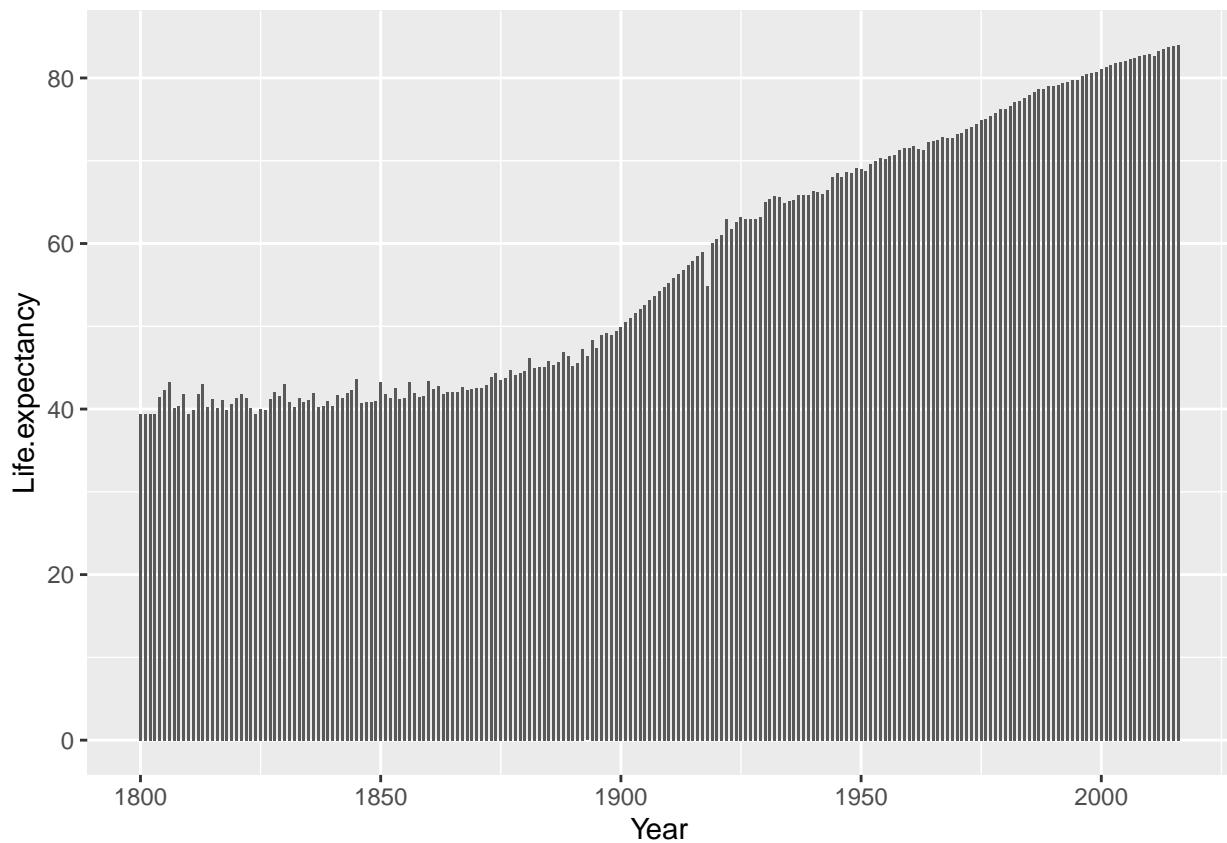
```
ggplot(pg_mean, aes(x = group, y = weight)) +  
  geom_col(width = 1)
```



```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(width = 0.7, position = "dodge")
```



```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_col(width = 0.5, position = position_dodge(0.7))
```



```

geom_bar(position = "dodge")

## geom_bar: width = NULL, na.rm = FALSE, orientation = NA
## stat_count: width = NULL, na.rm = FALSE, orientation = NA
## position_dodge

geom_bar(width = 0.9, position = position_dodge())

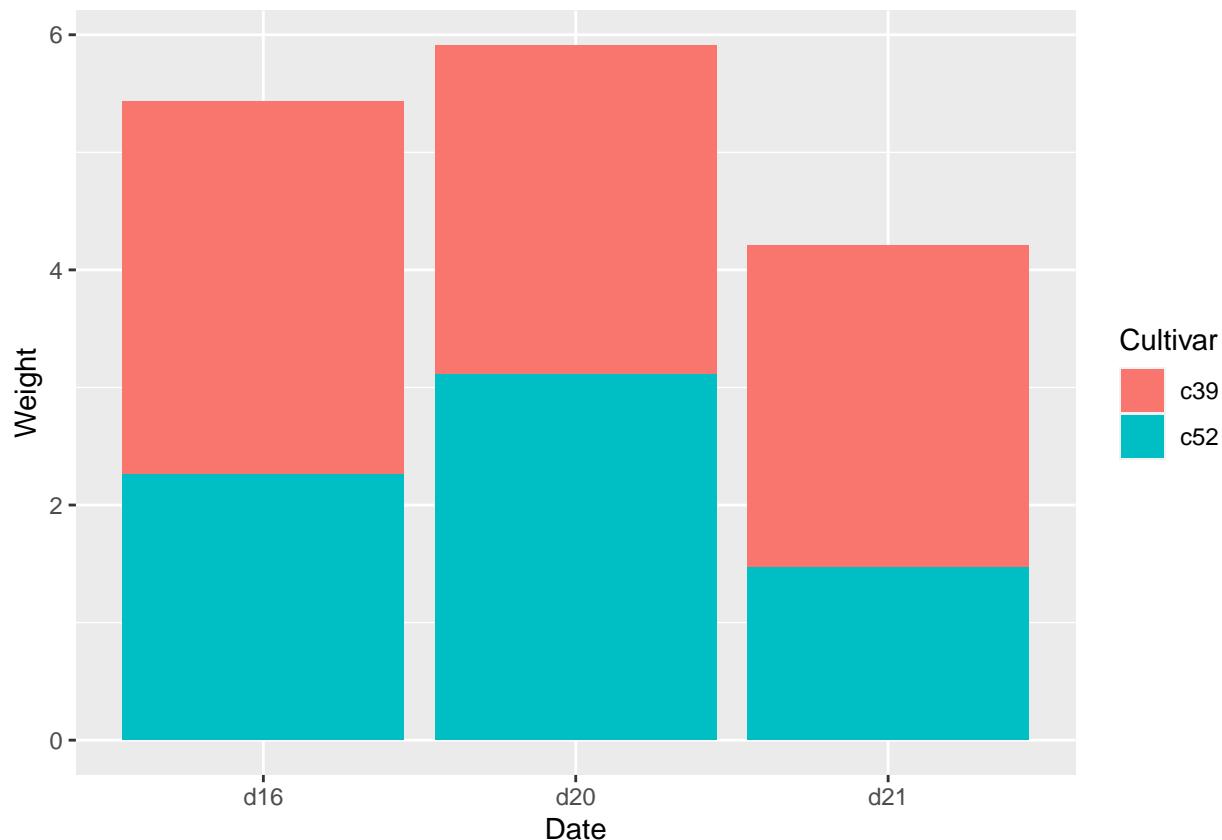
## geom_bar: width = 0.9, na.rm = FALSE, orientation = NA
## stat_count: width = 0.9, na.rm = FALSE, orientation = NA
## position_dodge

geom_bar(position = position_dodge(0.9))

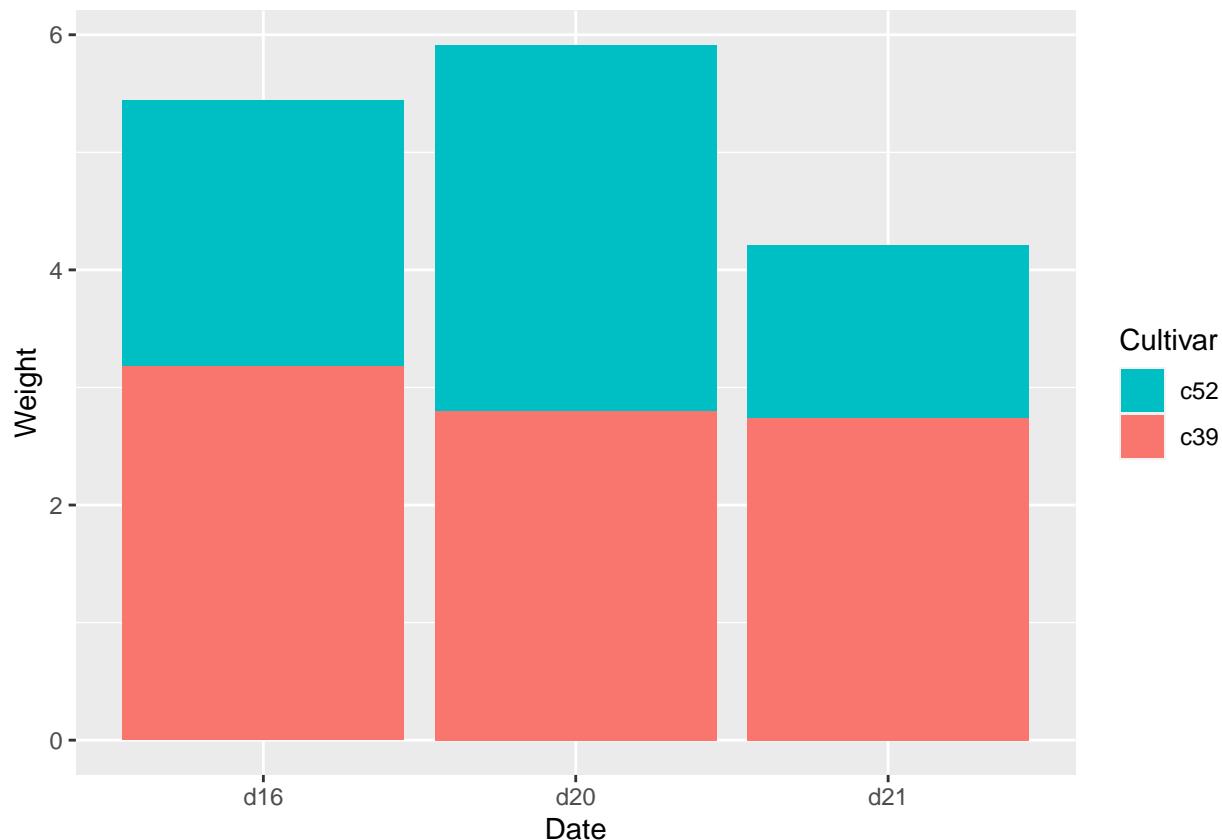
## geom_bar: width = NULL, na.rm = FALSE, orientation = NA
## stat_count: width = NULL, na.rm = FALSE, orientation = NA
## position_dodge

ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +
  geom_col()

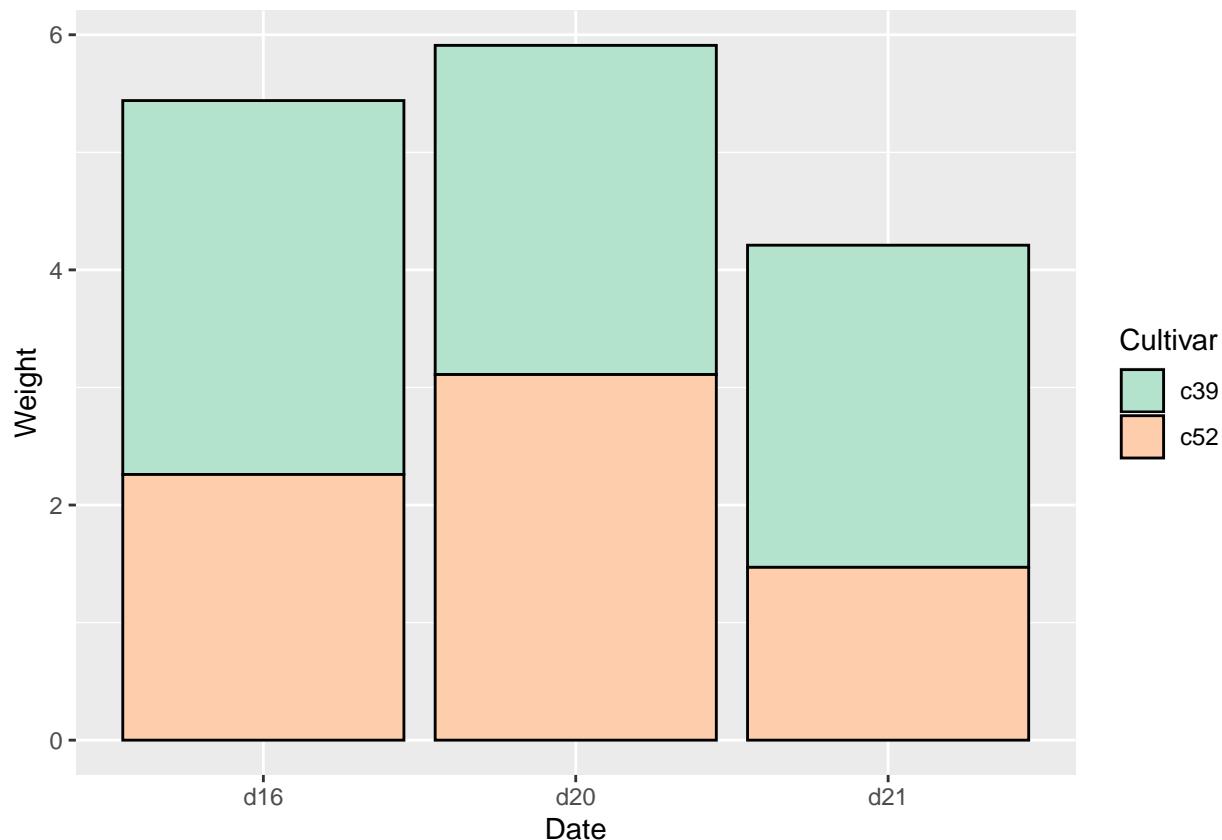
```



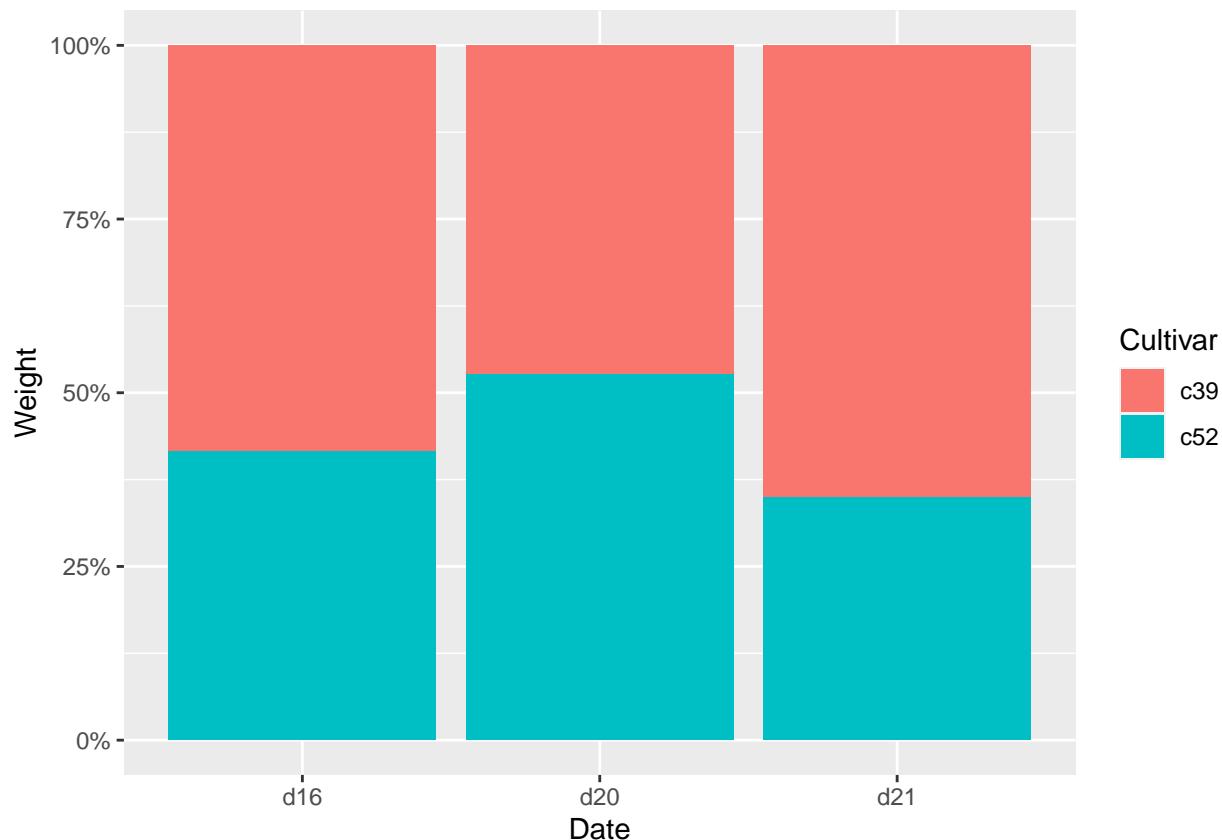
```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(position = position_stack(reverse = TRUE)) +  
  guides(fill = guide_legend(reverse = TRUE))
```



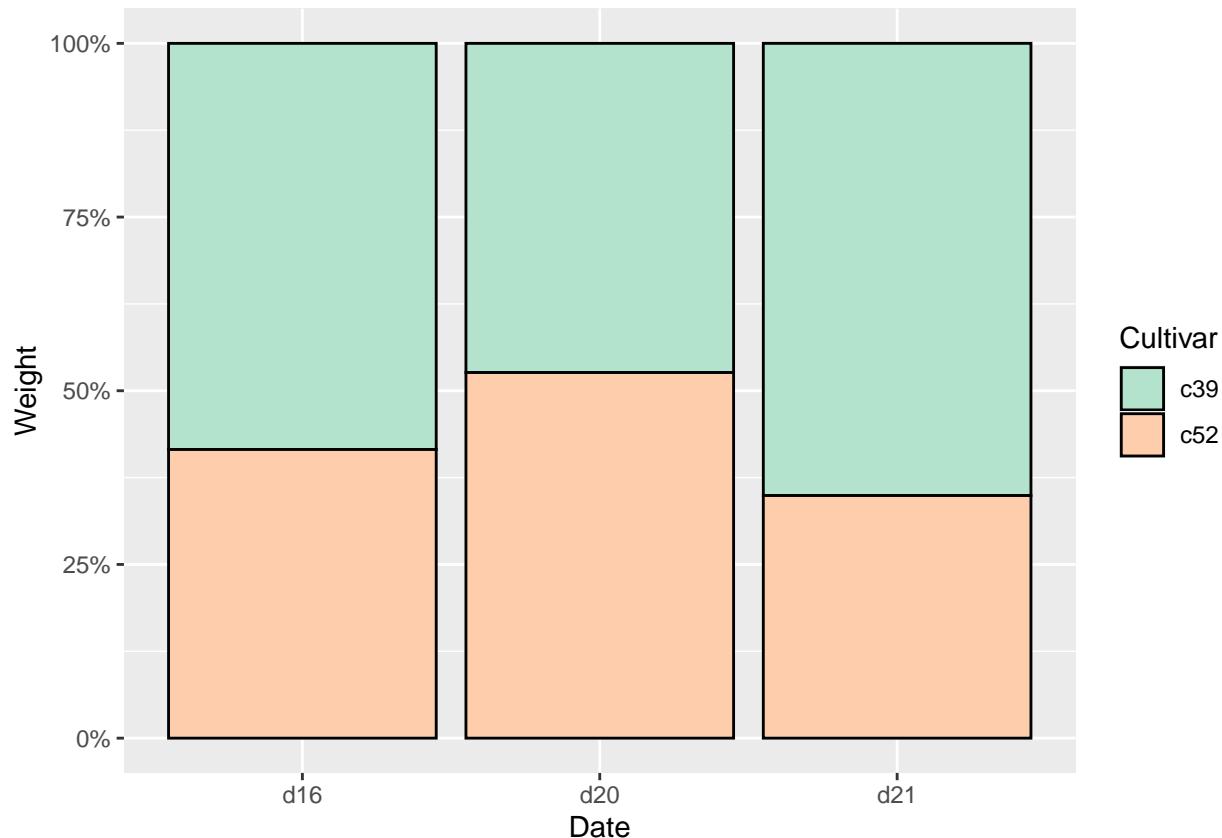
```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(colour = "black") +  
  scale_fill_brewer(palette = "Pastel2")
```



```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(position = "fill") +  
  scale_y_continuous(labels = scales::percent)
```



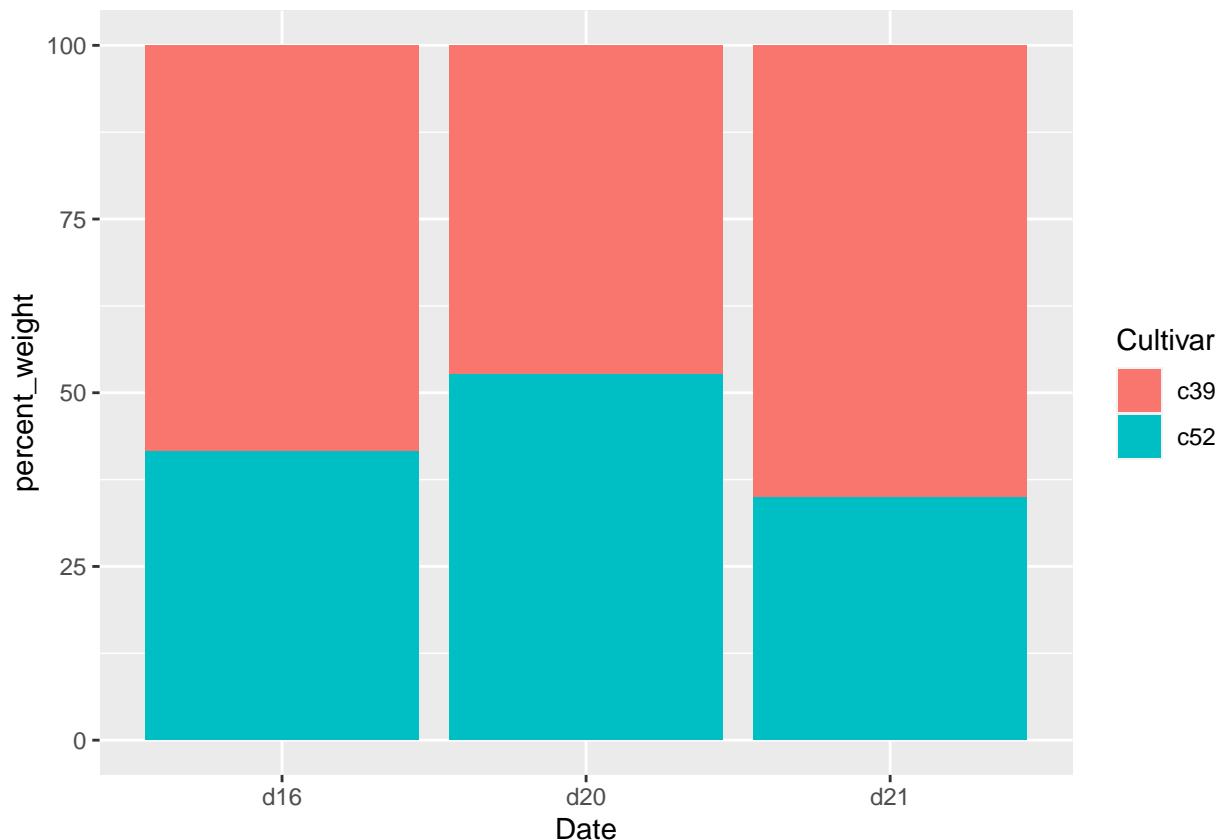
```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(colour = "black", position = "fill") +  
  scale_y_continuous(labels = scales::percent) +  
  scale_fill_brewer(palette = "Pastel2")
```



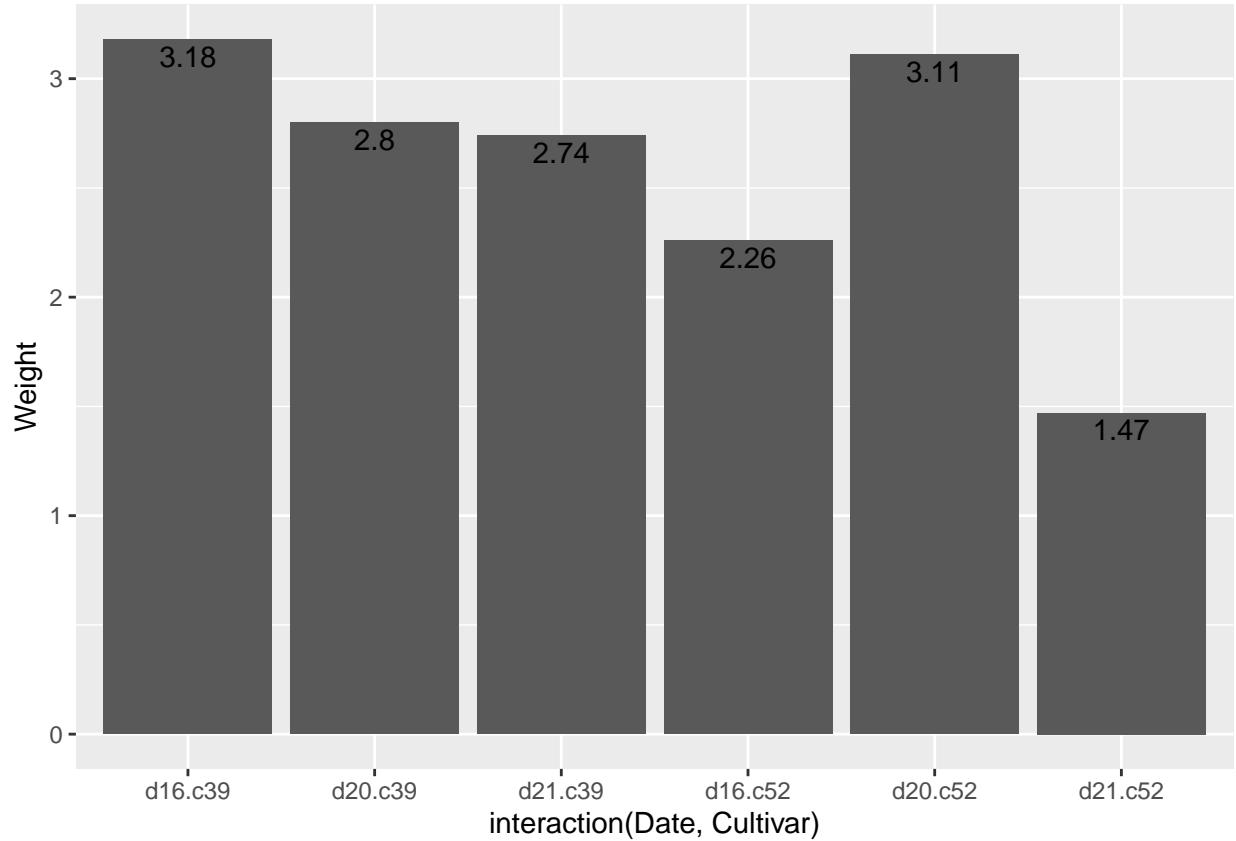
```
nd <- cabbage_exp %>%
  group_by(Date) %>%
  mutate(percent_weight = Weight / sum(Weight) * 100)
nd
```

```
## # A tibble: 6 x 7
## # Groups:   Date [3]
##   Cultivar Date  Weight     sd     n     se percent_weight
##   <fct>    <fct>   <dbl>  <dbl> <int>  <dbl>        <dbl>
## 1 c39      d16     3.18  0.957    10  0.303       58.5
## 2 c39      d20     2.8    0.279    10  0.0882      47.4
## 3 c39      d21     2.74  0.983    10  0.311       65.1
## 4 c52      d16     2.26  0.445    10  0.141       41.5
## 5 c52      d20     3.11  0.791    10  0.250       52.6
## 6 c52      d21     1.47  0.211    10  0.0667      34.9
```

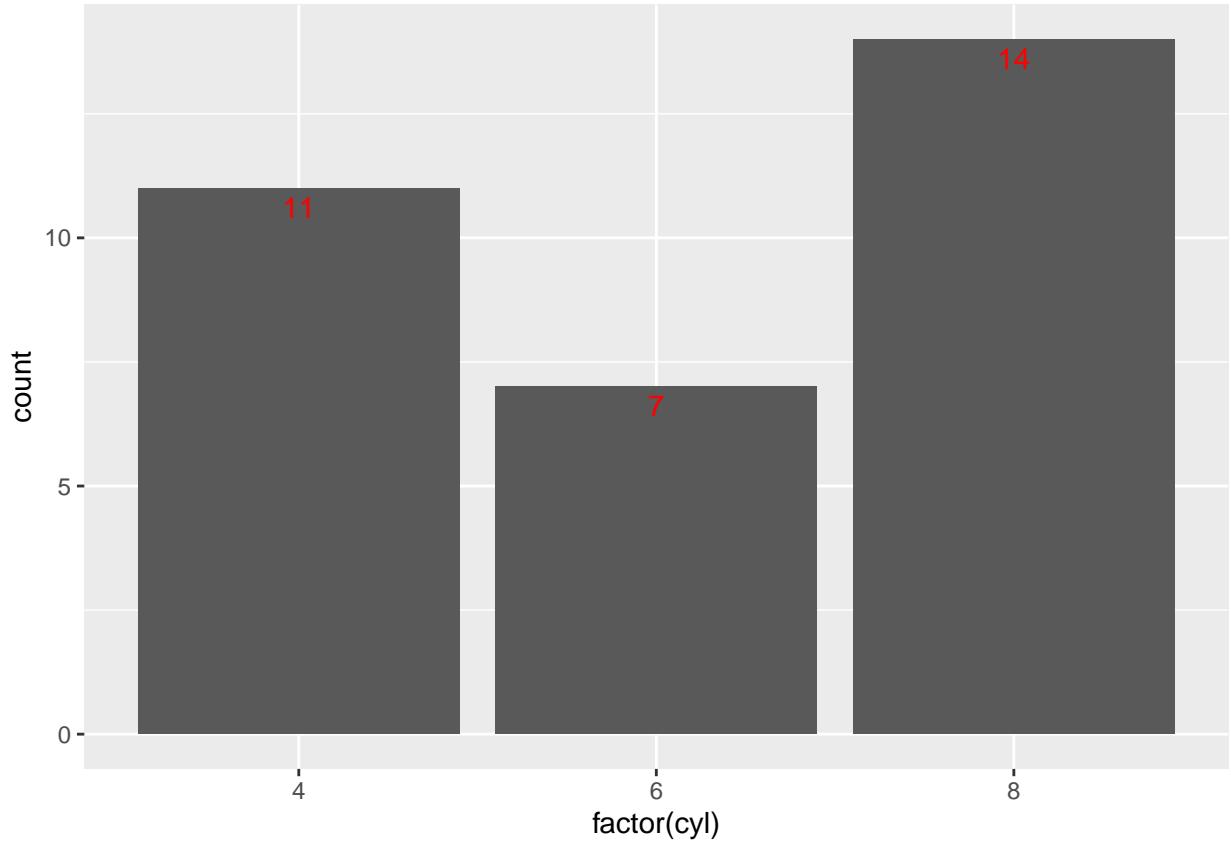
```
ggplot(nd, aes(x = Date, y = percent_weight, fill = Cultivar)) +
  geom_col()
```



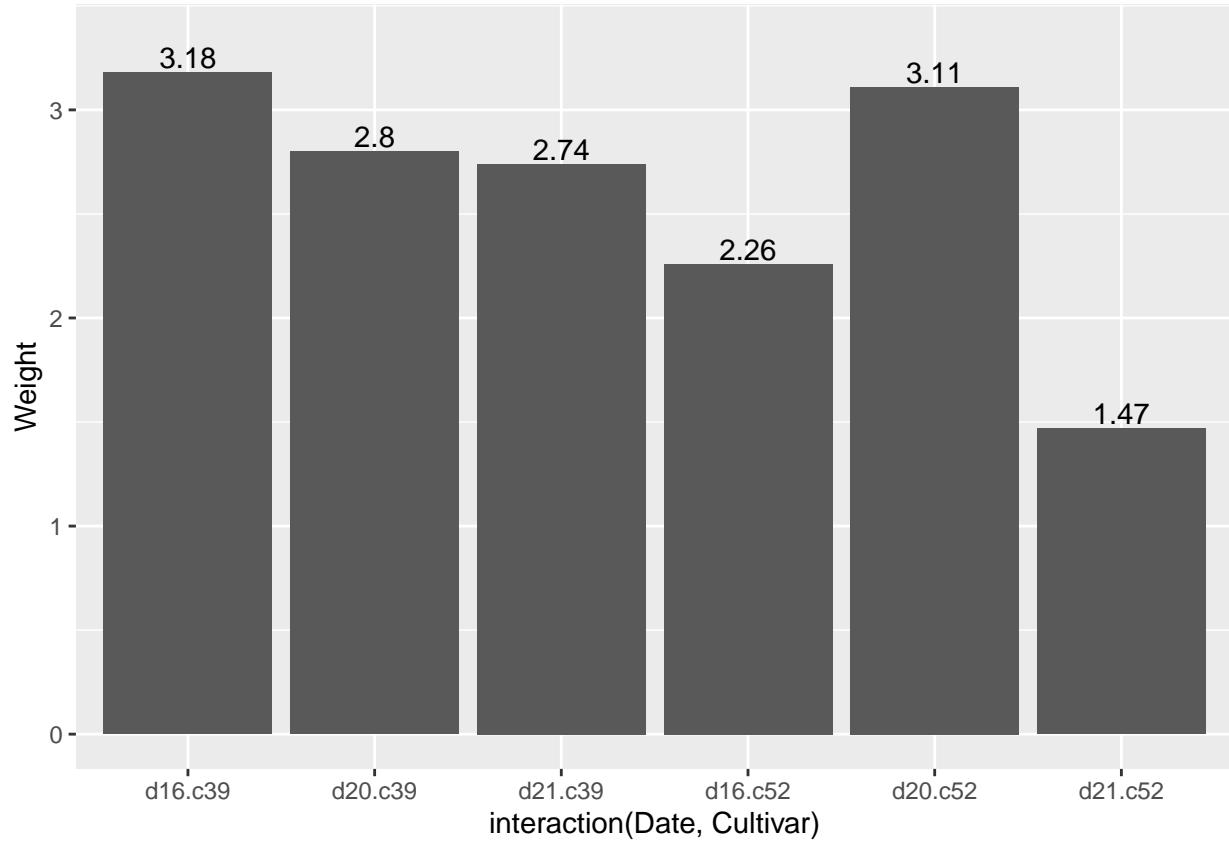
```
ggplot(cabbage_exp, aes(x = interaction(Date, Cultivar), y = Weight)) +  
  geom_col() +  
  geom_text(aes(label = Weight), vjust = 1.3, colour = "black")
```



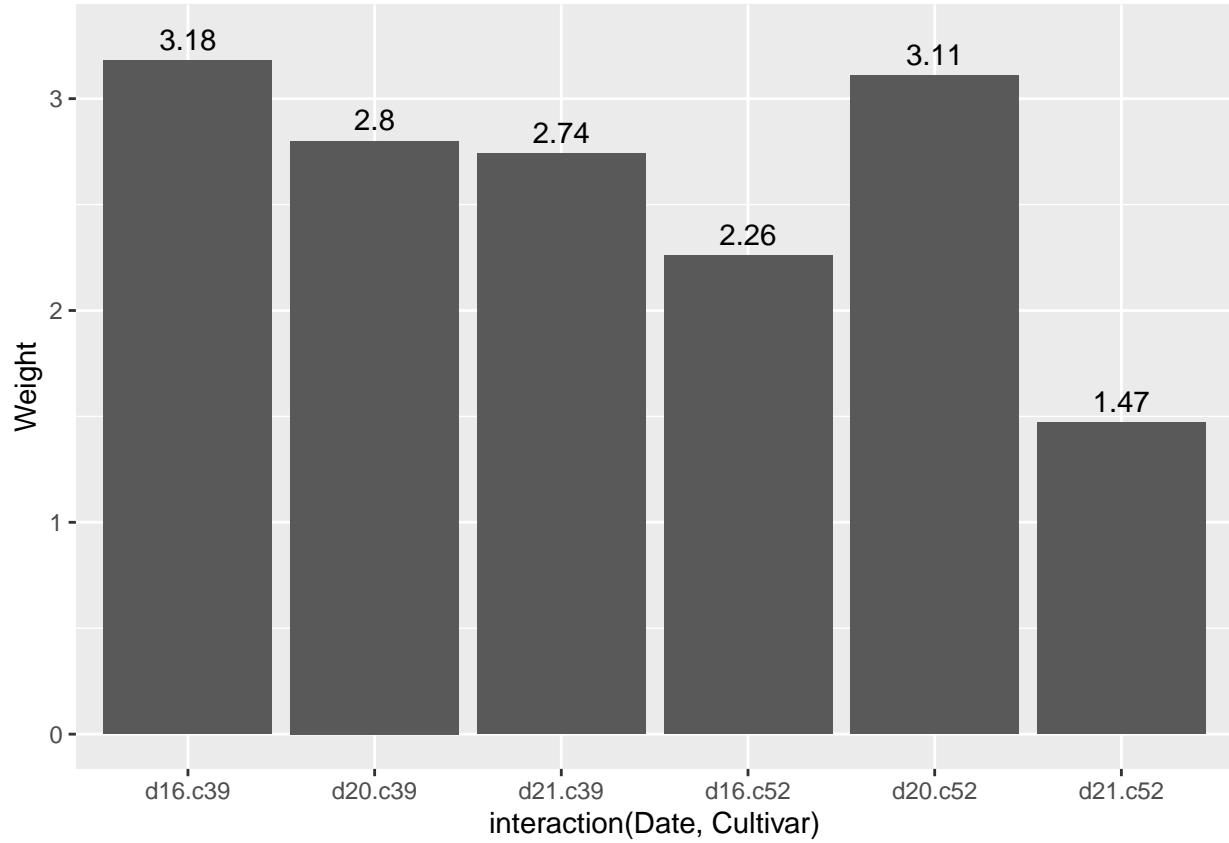
```
ggplot(mtcars, aes(x = factor(cyl))) +  
  geom_bar() +  
  geom_text(aes(label = ..count..), stat = "count", vjust = 1.4,  
  colour = "red")
```



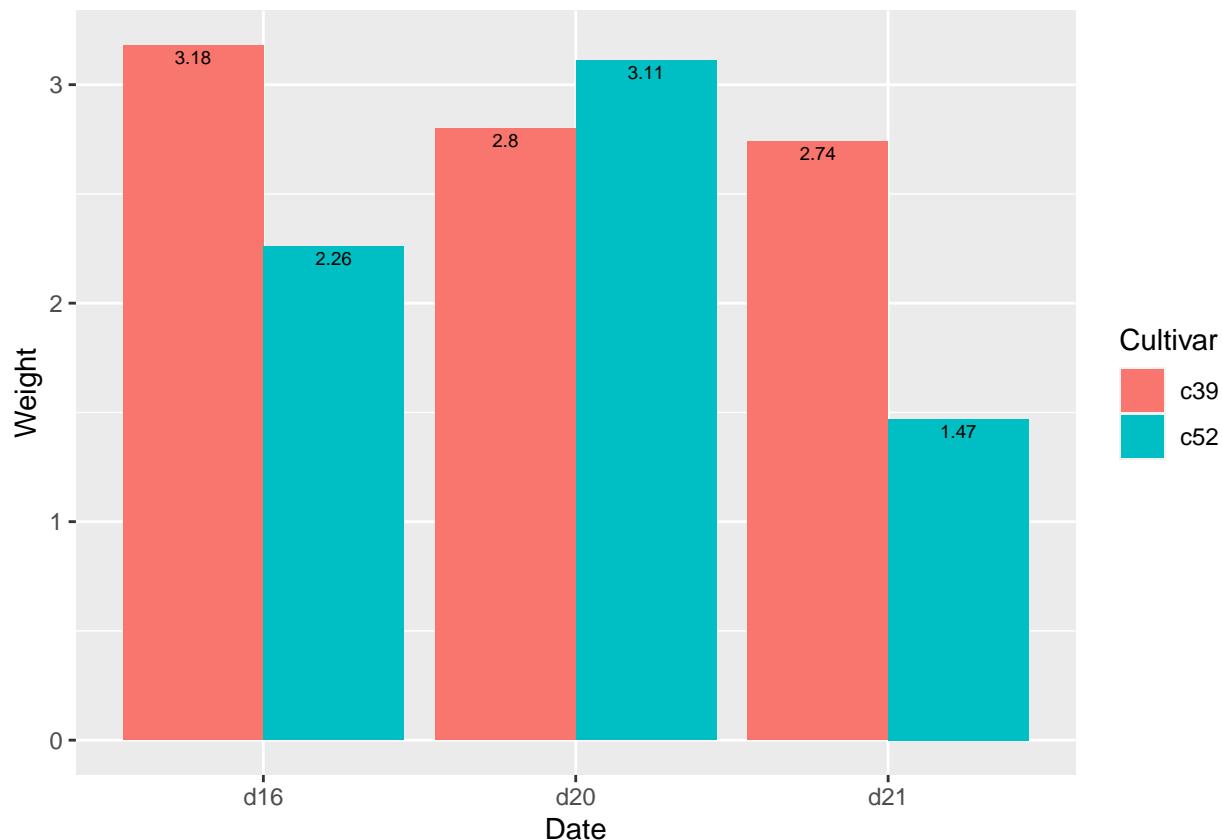
```
ggplot(cabbage_exp, aes(x = interaction(Date, Cultivar), y = Weight)) +  
  geom_col() +  
  geom_text(aes(label = Weight), vjust = -0.2) +  
  ylim(0, max(cabbage_exp$Weight) * 1.05)
```



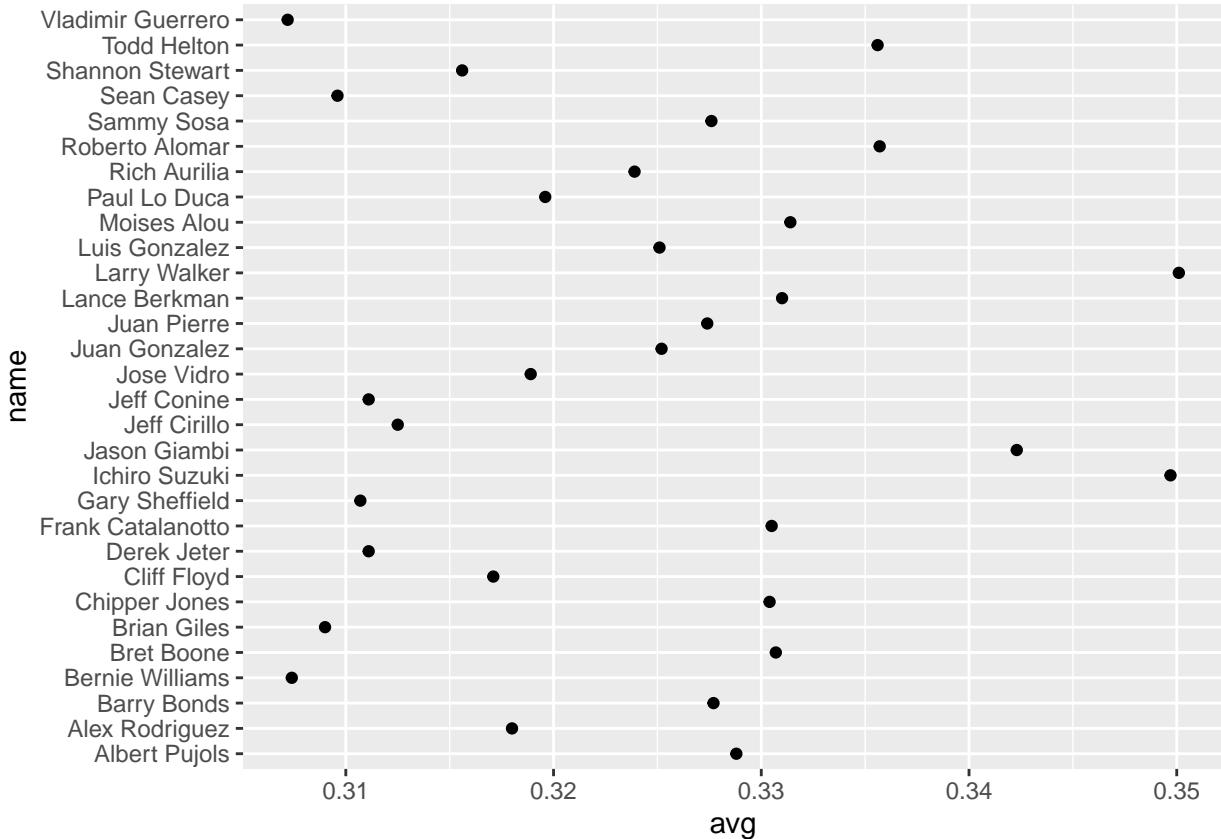
```
ggplot(cabbage_exp, aes(x = interaction(Date, Cultivar), y = Weight)) +  
  geom_col() +  
  geom_text(aes(y = Weight + 0.1, label = Weight))
```



```
ggplot(cabbage_exp, aes(x = Date, y = Weight, fill = Cultivar)) +  
  geom_col(position = "dodge") +  
  geom_text(  
    aes(label = Weight),  
    colour = "black", size = 2.5,  
    vjust = 1.4, position = position_dodge(.9)  
)
```



```
tophit <- tophitters2001[1:30, ]
ggplot(tophit, aes(x = avg, y = name)) +
  geom_point()
```



```
tophit[, c("name", "lg", "avg")]
```

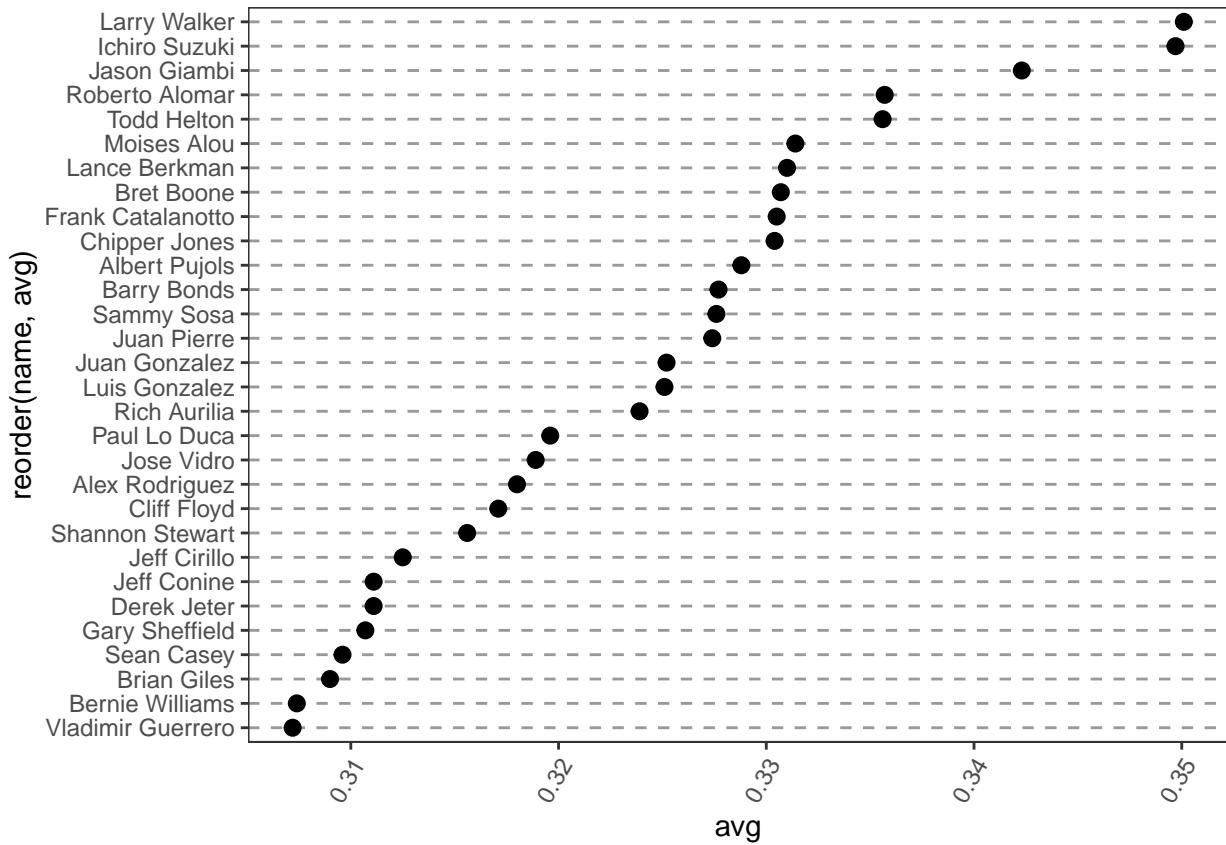
```
##          name lg      avg
## 1      Larry Walker NL 0.3501
## 2      Ichiro Suzuki AL 0.3497
## 3      Jason Giambi AL 0.3423
## 4      Roberto Alomar AL 0.3357
## 5      Todd Helton NL 0.3356
## 6      Moises Alou NL 0.3314
## 7      Lance Berkman NL 0.3310
## 8      Bret Boone AL 0.3307
## 9  Frank Catalanotto AL 0.3305
## 10     Chipper Jones NL 0.3304
## 11     Albert Pujols NL 0.3288
## 12     Barry Bonds NL 0.3277
## 13     Sammy Sosa NL 0.3276
## 14     Juan Pierre NL 0.3274
## 15     Juan Gonzalez AL 0.3252
## 16     Luis Gonzalez NL 0.3251
## 17     Rich Aurilia NL 0.3239
## 18     Paul Lo Duca NL 0.3196
## 19     Jose Vidro NL 0.3189
## 20     Alex Rodriguez AL 0.3180
## 21     Cliff Floyd NL 0.3171
## 22     Shannon Stewart AL 0.3156
```

```

## 23      Jeff Cirillo NL 0.3125
## 24      Jeff Conine AL 0.3111
## 25      Derek Jeter AL 0.3111
## 26      Gary Sheffield NL 0.3107
## 27      Sean Casey NL 0.3096
## 28      Brian Giles NL 0.3090
## 29      Bernie Williams AL 0.3074
## 30      Vladimir Guerrero NL 0.3072

ggplot(tophit, aes(x = avg, y = reorder(name, avg))) +
  geom_point(size = 2.5) +
  theme_bw() +
  theme(
    panel.grid.major.x = element_blank(),
    panel.grid.minor.x = element_blank(),
    panel.grid.major.y = element_line(colour = "grey60", linetype = "dashed"),
    axis.text.x = element_text(angle = 60, hjust = 1)
  )
)

```



```

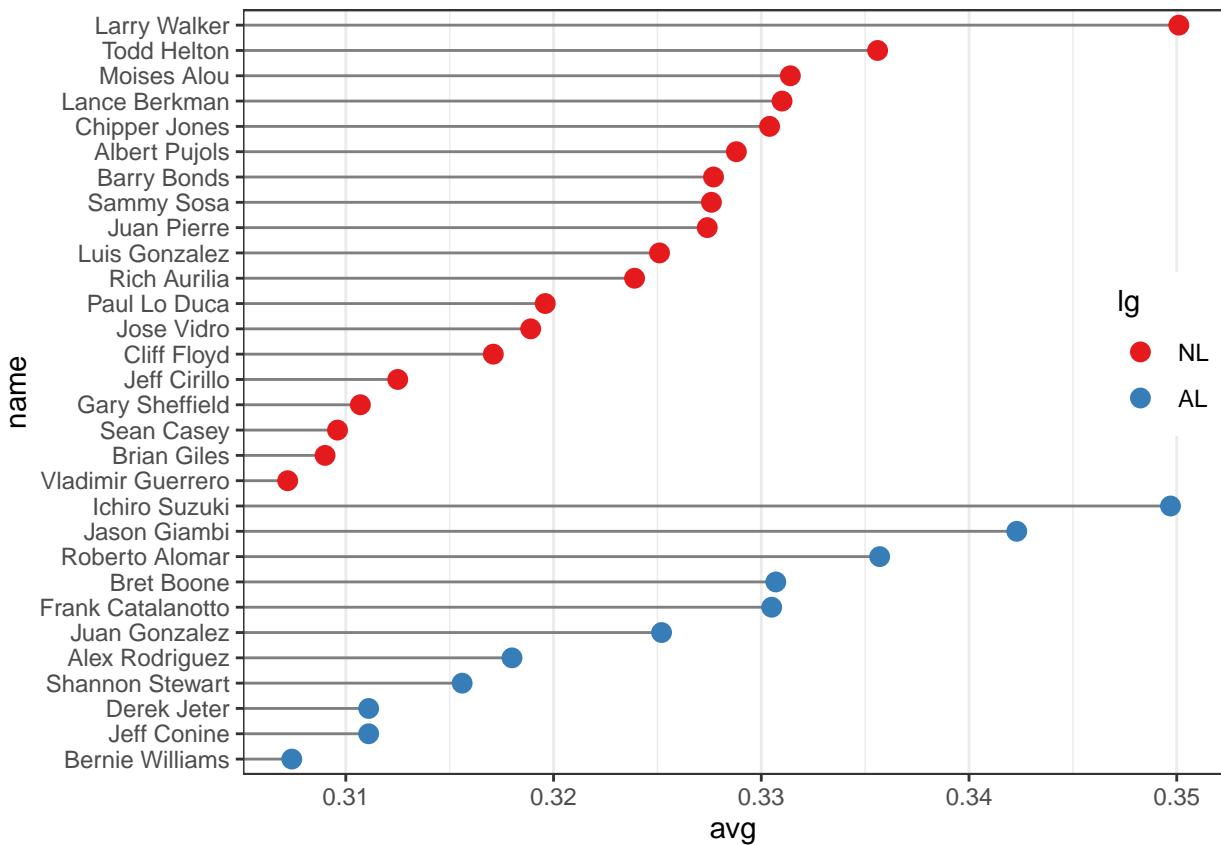
nameorder <- tophit$name[order(tophit$lg, tophit$avg)]
tophit$name <- factor(tophit$name, levels = nameorder)
ggplot(tophit, aes(x = avg, y = name)) +
  geom_segment(aes(yend = name), xend = 0, colour = "grey50") +
  geom_point(size = 3, aes(colour = lg)) +

```

```

scale_colour_brewer(palette = "Set1", limits = c("NL", "AL")) +
theme_bw() +
theme(
  panel.grid.major.y = element_blank(),
  legend.position = c(1, 0.55),
  legend.justification = c(1, 0.5)
)

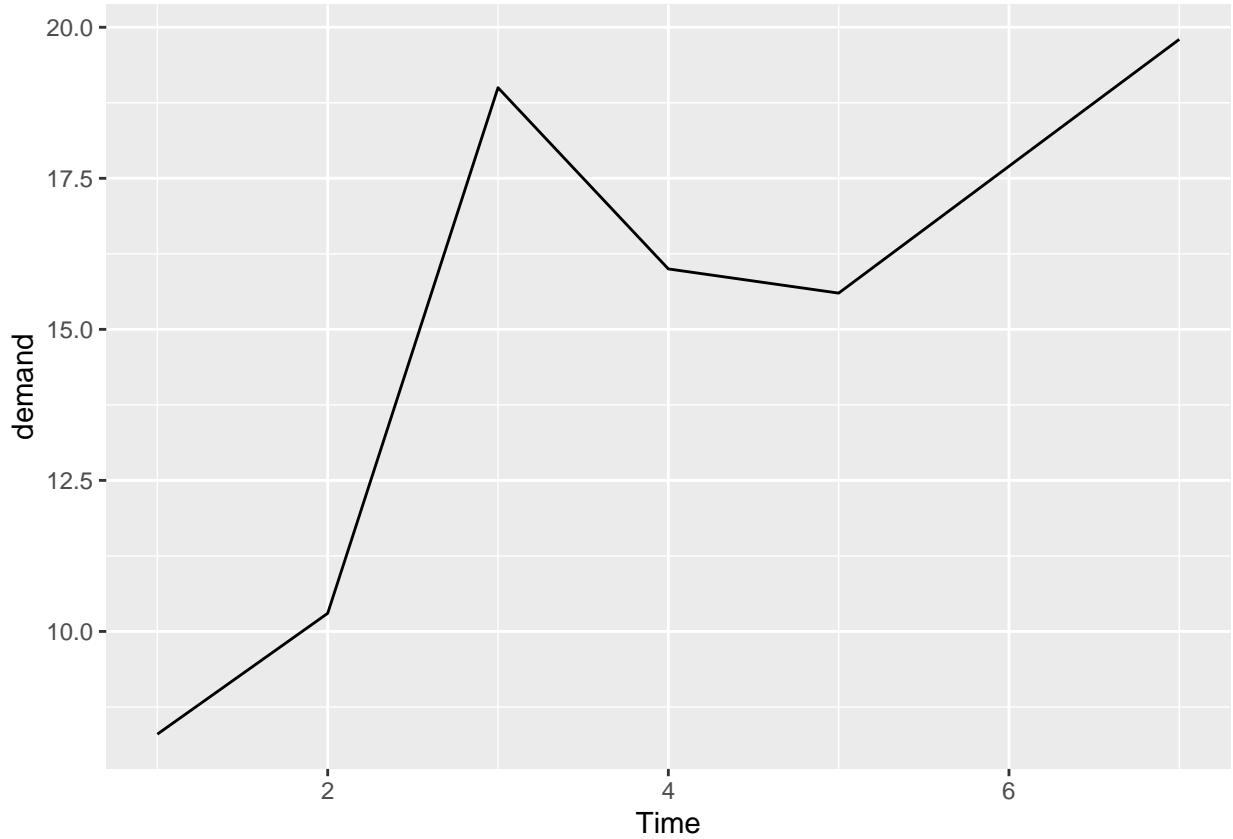
```



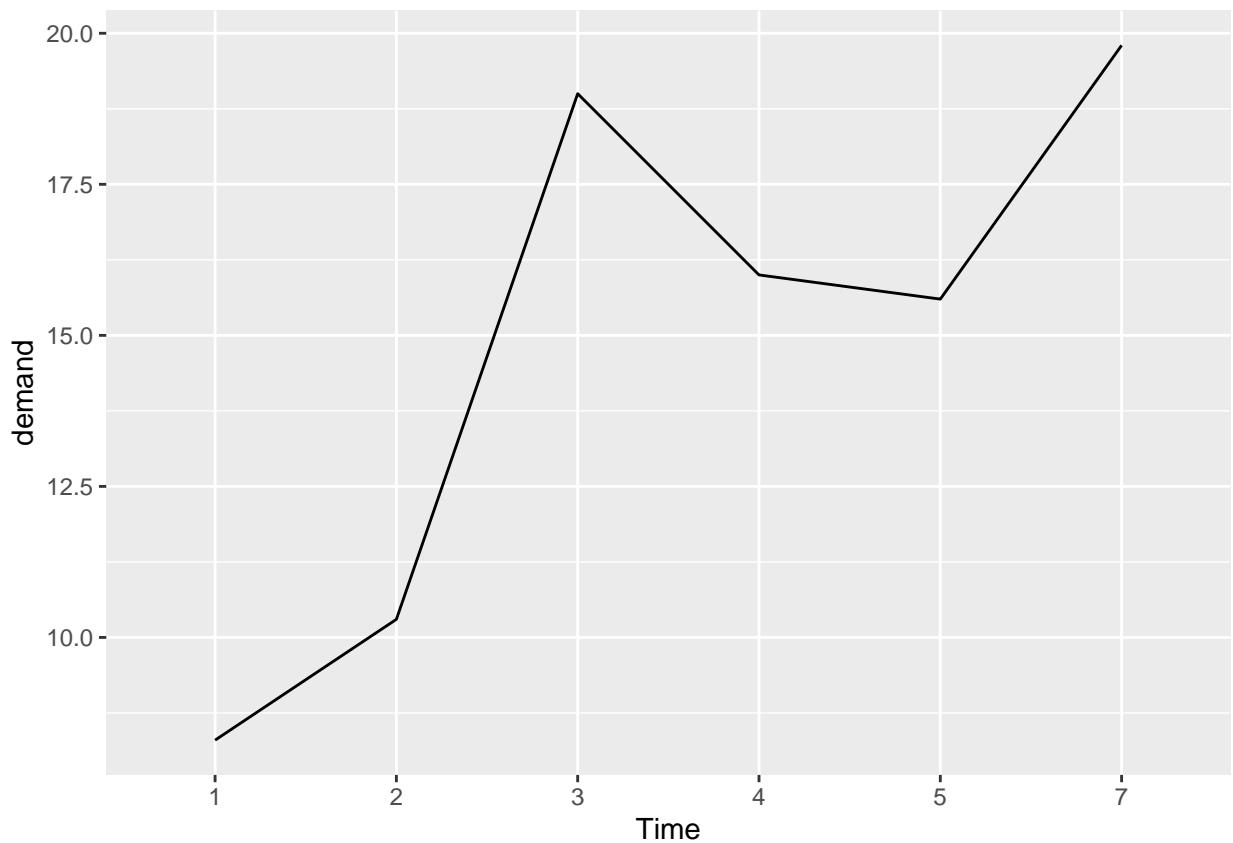
```

ggplot(BOD, aes(x = Time, y = demand)) +
geom_line()

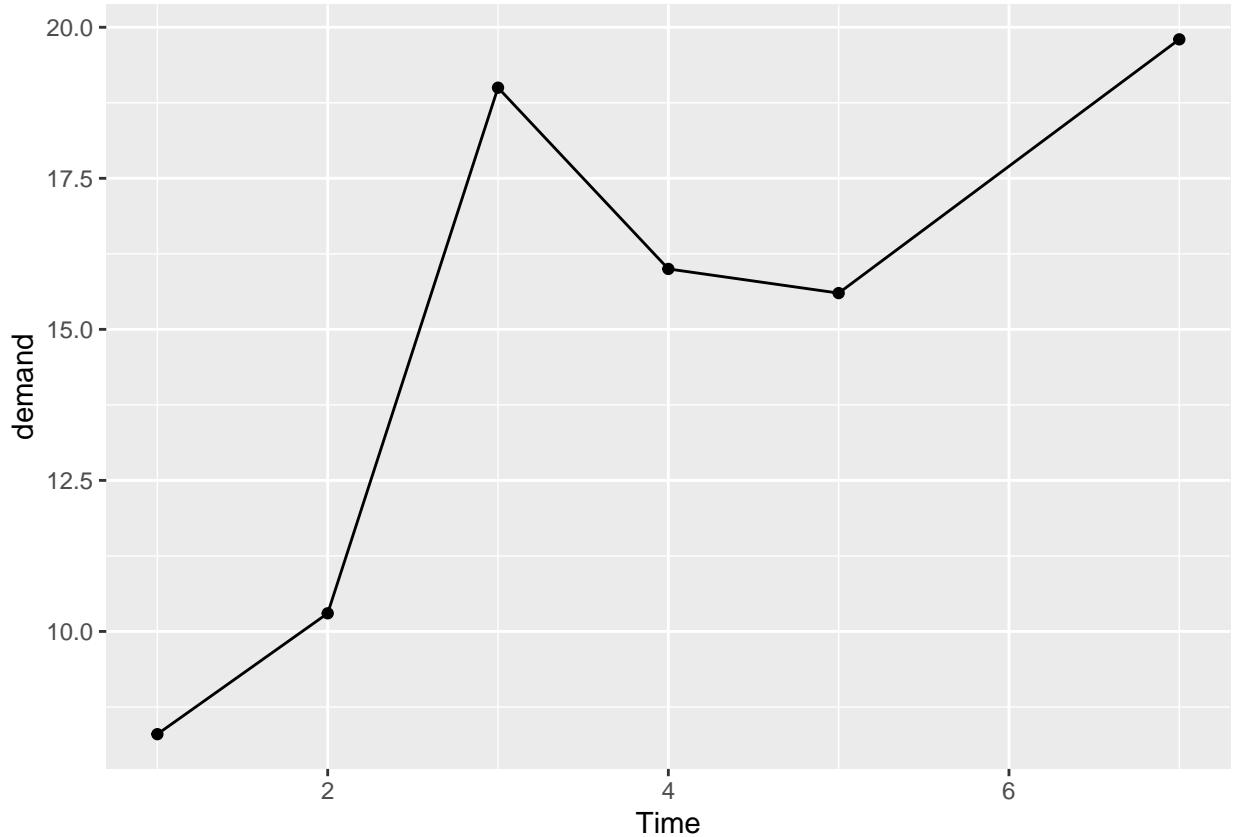
```



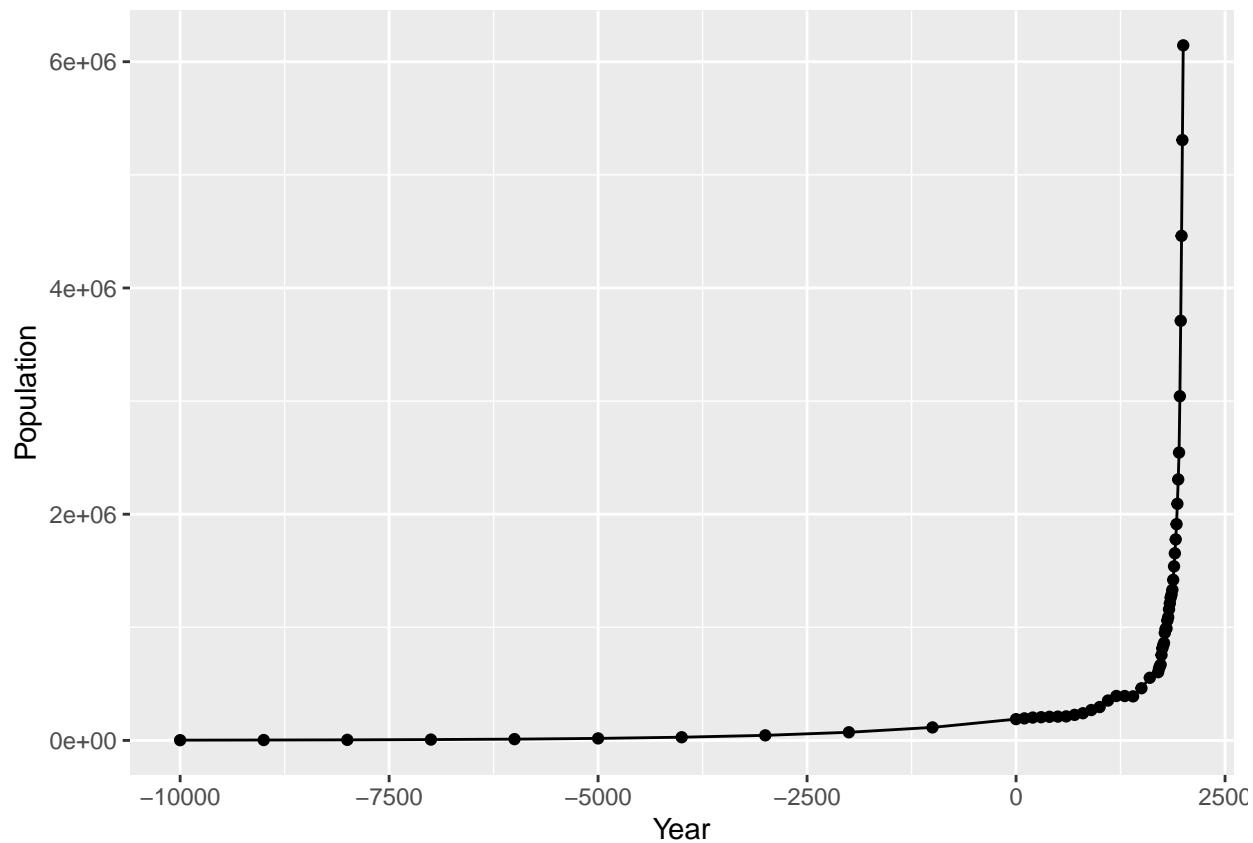
```
BOD1 <- BOD  
BOD1$Time <- factor(BOD1$Time)  
ggplot(BOD1, aes(x = Time, y = demand, group = 1)) +  
  geom_line()
```



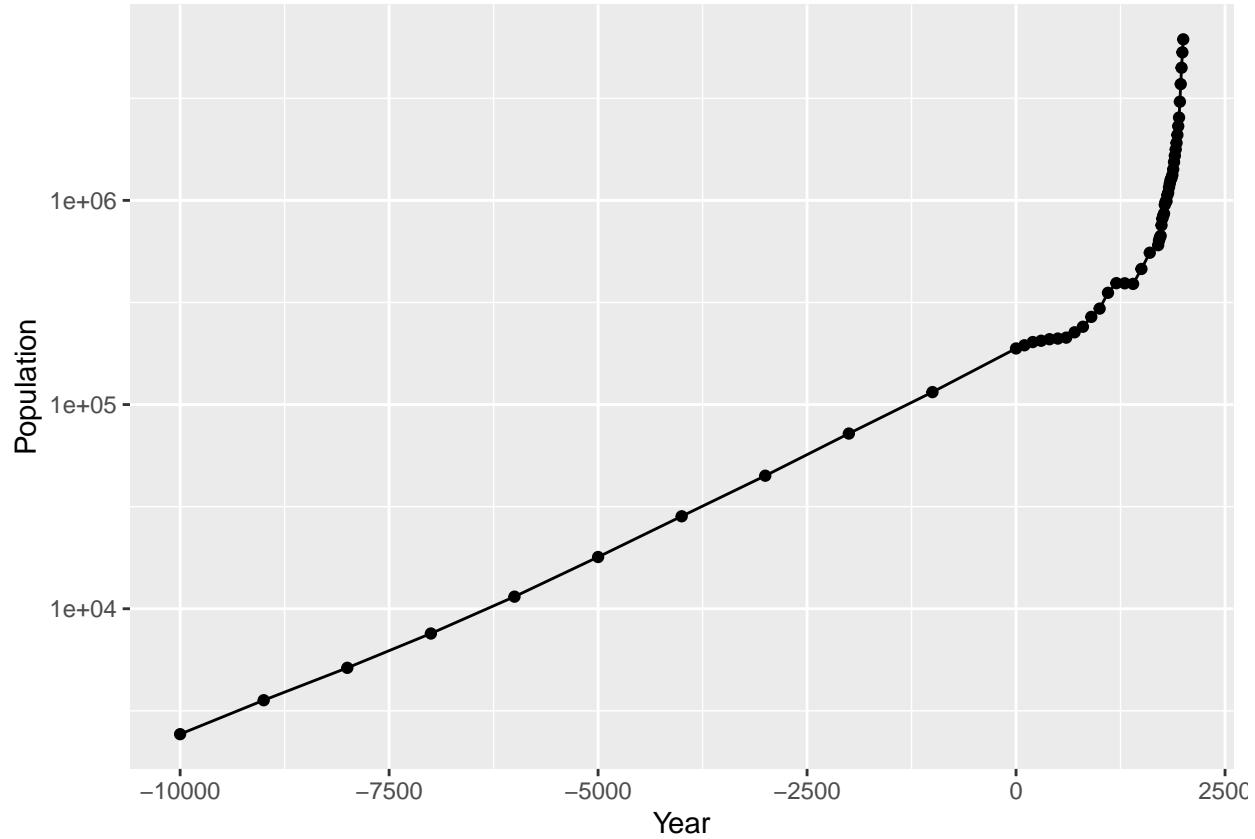
```
ggplot(BOD, aes(x = Time, y = demand)) +  
  geom_line() +  
  geom_point()
```



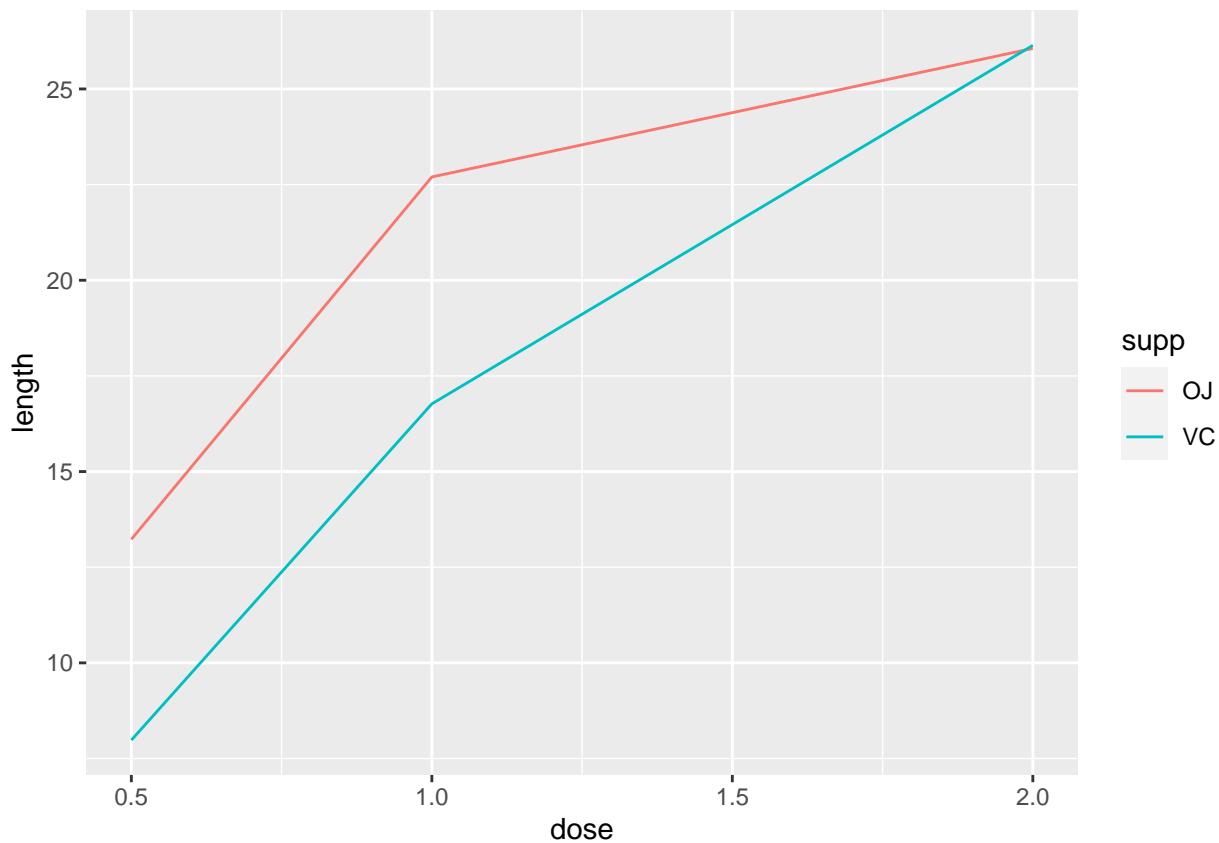
```
ggplot(worldpop, aes(x = Year, y = Population)) +  
  geom_line() +  
  geom_point()
```



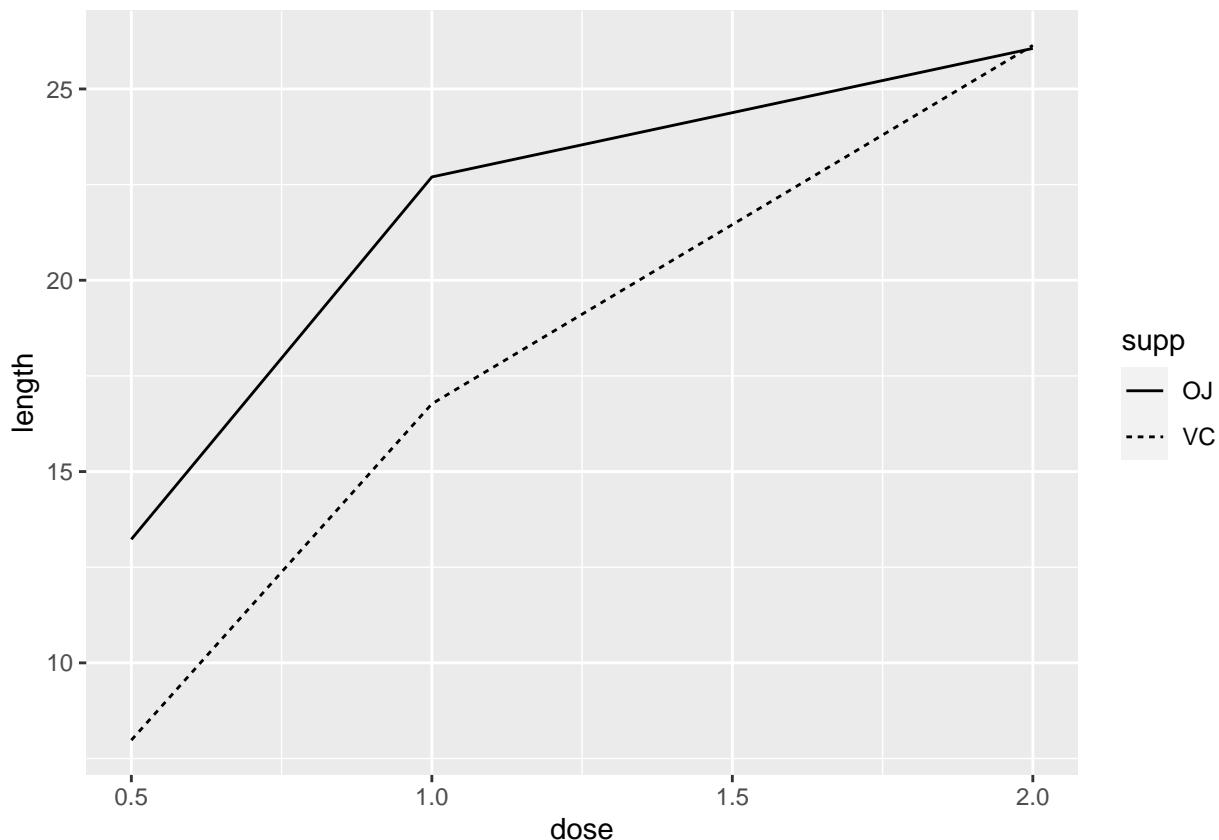
```
ggplot(worldpop, aes(x = Year, y = Population)) +  
  geom_line() +  
  geom_point() +  
  scale_y_log10()
```



```
ggplot(tg, aes(x = dose, y = length, colour = supp)) +  
  geom_line()
```

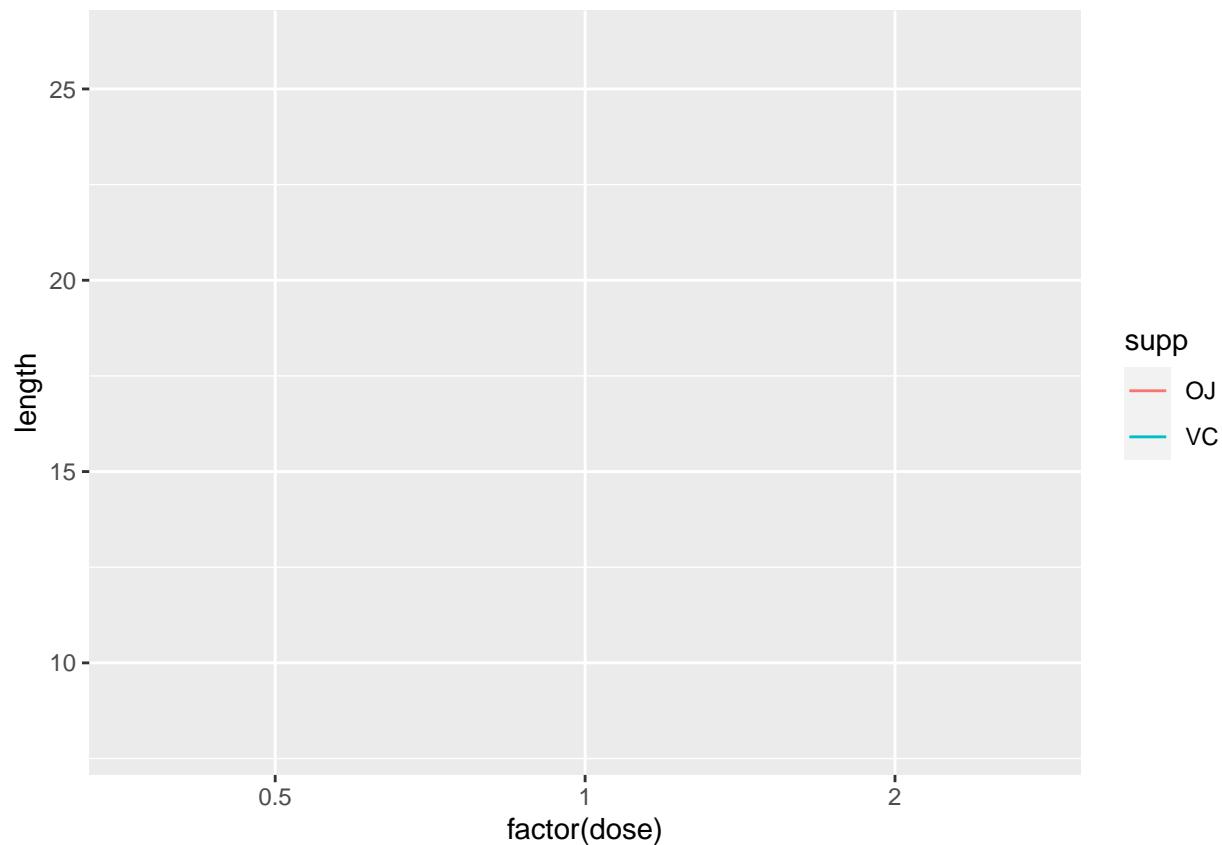


```
ggplot(tg, aes(x = dose, y = length, linetype = supp)) +  
  geom_line()
```

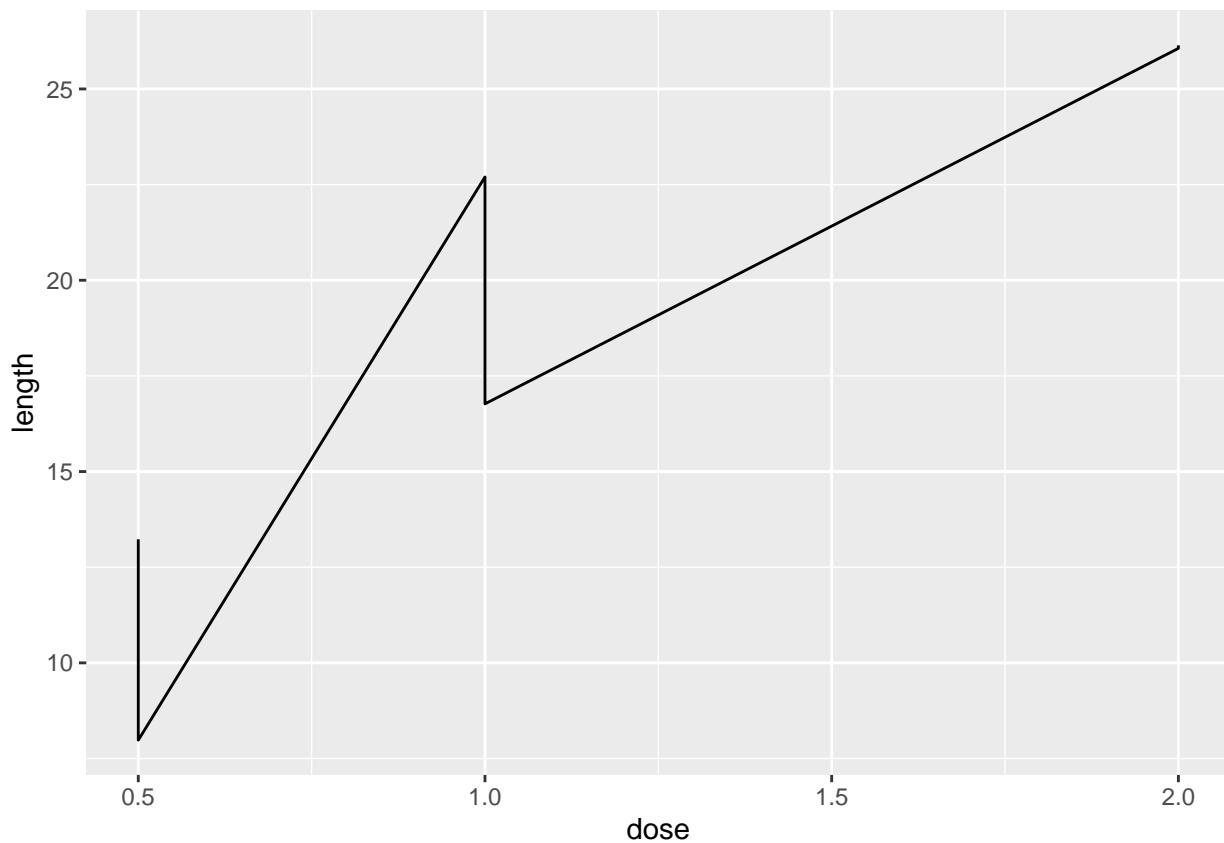


```
ggplot(tg, aes(x = factor(dose), y = length, colour = supp)) + geom_line()
```

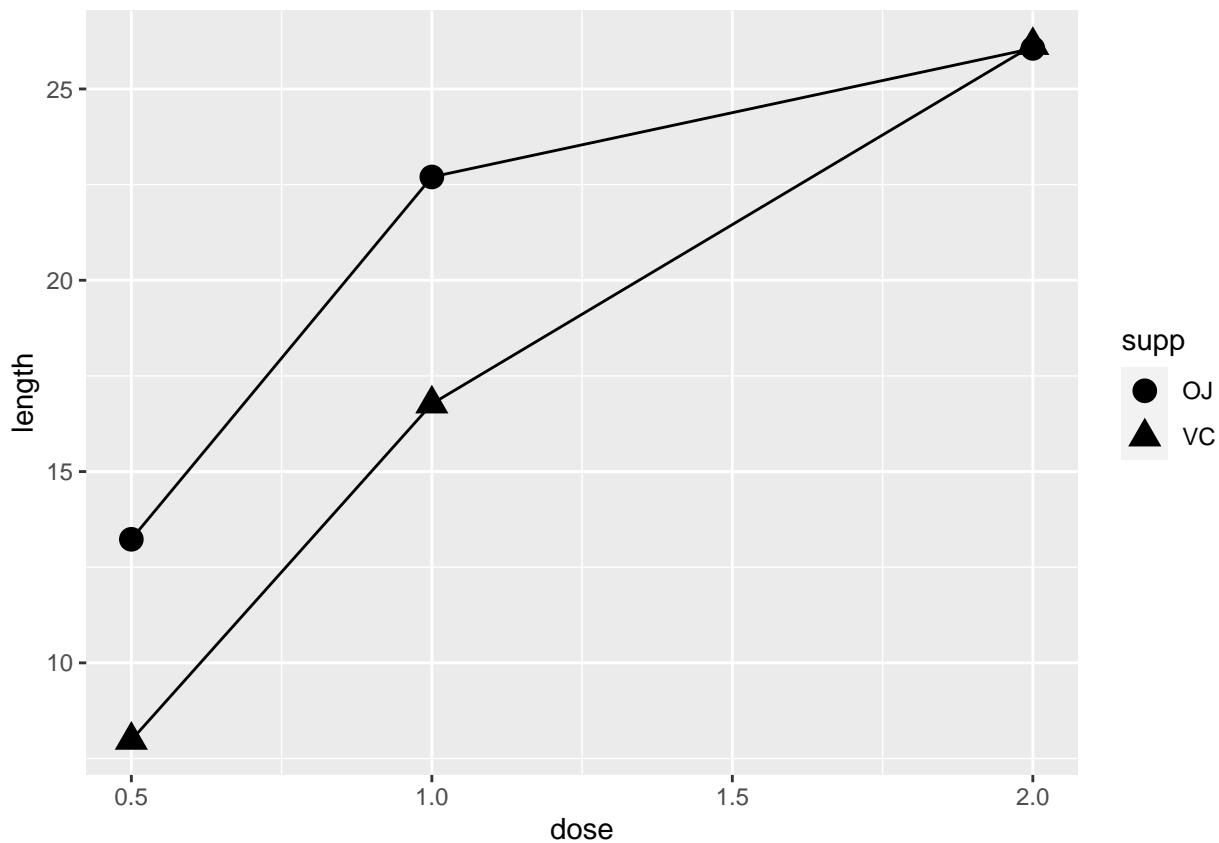
```
## geom_path: Each group consists of only one observation. Do you need to adjust
## the group aesthetic?
```



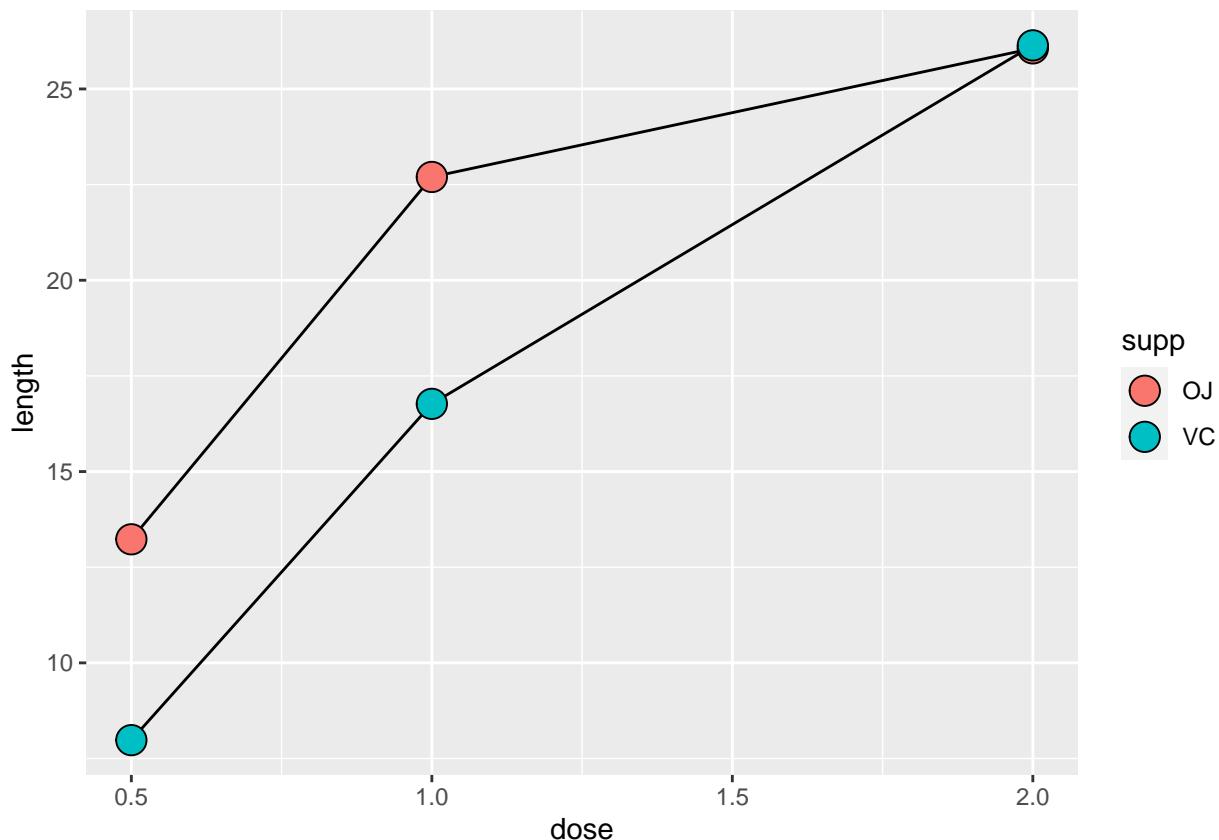
```
ggplot(tg, aes(x = dose, y = length)) +  
  geom_line()
```



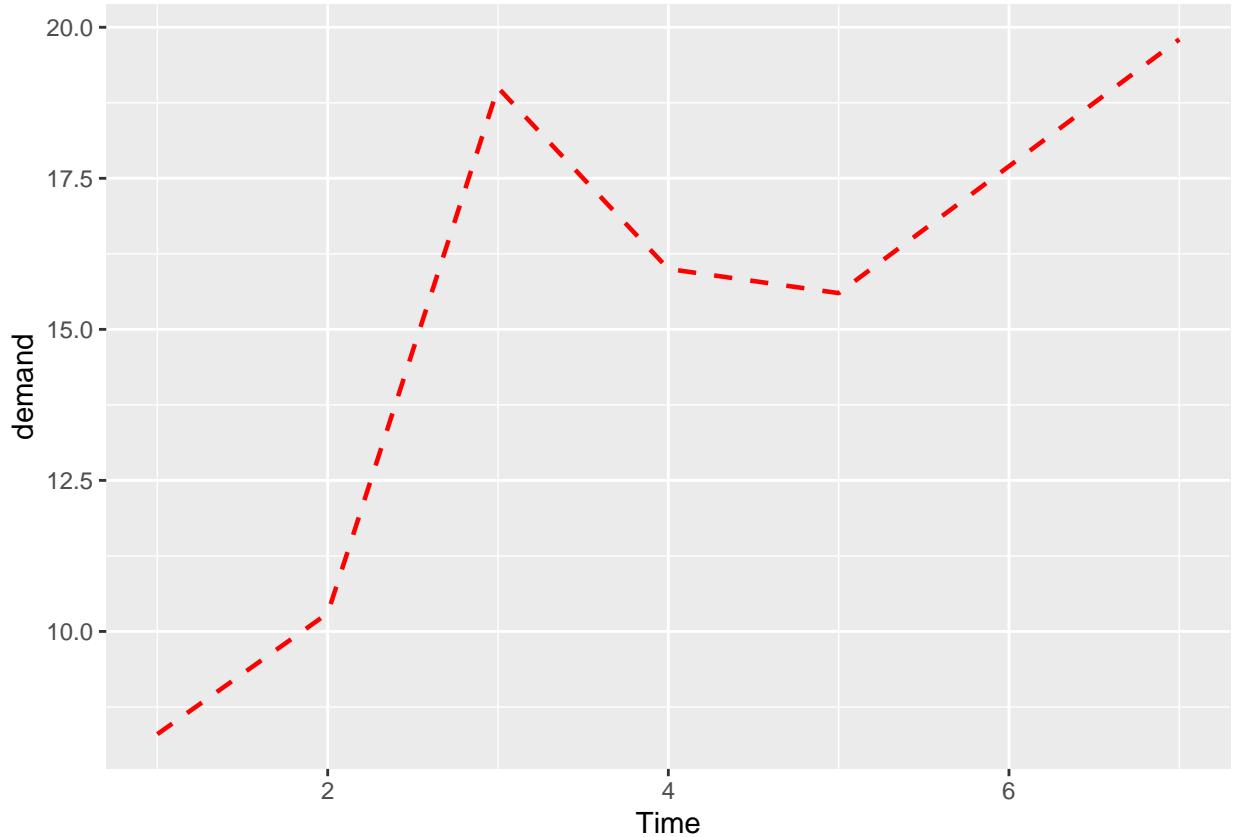
```
ggplot(tg, aes(x = dose, y = length, shape = supp)) +  
  geom_line() +  
  geom_point(size = 4)
```



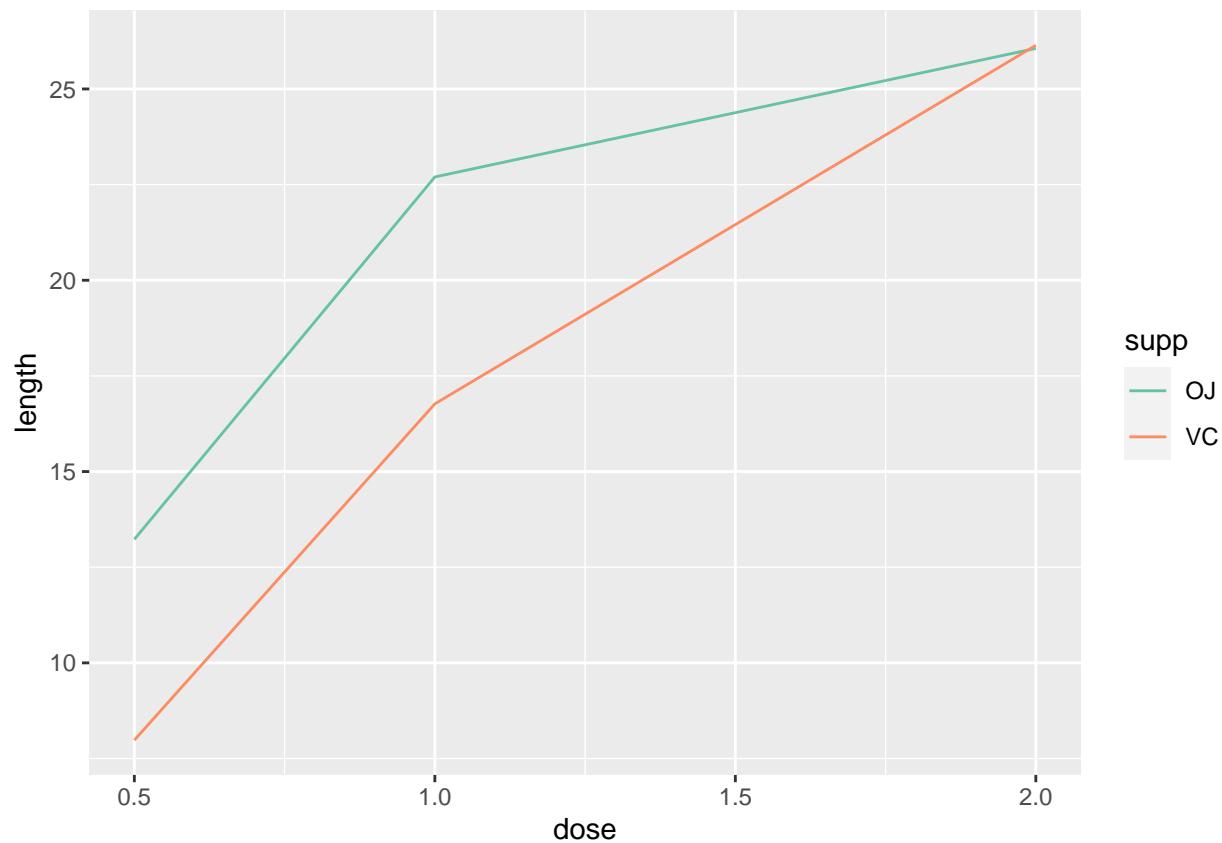
```
ggplot(tg, aes(x = dose, y = length, fill = supp)) +  
  geom_line() +  
  geom_point(size = 5, shape = 21)
```



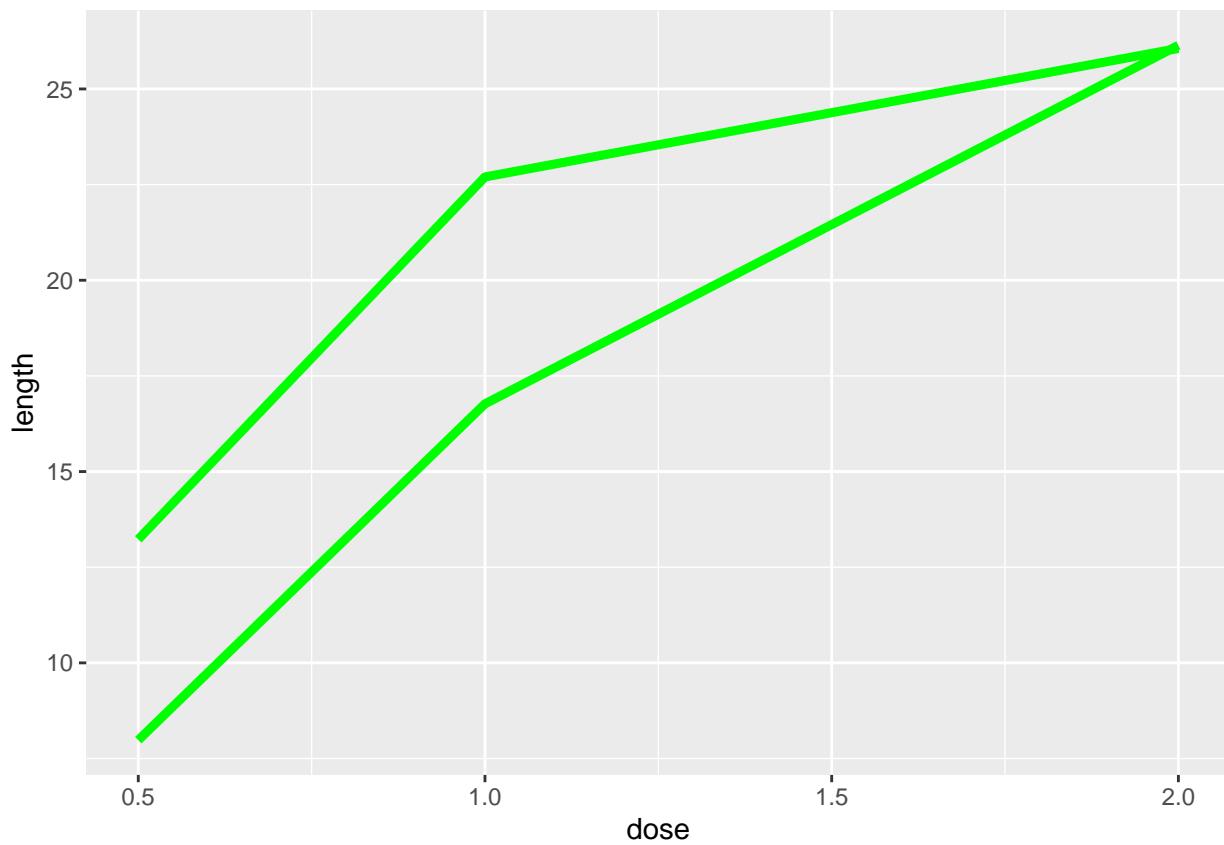
```
ggplot(BOD, aes(x = Time, y = demand)) +  
  geom_line(linetype = "dashed", size = 0.8, colour = "red")
```



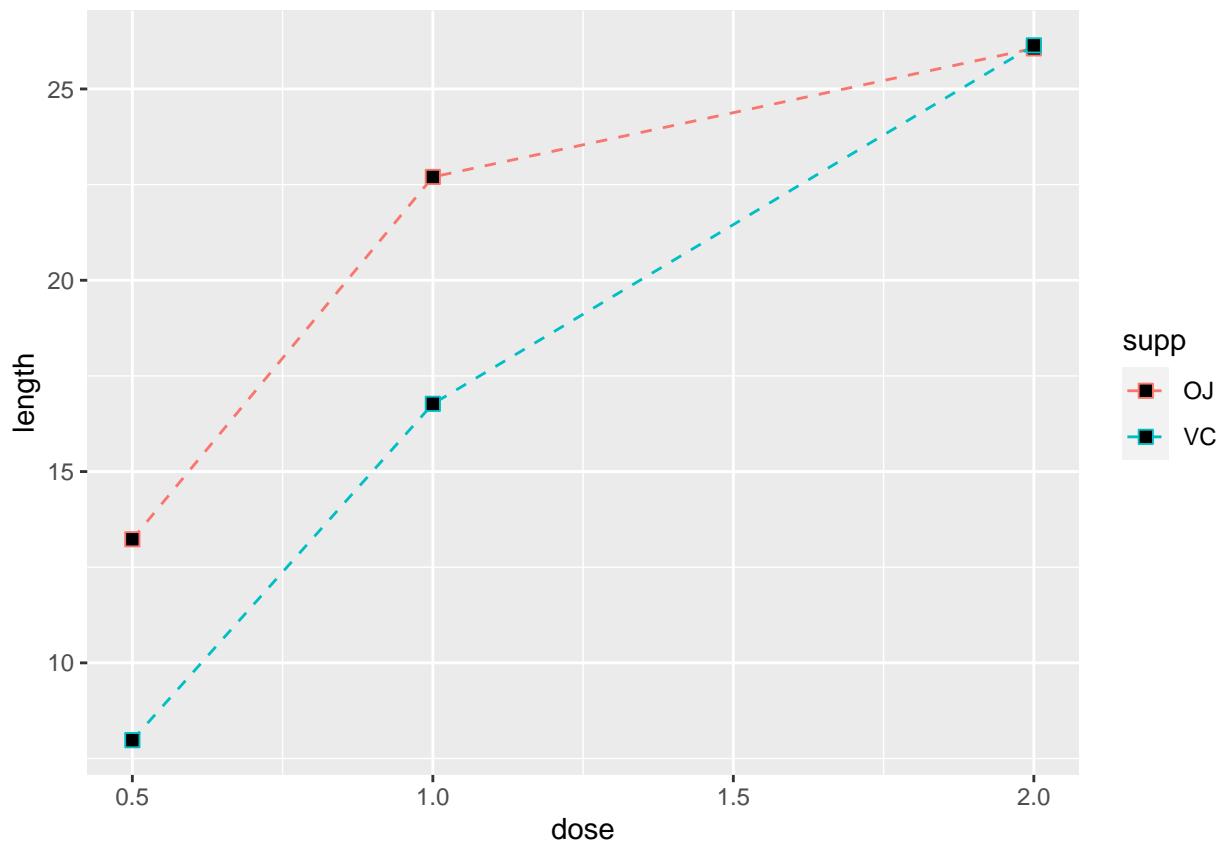
```
ggplot(tg, aes(x = dose, y = length, colour = supp)) +  
  geom_line() +  
  scale_colour_brewer(palette = "Set2")
```



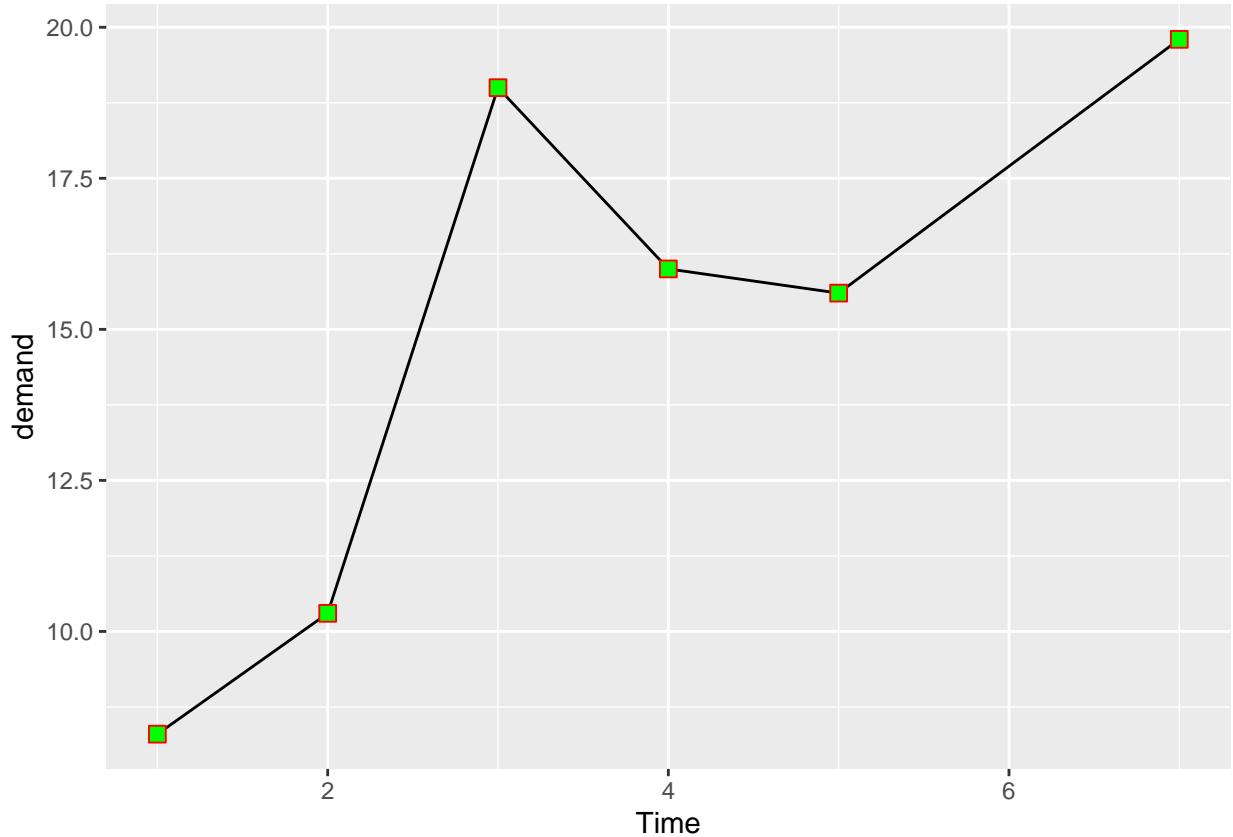
```
ggplot(tg, aes(x = dose, y = length, group = supp)) +  
  geom_line(colour = "green", size = 1.6)
```



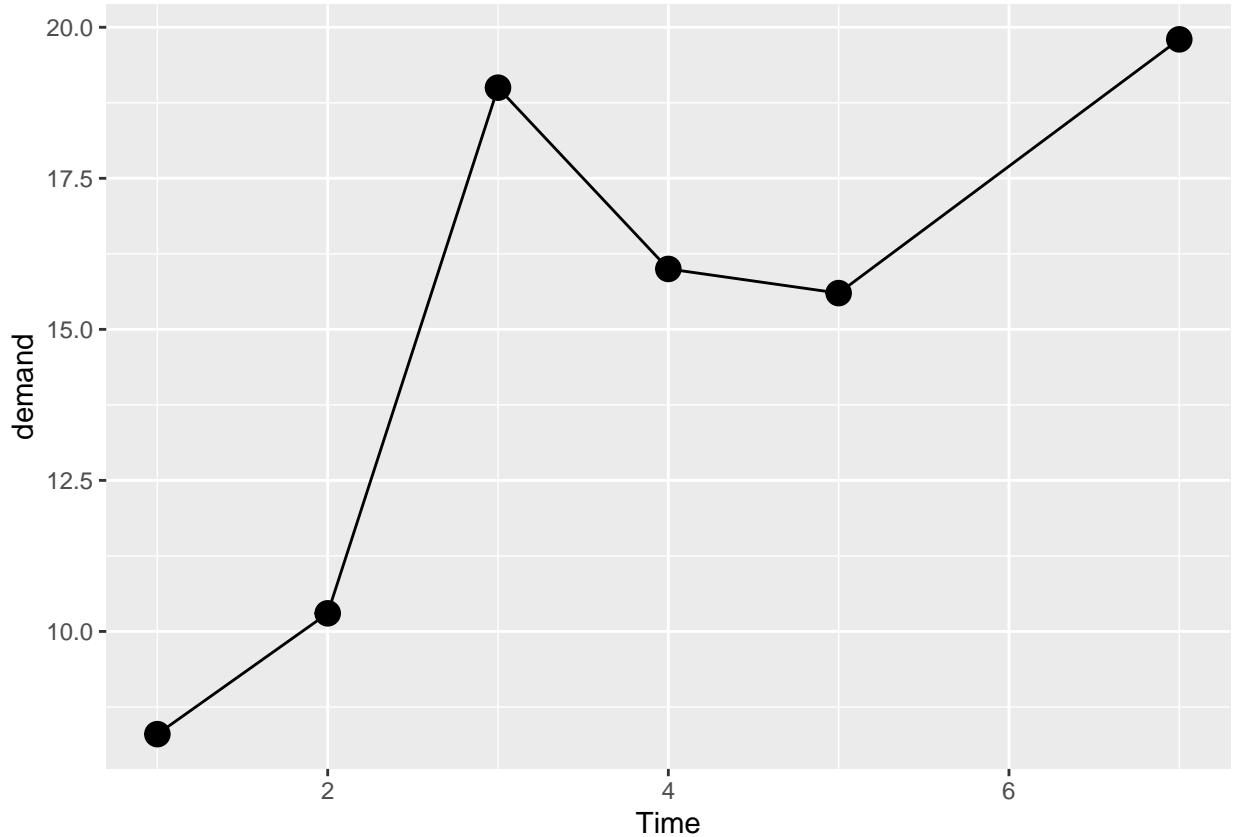
```
ggplot(tg, aes(x = dose, y = length, colour = supp)) +  
  geom_line(linetype = "dashed") +  
  geom_point(shape = 22, size = 2.5, fill = "black")
```



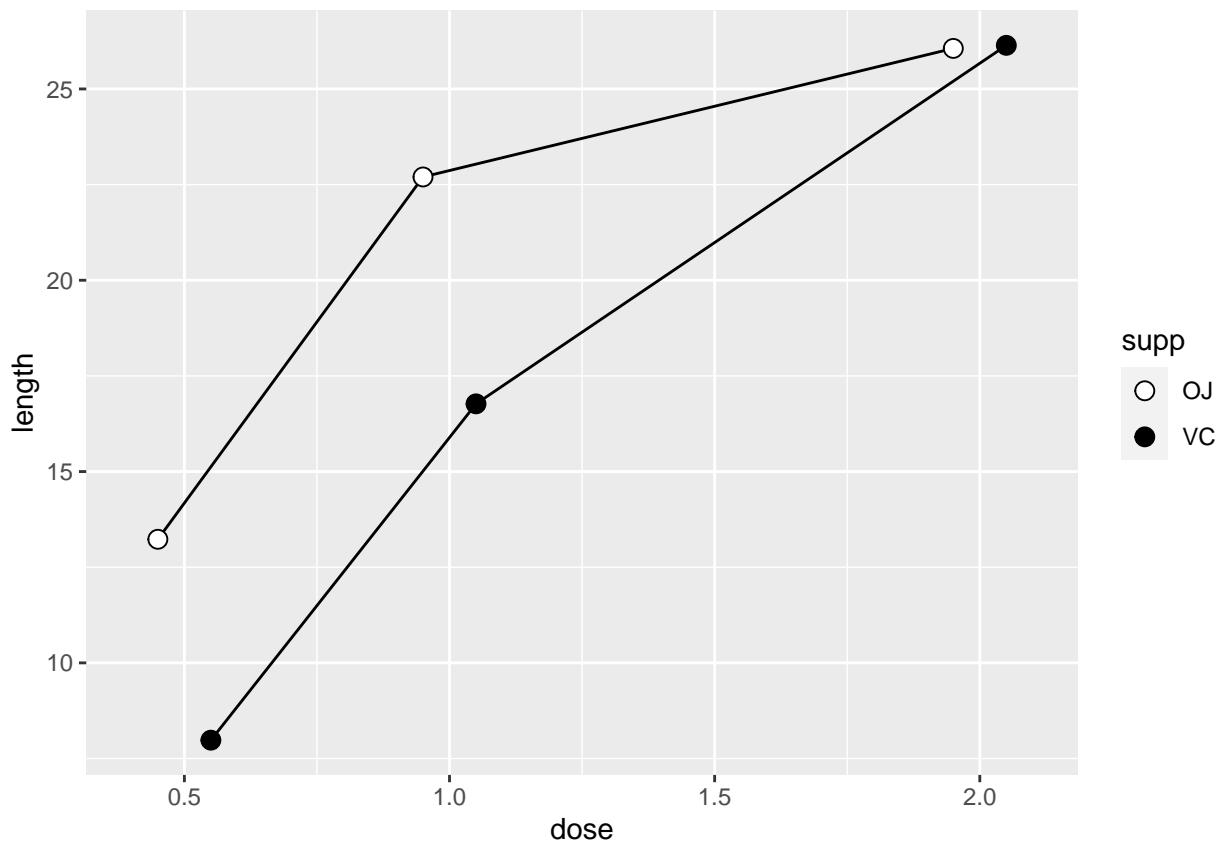
```
ggplot(BOD, aes(x = Time, y = demand)) +  
  geom_line() +  
  geom_point(size = 3, shape = 22, colour = "red", fill = "green")
```



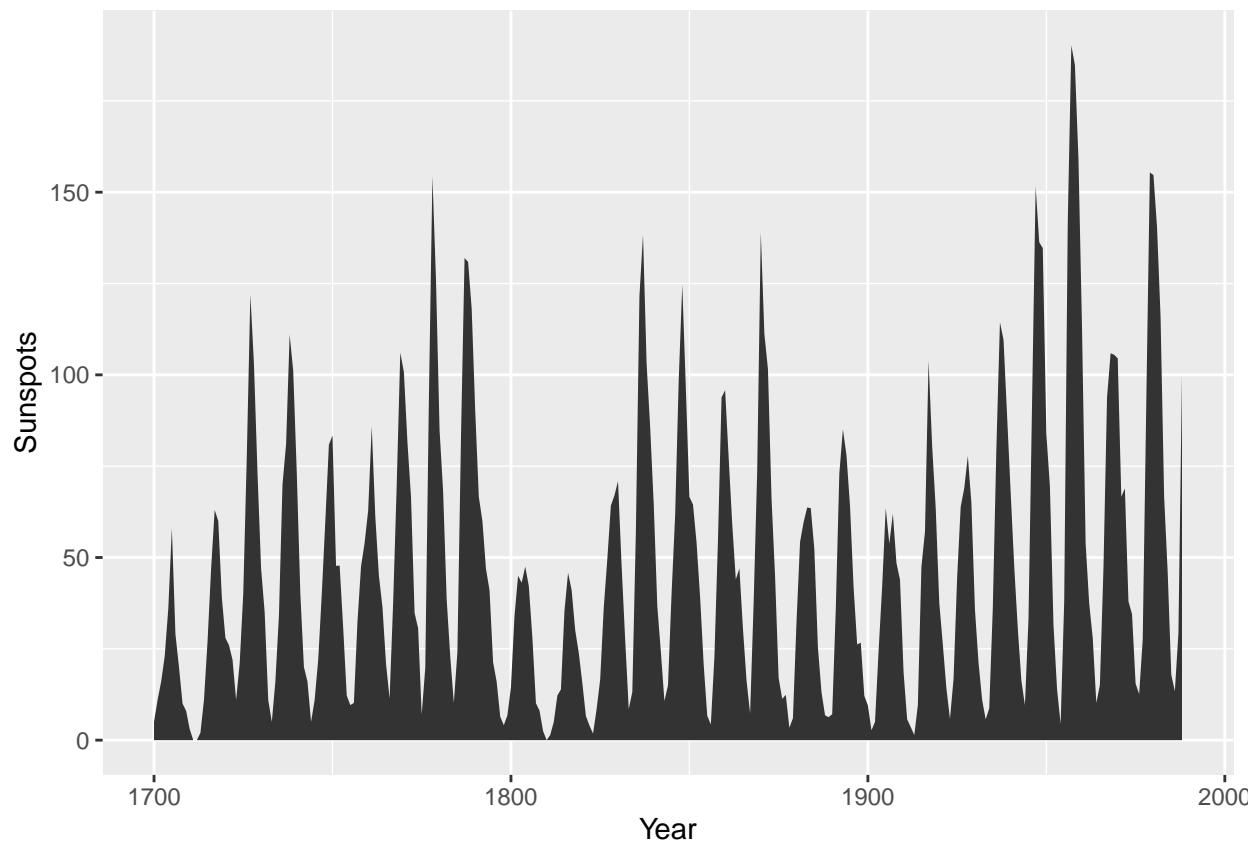
```
ggplot(BOD, aes(x = Time, y = demand)) +  
  geom_line() +  
  geom_point(size = 4, shape = 21, fill = "black")
```



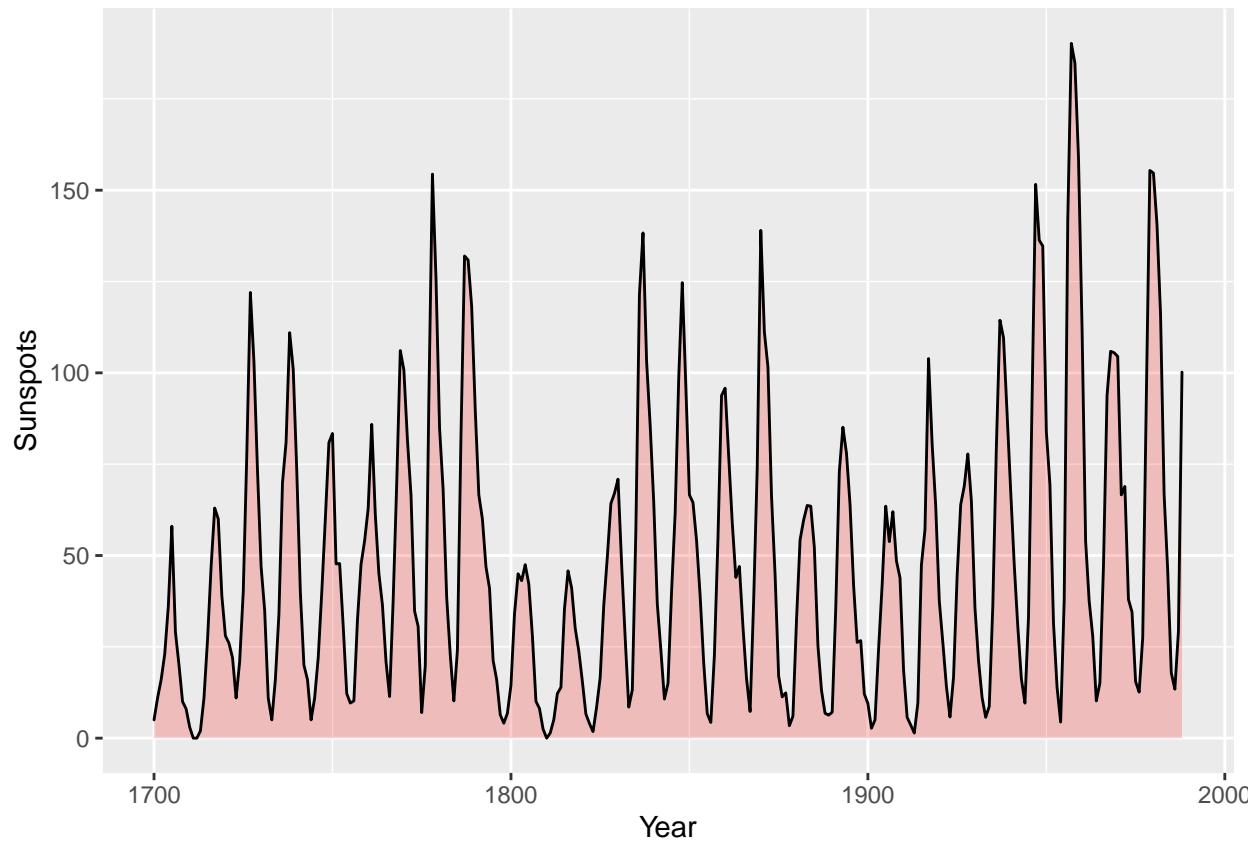
```
pd <- position_dodge(0.2)
ggplot(tg, aes(x = dose, y = length, fill = supp)) +
  geom_line(position = pd) +
  geom_point(shape = 21, size = 3, position = pd) +
  scale_fill_manual(values = c("white", "black"))
```



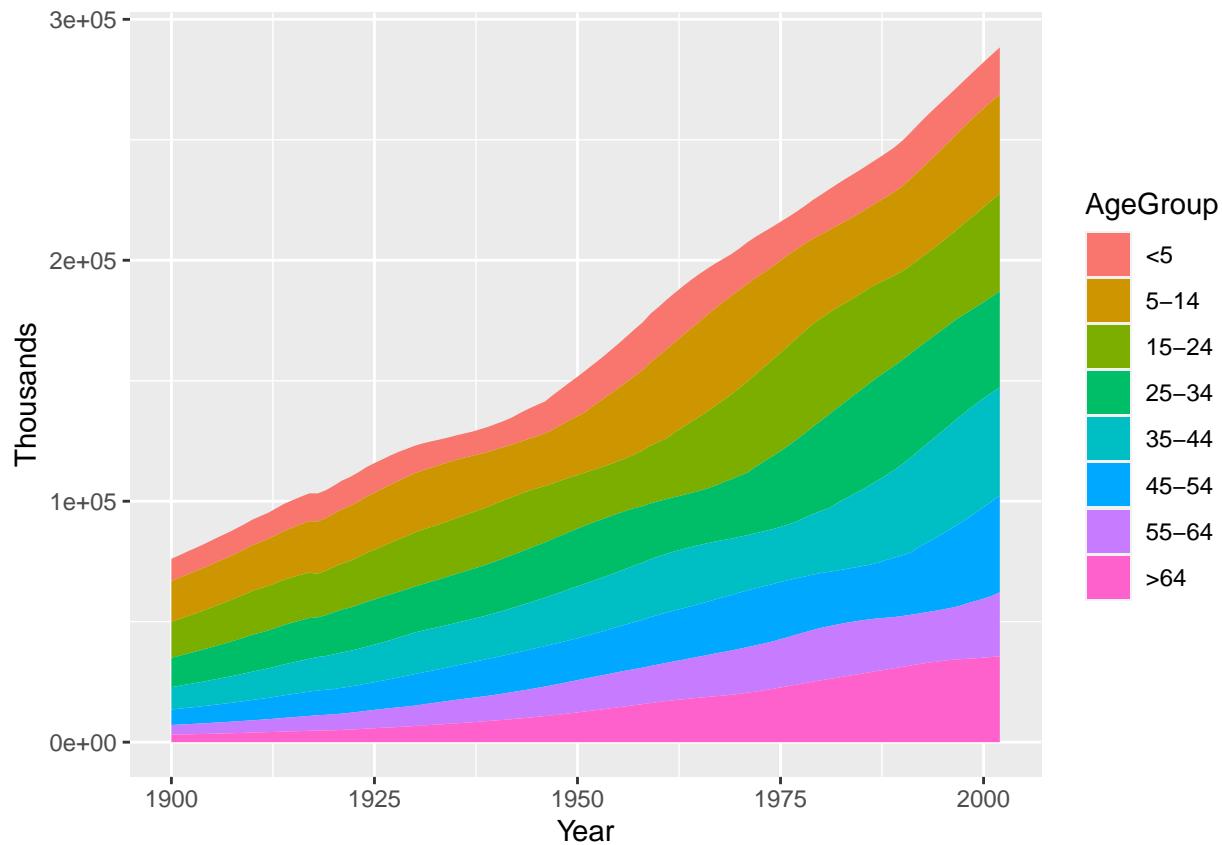
```
sunspotyear <- data.frame(  
  Year = as.numeric(time(sunspot.year)),  
  Sunspots = as.numeric(sunspot.year)  
)  
ggplot(sunspotyear, aes(x = Year, y = Sunspots)) +  
  geom_area()
```



```
ggplot(sunspotyear, aes(x = Year, y = Sunspots)) +  
  geom_area(colour = "black", fill = "red", alpha = .2)
```



```
ggplot(uspopage, aes(x = Year, y = Thousands, fill = AgeGroup)) +  
  geom_area()
```



uspopage

##	Year	AgeGroup	Thousands
## 1	1900	<5	9181
## 2	1900	5-14	16966
## 3	1900	15-24	14951
## 4	1900	25-34	12161
## 5	1900	35-44	9273
## 6	1900	45-54	6437
## 7	1900	55-64	4026
## 8	1900	>64	3099
## 9	1901	<5	9336
## 10	1901	5-14	17158
## 11	1901	15-24	15242
## 12	1901	25-34	12442
## 13	1901	35-44	9504
## 14	1901	45-54	6606
## 15	1901	55-64	4122
## 16	1901	>64	3174
## 17	1902	<5	9502
## 18	1902	5-14	17360
## 19	1902	15-24	15555
## 20	1902	25-34	12737
## 21	1902	35-44	9745
## 22	1902	45-54	6788
## 23	1902	55-64	4220

## 24	1902	>64	3256
## 25	1903	<5	9645
## 26	1903	5-14	17524
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## 32	1903	>64	3335
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## 643	1980	15-24	42497
## 644	1980	25-34	37429
## 645	1980	35-44	25805
## 646	1980	45-54	22743
## 647	1980	55-64	21754
## 648	1980	>64	25707
## 649	1981	<5	16893
## 650	1981	5-14	34360
## 651	1981	15-24	42204
## 652	1981	25-34	38900
## 653	1981	35-44	26394
## 654	1981	45-54	22580
## 655	1981	55-64	21913
## 656	1981	>64	26221
## 657	1982	<5	17228
## 658	1982	5-14	34103
## 659	1982	15-24	41644
## 660	1982	25-34	39418
## 661	1982	35-44	28030
## 662	1982	45-54	22425
## 663	1982	55-64	22030
## 664	1982	>64	26787
## 665	1983	<5	17547
## 666	1983	5-14	33922
## 667	1983	15-24	41020
## 668	1983	25-34	40208
## 669	1983	35-44	29267
## 670	1983	45-54	22356
## 671	1983	55-64	22112

## 672	1983	>64	27361
## 673	1984	<5	17695
## 674	1984	5-14	33788
## 675	1984	15-24	40460
## 676	1984	25-34	40962
## 677	1984	35-44	30503
## 678	1984	45-54	22386
## 679	1984	55-64	22155
## 680	1984	>64	27877
## 681	1985	<5	17842
## 682	1985	5-14	33692
## 683	1985	15-24	39992
## 684	1985	25-34	41696
## 685	1985	35-44	31691
## 686	1985	45-54	22460
## 687	1985	55-64	22135
## 688	1985	>64	28415
## 689	1986	<5	17963
## 690	1986	5-14	33572
## 691	1986	15-24	39557
## 692	1986	25-34	42372
## 693	1986	35-44	33009
## 694	1986	45-54	22659
## 695	1986	55-64	21994
## 696	1986	>64	29008
## 697	1987	<5	18052
## 698	1987	5-14	33807
## 699	1987	15-24	38890
## 700	1987	25-34	42841
## 701	1987	35-44	34227
## 702	1987	45-54	23096
## 703	1987	55-64	21751
## 704	1987	>64	29625
## 705	1988	<5	18195
## 706	1988	5-14	34255
## 707	1988	15-24	38151
## 708	1988	25-34	43130
## 709	1988	35-44	35181
## 710	1988	45-54	23949
## 711	1988	55-64	21513
## 712	1988	>64	30123
## 713	1989	<5	18508
## 714	1989	5-14	34714
## 715	1989	15-24	37391
## 716	1989	25-34	43236
## 717	1989	35-44	36415
## 718	1989	45-54	24633
## 719	1989	55-64	21241
## 720	1989	>64	30682
## 721	1990	<5	18856
## 722	1990	5-14	35290
## 723	1990	15-24	36922
## 724	1990	25-34	43216
## 725	1990	35-44	37783

```

## 726 1990    45-54    25207
## 727 1990    55-64    21102
## 728 1990      >64    31247
## 729 1991      <5     19208
## 730 1991    5-14     36037
## 731 1991   15-24     36504
## 732 1991   25-34     43224
## 733 1991   35-44     39329
## 734 1991   45-54     25820
## 735 1991   55-64     21046
## 736 1991      >64    31812
## 737 1992      <5     19528
## 738 1992    5-14     36677
## 739 1992   15-24     36434
## 740 1992   25-34     42997
## 741 1992   35-44     39976
## 742 1992   45-54     27548
## 743 1992   55-64     20998
## 744 1992      >64    32356
## 745 1993      <5     19729
## 746 1993    5-14     37367
## 747 1993   15-24     36464
## 748 1993   25-34     42653
## 749 1993   35-44     40912
## 750 1993   45-54     28864
## 751 1993   55-64     21028
## 752 1993      >64    32903
## 753 1994      <5     19777
## 754 1994    5-14     38026
## 755 1994   15-24     36532
## 756 1994   25-34     42330
## 757 1994   35-44     41819
## 758 1994   45-54     30153
## 759 1994   55-64     21159
## 760 1994      >64    33331
## 761 1995      <5     19627
## 762 1995    5-14     38645
## 763 1995   15-24     36674
## 764 1995   25-34     42052
## 765 1995   35-44     42711
## 766 1995   45-54     31480
## 767 1995   55-64     21320
## 768 1995      >64    33769
## 769 1996      <5     19408
## 770 1996    5-14     39296
## 771 1996   15-24     36797
## 772 1996   25-34     41809
## 773 1996   35-44     43552
## 774 1996   45-54     32800
## 775 1996   55-64     21590
## 776 1996      >64    34143
## 777 1997      <5     19233
## 778 1997    5-14     39855
## 779 1997   15-24     37308

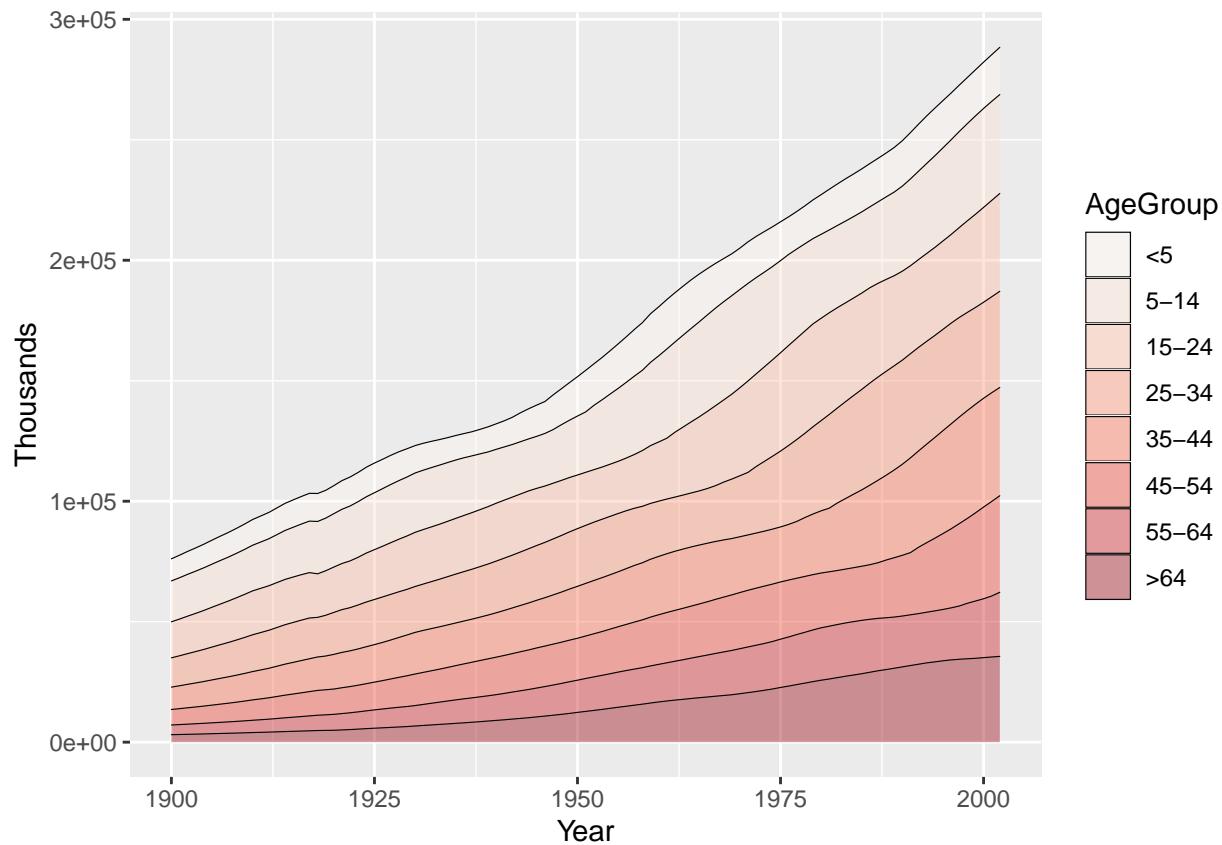
```

```

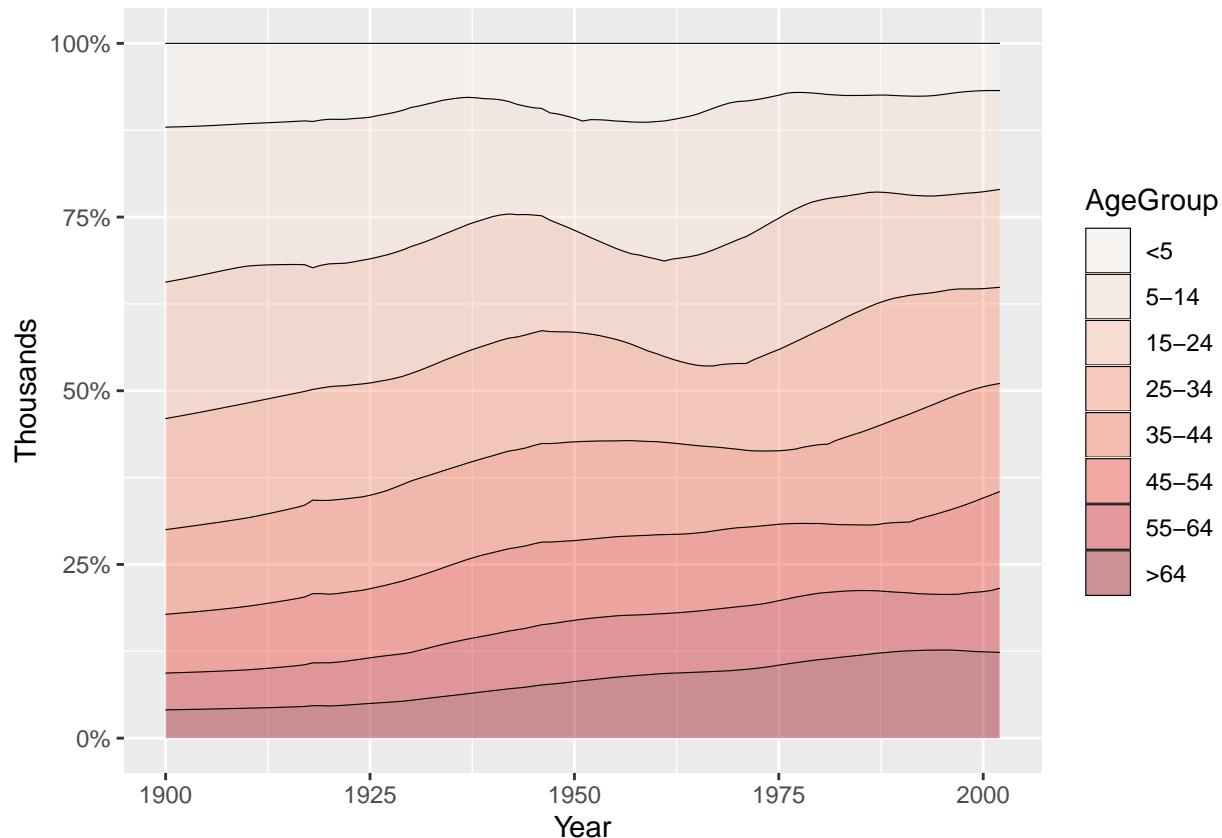
## 780 1997    25-34    41345
## 781 1997    35-44    44229
## 782 1997    45-54    34178
## 783 1997    55-64    22099
## 784 1997    >64     34401
## 785 1998    <5      19145
## 786 1998    5-14     40335
## 787 1998    15-24    38007
## 788 1998    25-34    40757
## 789 1998    35-44    44748
## 790 1998    45-54    35232
## 791 1998    55-64    23011
## 792 1998    >64     34619
## 793 1999    <5      19136
## 794 1999    5-14     40819
## 795 1999    15-24    38676
## 796 1999    25-34    40178
## 797 1999    35-44    45077
## 798 1999    45-54    36578
## 799 1999    55-64    23778
## 800 1999    >64     34798
## 801 2000    <5      19212
## 802 2000    5-14     41077
## 803 2000    15-24    39357
## 804 2000    25-34    39857
## 805 2000    35-44    45154
## 806 2000    45-54    38052
## 807 2000    55-64    24436
## 808 2000    >64     35081
## 809 2001    <5      19364
## 810 2001    5-14     41118
## 811 2001    15-24    39982
## 812 2001    25-34    39815
## 813 2001    35-44    45141
## 814 2001    45-54    39228
## 815 2001    55-64    25315
## 816 2001    >64     35352
## 817 2002    <5      19609
## 818 2002    5-14     41037
## 819 2002    15-24    40590
## 820 2002    25-34    39928
## 821 2002    35-44    44917
## 822 2002    45-54    40084
## 823 2002    55-64    26602
## 824 2002    >64     35602

ggplot(uspopage, aes(x = Year, y = Thousands, fill = AgeGroup)) +
  geom_area(colour = "black", size = .2, alpha = .4) +
  scale_fill_brewer(palette = "Reds")

```



```
ggplot(uspopage, aes(x = Year, y = Thousands, fill = AgeGroup)) +
  geom_area(position = "fill", colour = "black", size = .2, alpha = .4) +
  scale_fill_brewer(palette = "Reds") +
  scale_y_continuous(labels = scales::percent)
```



```
climate_mod <- climate %>%
filter(Source == "Berkeley") %>%
select(Year, Anomaly10y, Unc10y)
climate_mod
```

```
##      Year Anomaly10y Unc10y
## 1    1800   -0.435  0.505
## 2    1801   -0.453  0.493
## 3    1802   -0.460  0.486
## 4    1803   -0.493  0.489
## 5    1804   -0.536  0.483
## 6    1805   -0.541  0.475
## 7    1806   -0.590  0.468
## 8    1807   -0.695  0.461
## 9    1808   -0.763  0.453
## 10   1809   -0.818  0.451
## 11   1810   -0.842  0.437
## 12   1811   -0.912  0.406
## 13   1812   -0.963  0.395
## 14   1813   -1.015  0.389
## 15   1814   -0.949  0.369
## 16   1815   -0.935  0.368
## 17   1816   -0.918  0.361
## 18   1817   -0.802  0.330
## 19   1818   -0.743  0.349
```

```

## 20 1819 -0.703 0.382
## 21 1820 -0.625 0.395
## 22 1821 -0.527 0.363
## 23 1822 -0.392 0.339
## 24 1823 -0.332 0.351
## 25 1824 -0.321 0.343
## 26 1825 -0.278 0.344
## 27 1826 -0.270 0.295
## 28 1827 -0.378 0.284
## 29 1828 -0.398 0.254
## 30 1829 -0.388 0.243
## 31 1830 -0.429 0.247
## 32 1831 -0.506 0.247
## 33 1832 -0.625 0.257
## 34 1833 -0.689 0.246
## 35 1834 -0.667 0.224
## 36 1835 -0.689 0.220
## 37 1836 -0.727 0.221
## 38 1837 -0.662 0.218
## 39 1838 -0.612 0.222
## 40 1839 -0.613 0.256
## 41 1840 -0.638 0.274
## 42 1841 -0.542 0.267
## 43 1842 -0.472 0.282
## 44 1843 -0.407 0.269
## 45 1844 -0.402 0.285
## 46 1845 -0.390 0.285
## 47 1846 -0.351 0.284
## 48 1847 -0.346 0.280
## 49 1848 -0.362 0.273
## 50 1849 -0.357 0.260
## 51 1850 -0.290 0.244
## 52 1851 -0.321 0.239
## 53 1852 -0.372 0.228
## 54 1853 -0.363 0.226
## 55 1854 -0.351 0.228
## 56 1855 -0.348 0.216
## 57 1856 -0.374 0.203
## 58 1857 -0.418 0.187
## 59 1858 -0.420 0.186
## 60 1859 -0.427 0.178
## 61 1860 -0.473 0.172
## 62 1861 -0.458 0.154
## 63 1862 -0.412 0.149
## 64 1863 -0.393 0.145
## 65 1864 -0.373 0.141
## 66 1865 -0.344 0.148
## 67 1866 -0.317 0.147
## 68 1867 -0.282 0.145
## 69 1868 -0.269 0.145
## 70 1869 -0.241 0.149
## 71 1870 -0.233 0.149
## 72 1871 -0.255 0.146
## 73 1872 -0.271 0.142

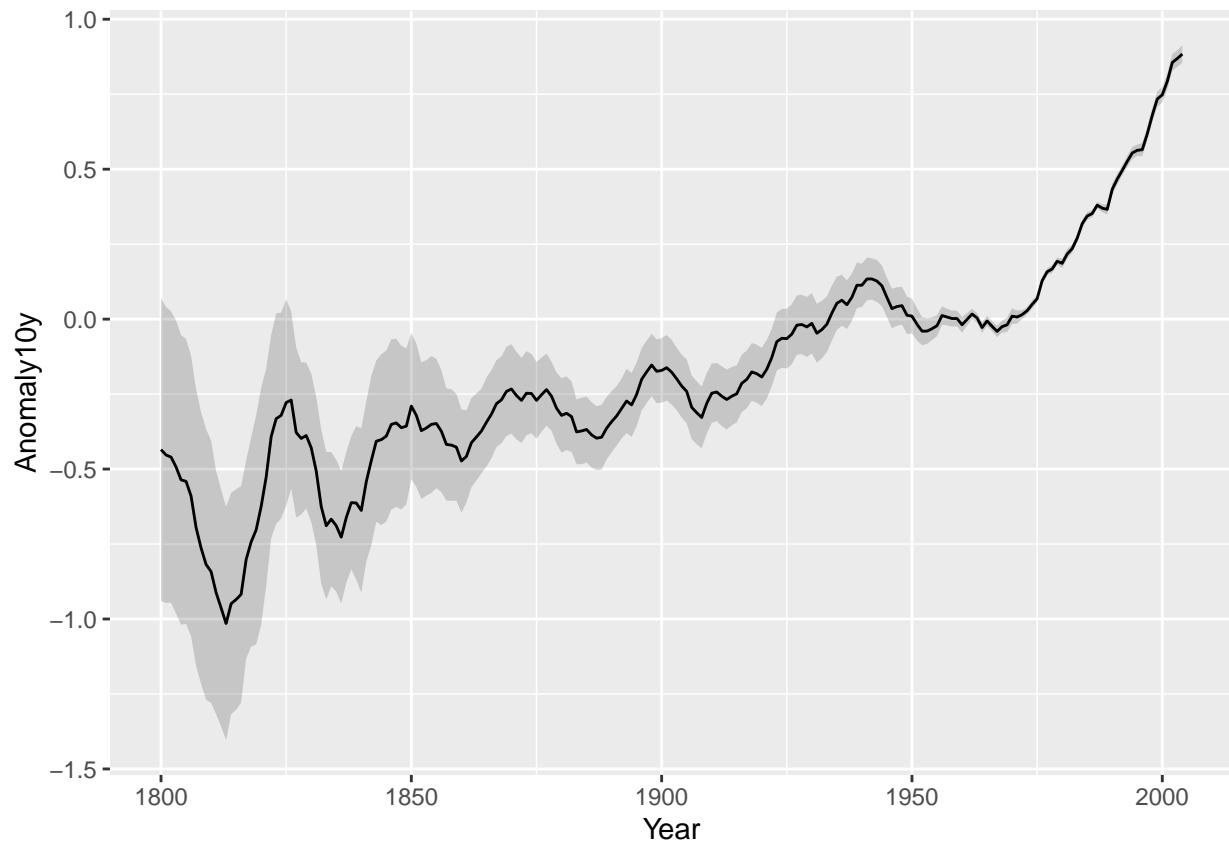
```

##	74	1873	-0.247	0.140
##	75	1874	-0.248	0.132
##	76	1875	-0.271	0.128
##	77	1876	-0.252	0.124
##	78	1877	-0.235	0.120
##	79	1878	-0.257	0.115
##	80	1879	-0.297	0.119
##	81	1880	-0.321	0.124
##	82	1881	-0.314	0.123
##	83	1882	-0.325	0.117
##	84	1883	-0.376	0.108
##	85	1884	-0.373	0.111
##	86	1885	-0.368	0.110
##	87	1886	-0.386	0.109
##	88	1887	-0.397	0.107
##	89	1888	-0.394	0.108
##	90	1889	-0.364	0.104
##	91	1890	-0.342	0.102
##	92	1891	-0.323	0.099
##	93	1892	-0.298	0.100
##	94	1893	-0.273	0.107
##	95	1894	-0.286	0.107
##	96	1895	-0.251	0.106
##	97	1896	-0.201	0.104
##	98	1897	-0.176	0.104
##	99	1898	-0.153	0.104
##	100	1899	-0.174	0.106
##	101	1900	-0.171	0.108
##	102	1901	-0.162	0.109
##	103	1902	-0.177	0.108
##	104	1903	-0.199	0.104
##	105	1904	-0.223	0.105
##	106	1905	-0.241	0.107
##	107	1906	-0.294	0.106
##	108	1907	-0.312	0.105
##	109	1908	-0.328	0.103
##	110	1909	-0.281	0.101
##	111	1910	-0.247	0.099
##	112	1911	-0.243	0.097
##	113	1912	-0.257	0.100
##	114	1913	-0.268	0.100
##	115	1914	-0.257	0.097
##	116	1915	-0.249	0.095
##	117	1916	-0.214	0.096
##	118	1917	-0.201	0.096
##	119	1918	-0.176	0.096
##	120	1919	-0.182	0.097
##	121	1920	-0.193	0.097
##	122	1921	-0.167	0.098
##	123	1922	-0.128	0.096
##	124	1923	-0.075	0.097
##	125	1924	-0.064	0.098
##	126	1925	-0.065	0.100
##	127	1926	-0.050	0.100

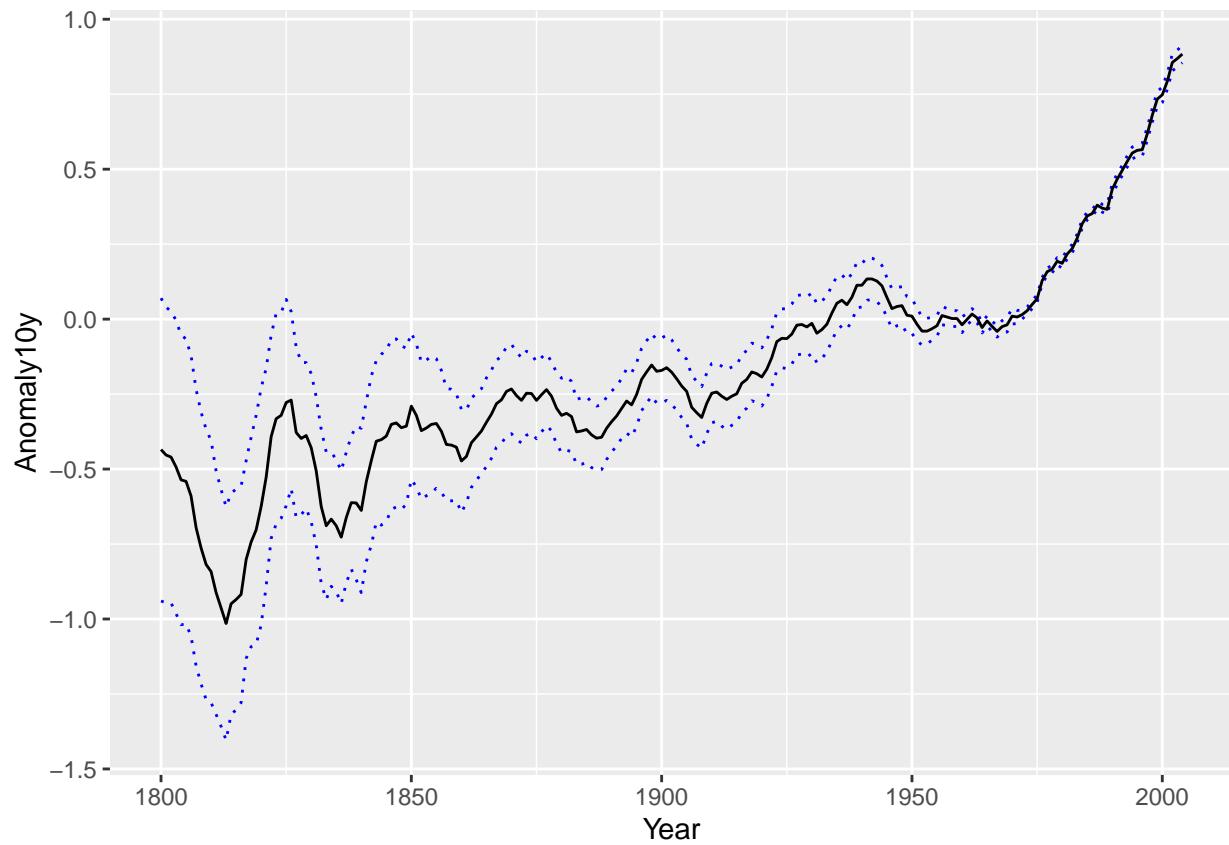
## 128 1927	-0.020	0.099
## 129 1928	-0.018	0.099
## 130 1929	-0.026	0.100
## 131 1930	-0.014	0.101
## 132 1931	-0.047	0.098
## 133 1932	-0.035	0.096
## 134 1933	-0.017	0.093
## 135 1934	0.020	0.092
## 136 1935	0.053	0.089
## 137 1936	0.063	0.085
## 138 1937	0.048	0.081
## 139 1938	0.073	0.079
## 140 1939	0.113	0.076
## 141 1940	0.113	0.072
## 142 1941	0.134	0.071
## 143 1942	0.134	0.069
## 144 1943	0.127	0.070
## 145 1944	0.111	0.068
## 146 1945	0.072	0.066
## 147 1946	0.035	0.066
## 148 1947	0.042	0.064
## 149 1948	0.045	0.063
## 150 1949	0.013	0.062
## 151 1950	0.010	0.058
## 152 1951	-0.017	0.054
## 153 1952	-0.040	0.047
## 154 1953	-0.040	0.043
## 155 1954	-0.032	0.038
## 156 1955	-0.022	0.035
## 157 1956	0.012	0.031
## 158 1957	0.007	0.028
## 159 1958	0.002	0.027
## 160 1959	0.002	0.026
## 161 1960	-0.019	0.026
## 162 1961	-0.001	0.021
## 163 1962	0.017	0.018
## 164 1963	0.004	0.016
## 165 1964	-0.028	0.018
## 166 1965	-0.006	0.017
## 167 1966	-0.024	0.017
## 168 1967	-0.041	0.019
## 169 1968	-0.025	0.020
## 170 1969	-0.019	0.024
## 171 1970	0.010	0.026
## 172 1971	0.007	0.022
## 173 1972	0.015	0.015
## 174 1973	0.028	0.012
## 175 1974	0.049	0.014
## 176 1975	0.068	0.012
## 177 1976	0.128	0.011
## 178 1977	0.158	0.012
## 179 1978	0.167	0.013
## 180 1979	0.193	0.012
## 181 1980	0.186	0.016

```
## 182 1981      0.217  0.016
## 183 1982      0.235  0.014
## 184 1983      0.270  0.014
## 185 1984      0.318  0.014
## 186 1985      0.344  0.013
## 187 1986      0.352  0.012
## 188 1987      0.380  0.011
## 189 1988      0.370  0.013
## 190 1989      0.366  0.017
## 191 1990      0.433  0.019
## 192 1991      0.467  0.018
## 193 1992      0.496  0.017
## 194 1993      0.526  0.019
## 195 1994      0.554  0.020
## 196 1995      0.563  0.019
## 197 1996      0.565  0.022
## 198 1997      0.618  0.022
## 199 1998      0.680  0.023
## 200 1999      0.734  0.025
## 201 2000      0.748  0.026
## 202 2001      0.793  0.027
## 203 2002      0.856  0.028
## 204 2003      0.869  0.028
## 205 2004      0.884  0.029
```

```
ggplot(climate_mod, aes(x = Year, y = Anomaly10y)) +
  geom_ribbon(aes(ymin = Anomaly10y - Unc10y,
  ymax = Anomaly10y + Unc10y),
  alpha = 0.2) +
  geom_line()
```



```
ggplot(climate_mod, aes(x = Year, y = Anomaly10y)) +  
  geom_line(aes(y = Anomaly10y - Unc10y), colour = "blue",  
            linetype = "dotted") +  
  geom_line(aes(y = Anomaly10y + Unc10y), colour = "blue",  
            linetype = "dotted") +  
  geom_line()
```



```
df%>%
  select(Entity,Year )
```

```
##           Entity Year
## 1      Australia 1802
## 2      Australia 1803
## 3      Australia 1804
## 4      Australia 1805
## 5      Australia 1806
## 6      Australia 1807
## 7      Australia 1808
## 8      Australia 1809
## 9      Australia 1810
## 10     Australia 1811
## 11     Australia 1812
## 12     Australia 1813
## 13     Australia 1814
## 14     Australia 1815
## 15     Australia 1816
## 16     Australia 1817
## 17     Australia 1818
## 18     Australia 1819
## 19     Australia 1820
## 20     Australia 1821
## 21     Australia 1822
```

```
## 22      Australia 1823
## 23      Australia 1824
## 24      Australia 1825
## 25      Australia 1826
## 26      Australia 1827
## 27      Australia 1828
## 28      Australia 1829
## 29      Australia 1830
## 30      Australia 1831
## 31      Australia 1832
## 32      Australia 1833
## 33      Australia 1834
## 34      Australia 1835
## 35      Australia 1836
## 36      Australia 1837
## 37      Australia 1838
## 38      Australia 1839
## 39      Australia 1840
## 40      Australia 1841
## 41      Australia 1842
## 42      Australia 1843
## 43      Australia 1844
## 44      Australia 1845
## 45      Australia 1846
## 46      Australia 1847
## 47      Australia 1848
## 48      Australia 1849
## 49      Australia 1850
## 50      Australia 1851
## 51      Australia 1852
## 52      Australia 1853
## 53      Australia 1854
## 54      Australia 1855
## 55      Australia 1856
## 56      Australia 1857
## 57      Australia 1858
## 58      Australia 1859
## 59      Australia 1860
## 60      Australia 1861
## 61      Australia 1862
## 62      Australia 1863
## 63      Australia 1864
## 64      Australia 1865
## 65      Australia 1866
## 66      Australia 1867
## 67      Australia 1868
## 68      Australia 1869
## 69      Australia 1870
## 70      Australia 1871
## 71      Australia 1872
## 72      Australia 1873
## 73      Australia 1874
## 74      Australia 1875
## 75      Australia 1876
```

```
## 76      Australia 1877
## 77      Australia 1878
## 78      Australia 1879
## 79      Australia 1880
## 80      Australia 1881
## 81      Australia 1882
## 82      Australia 1883
## 83      Australia 1884
## 84      Australia 1885
## 85      Australia 1886
## 86      Australia 1887
## 87      Australia 1888
## 88      Australia 1889
## 89      Australia 1890
## 90      Australia 1891
## 91      Australia 1892
## 92      Australia 1893
## 93      Australia 1894
## 94      Australia 1895
## 95      Australia 1896
## 96      Australia 1897
## 97      Australia 1898
## 98      Australia 1899
## 99      Australia 1900
## 100     Australia 1901
## 101     Australia 1902
## 102     Australia 1903
## 103     Australia 1904
## 104     Australia 1905
## 105     Australia 1906
## 106     Australia 1907
## 107     Australia 1908
## 108     Australia 1909
## 109     Australia 1910
## 110     Australia 1911
## 111     Australia 1912
## 112     Australia 1913
## 113     Australia 1914
## 114     Australia 1915
## 115     Australia 1916
## 116     Australia 1917
## 117     Australia 1918
## 118     Australia 1919
## 119     Australia 1920
## 120     Australia 1921
## 121     Australia 1922
## 122     Australia 1923
## 123     Australia 1924
## 124     Australia 1925
## 125     Australia 1926
## 126     Australia 1927
## 127     Australia 1928
## 128     Australia 1929
## 129     Australia 1930
```

```
## 130      Australia 1931
## 131      Australia 1932
## 132      Australia 1933
## 133      Australia 1934
## 134      Australia 1935
## 135      Australia 1936
## 136      Australia 1937
## 137      Australia 1938
## 138      Australia 1939
## 139      Australia 1940
## 140      Australia 1941
## 141      Australia 1942
## 142      Australia 1943
## 143      Australia 1944
## 144      Australia 1945
## 145      Australia 1946
## 146      Australia 1947
## 147      Australia 1948
## 148      Australia 1949
## 149      Australia 1950
## 150      Australia 1951
## 151      Australia 1952
## 152      Australia 1953
## 153      Australia 1954
## 154      Australia 1955
## 155      Australia 1956
## 156      Australia 1957
## 157      Australia 1958
## 158      Australia 1959
## 159      Australia 1960
## 160      Australia 1961
## 161      Australia 1962
## 162      Australia 1963
## 163      Australia 1964
## 164      Australia 1965
## 165      Australia 1966
## 166      Australia 1967
## 167      Australia 1968
## 168      Australia 1969
## 169      Australia 1970
## 170      Australia 1971
## 171      Australia 1972
## 172      Australia 1973
## 173      Australia 1974
## 174      Australia 1975
## 175      Australia 1976
## 176      Australia 1977
## 177      Australia 1978
## 178      Australia 1979
## 179      Australia 1980
## 180      Australia 1981
## 181      Australia 1982
## 182      Australia 1983
## 183      Australia 1984
```

```
## 184      Australia 1985
## 185      Australia 1986
## 186      Australia 1987
## 187      Australia 1988
## 188      Australia 1989
## 189      Australia 1990
## 190      Australia 1991
## 191      Australia 1992
## 192      Australia 1993
## 193      Australia 1994
## 194      Australia 1995
## 195      Australia 1996
## 196      Australia 1997
## 197      Australia 1998
## 198      Australia 1999
## 199      Australia 2000
## 200      Australia 2001
## 201      Australia 2002
## 202      Australia 2003
## 203      Australia 2004
## 204      Australia 2005
## 205      Australia 2006
## 206      Australia 2007
## 207      Australia 2008
## 208      Australia 2009
## 209      Australia 2010
## 210      Australia 2011
## 211      Australia 2012
## 212      Australia 2013
## 213      Australia 2014
## 214      Australia 2015
## 215      Australia 2016
## 216      Brazil 1800
## 217      Brazil 1801
## 218      Brazil 1802
## 219      Brazil 1803
## 220      Brazil 1804
## 221      Brazil 1805
## 222      Brazil 1806
## 223      Brazil 1807
## 224      Brazil 1808
## 225      Brazil 1809
## 226      Brazil 1810
## 227      Brazil 1811
## 228      Brazil 1812
## 229      Brazil 1813
## 230      Brazil 1814
## 231      Brazil 1815
## 232      Brazil 1816
## 233      Brazil 1817
## 234      Brazil 1818
## 235      Brazil 1819
## 236      Brazil 1820
## 237      Brazil 1821
```

```
## 238      Brazil 1822
## 239      Brazil 1823
## 240      Brazil 1824
## 241      Brazil 1825
## 242      Brazil 1826
## 243      Brazil 1827
## 244      Brazil 1828
## 245      Brazil 1829
## 246      Brazil 1830
## 247      Brazil 1831
## 248      Brazil 1832
## 249      Brazil 1833
## 250      Brazil 1834
## 251      Brazil 1835
## 252      Brazil 1836
## 253      Brazil 1837
## 254      Brazil 1838
## 255      Brazil 1839
## 256      Brazil 1840
## 257      Brazil 1841
## 258      Brazil 1842
## 259      Brazil 1843
## 260      Brazil 1844
## 261      Brazil 1845
## 262      Brazil 1846
## 263      Brazil 1847
## 264      Brazil 1848
## 265      Brazil 1849
## 266      Brazil 1850
## 267      Brazil 1851
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## 2279	Russia 1910
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## 2282	Russia 1913
## 2283	Russia 1914
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## 2312	Russia 1943
## 2313	Russia 1944
## 2314	Russia 1945
## 2315	Russia 1946
## 2316	Russia 1947
## 2317	Russia 1948
## 2318	Russia 1949
## 2319	Russia 1950
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## 2338	Russia 1969
## 2339	Russia 1970
## 2340	Russia 1971
## 2341	Russia 1972
## 2342	Russia 1973
## 2343	Russia 1974

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## 2352      Russia 1983
## 2353      Russia 1984
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## 2357      Russia 1988
## 2358      Russia 1989
## 2359      Russia 1990
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## 2362      Russia 1993
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## 2366      Russia 1997
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## 2369      Russia 2000
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## 2372      Russia 2003
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## 2374      Russia 2005
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## 2377      Russia 2008
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## 2379      Russia 2010
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## 2382      Russia 2013
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## 2388      Spain 1802
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## 2390      Spain 1804
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## 2392      Spain 1806
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## 2599      Spain 2013
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## 2601      Spain 2015
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## 2604      Switzerland 1801
## 2605      Switzerland 1802
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## 2612      Switzerland 1809
## 2613      Switzerland 1810
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## 2818 Switzerland 2015
## 2819 Switzerland 2016
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## 2821 United Kingdom 1801
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## 2990 United Kingdom 1970
## 2991 United Kingdom 1971
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## 2992 United Kingdom 1972
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## 3032 United Kingdom 2012
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## 3036 United Kingdom 2016
## 3037 United States 1800
## 3038 United States 1801
## 3039 United States 1802
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## 3041 United States 1804
## 3042 United States 1805
## 3043 United States 1806
## 3044 United States 1807
## 3045 United States 1808
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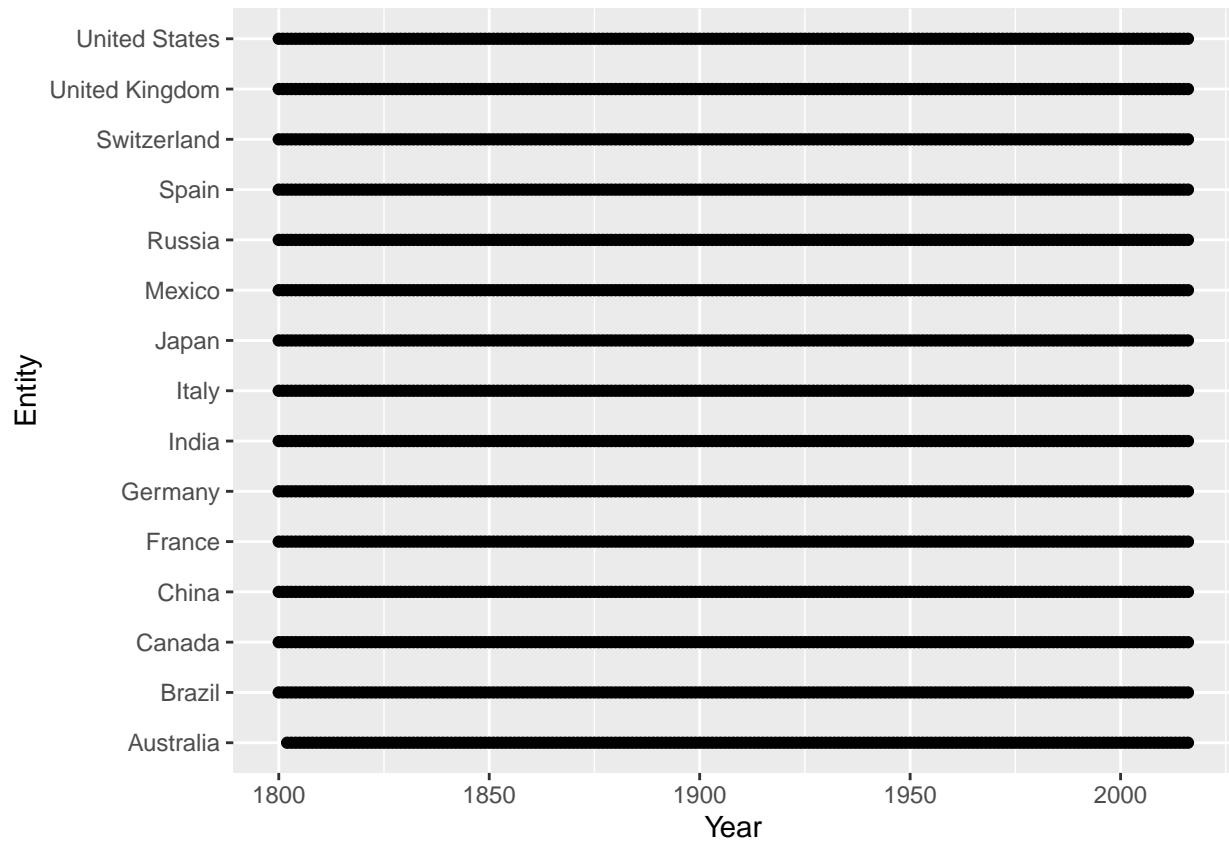
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## 3098 United States 1861
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## 3100 United States 1863
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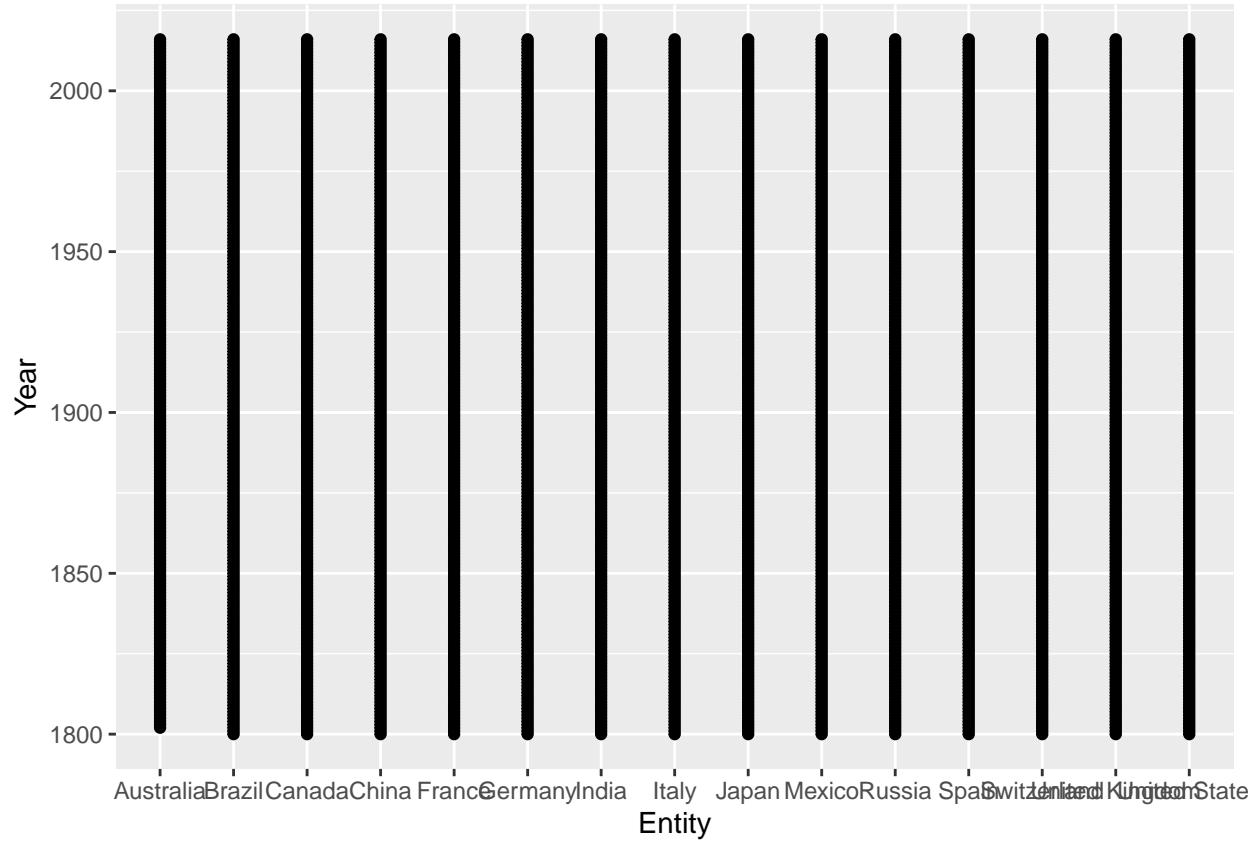
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## 3208 United States 1971
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## 3251 United States 2014
## 3252 United States 2015
## 3253 United States 2016
```

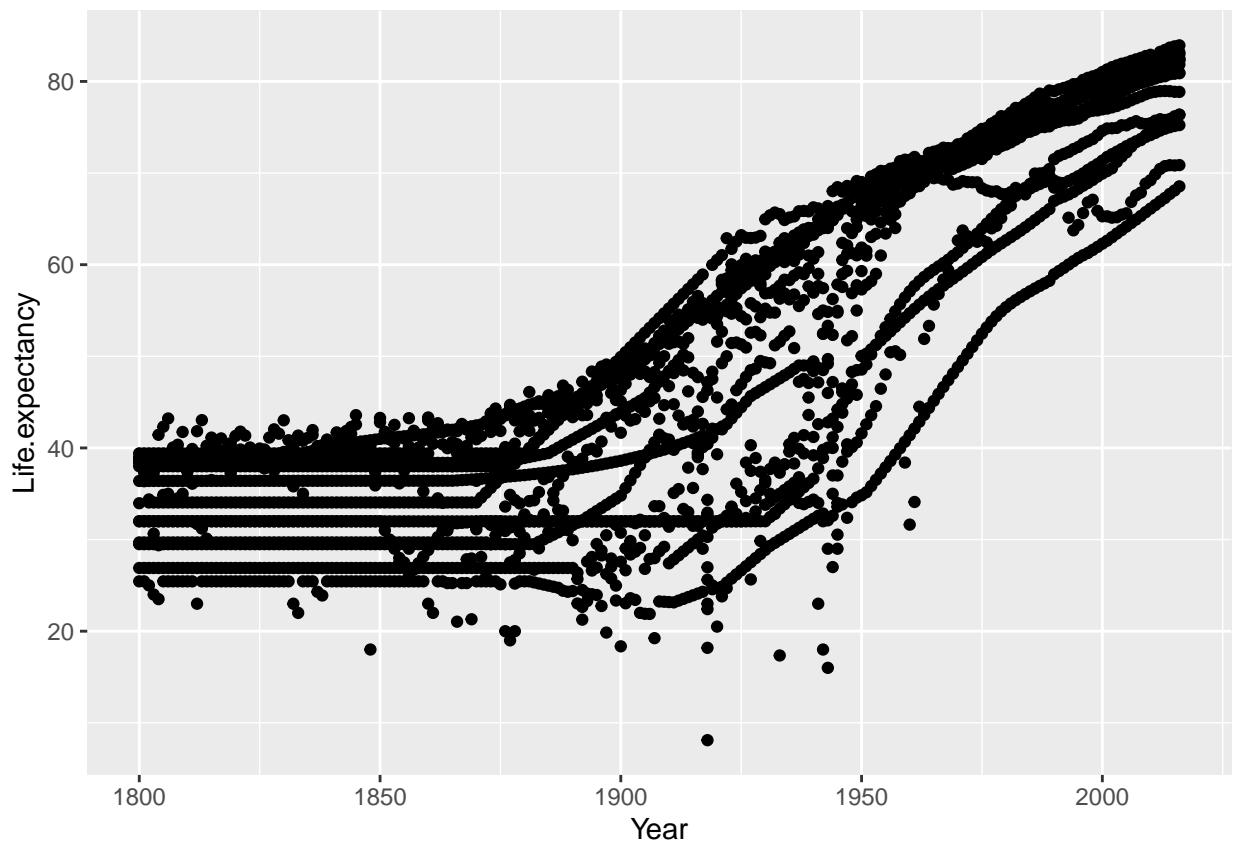
```
ggplot(df, aes(x = Year, y = Entity)) +
geom_point()
```



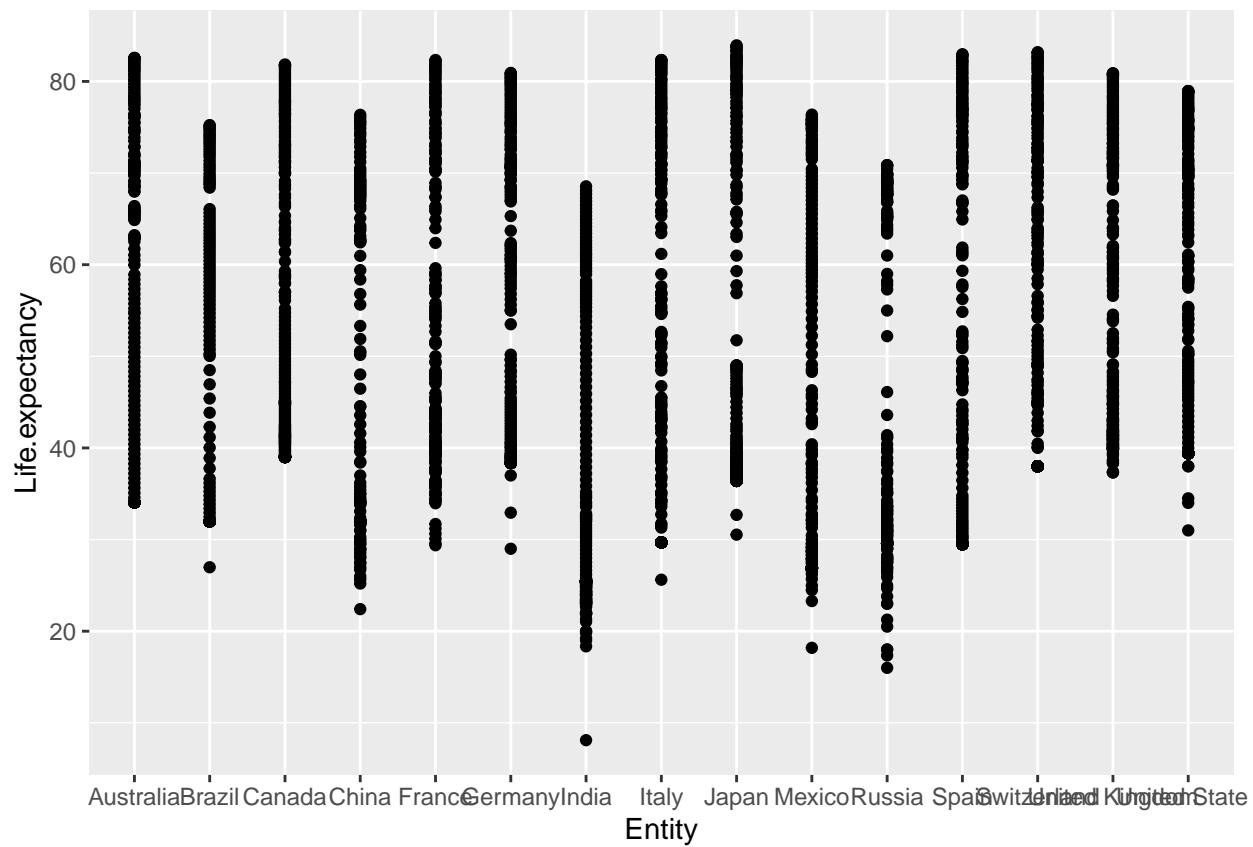
```
ggplot(df, aes(x = Entity, y = Year)) +  
  geom_point()
```



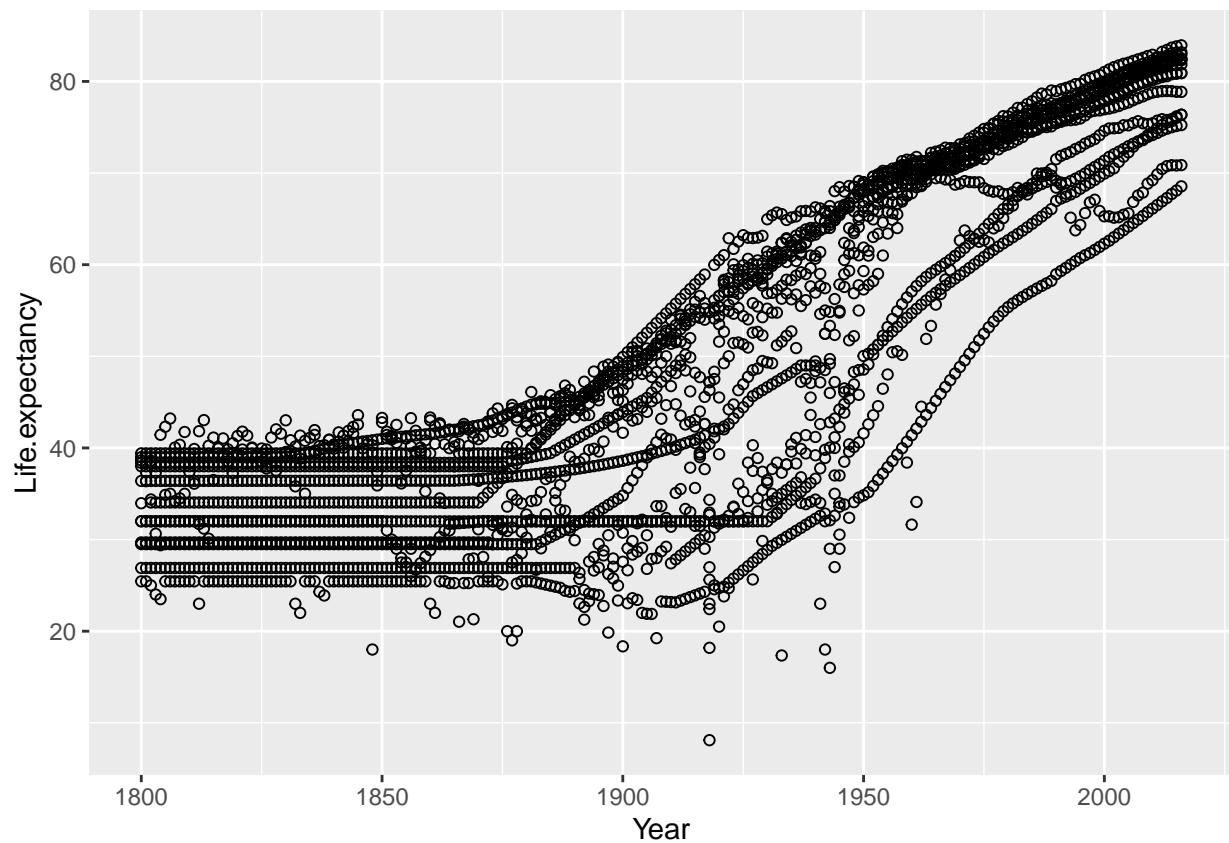
```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_point()
```



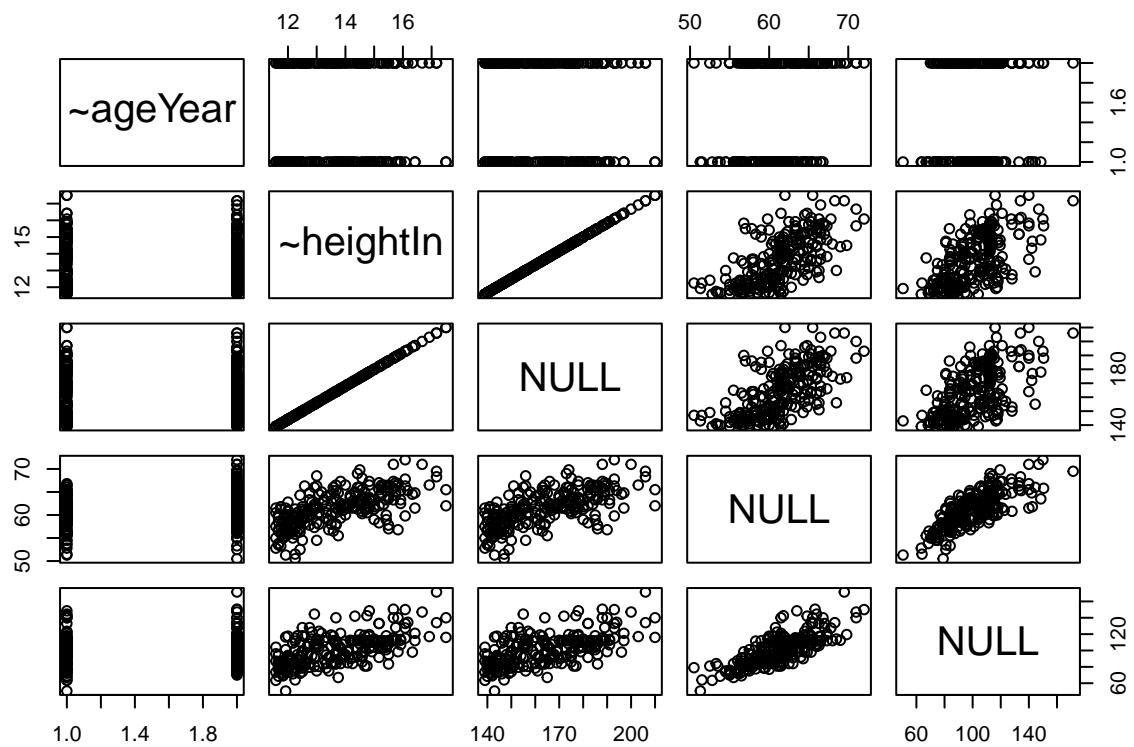
```
ggplot(df, aes(x = Entity, y = Life.expectancy)) +  
  geom_point()
```



```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_point(shape = 21)
```

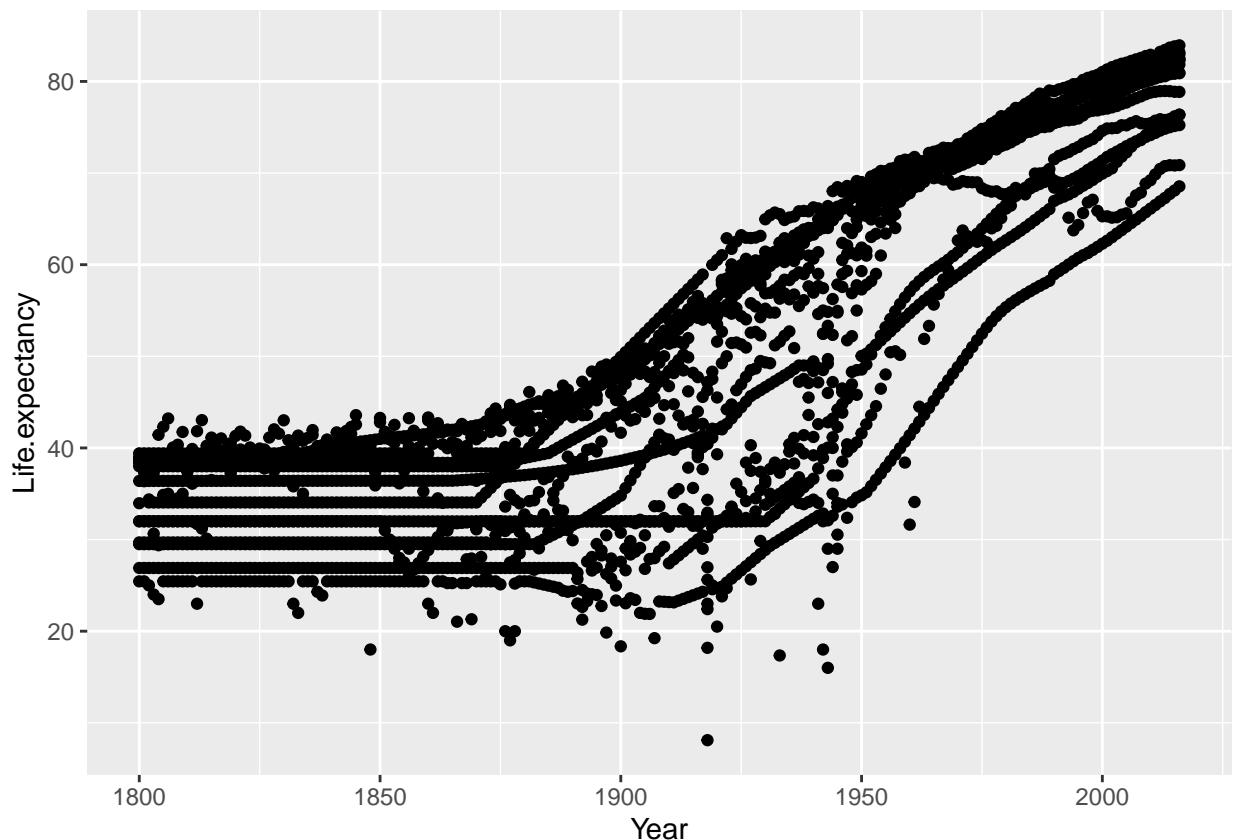


```
plot(heightweight, aes(x = ageYear, y = heightIn)) +  
  geom_point(size = 1.5)
```



```
## NULL
```

```
ggplot(df, aes(x = Year, y = Life.expectancy)) +
  geom_point(size = 1.5)
```



```
heightweight %>%
  select(sex, ageYear, heightIn)
```

```
##      sex ageYear heightIn
## 1      f    11.92    56.3
## 2      f    12.92    62.3
## 3      f    12.75    63.3
## 4      f    13.42    59.0
## 5      f    15.92    62.5
## 6      f    14.25    62.5
## 7      f    15.42    59.0
## 8      f    11.83    56.5
## 9      f    13.33    62.0
## 10     f    11.67    53.8
## 11     f    11.58    61.5
## 12     f    14.83    61.5
## 13     f    13.08    64.5
## 14     f    12.42    58.3
## 15     f    11.92    51.3
## 16     f    12.08    58.8
## 17     f    15.92    65.3
## 18     f    12.50    59.5
## 19     f    12.25    61.3
## 20     f    15.00    63.3
## 21     f    11.75    61.8
```

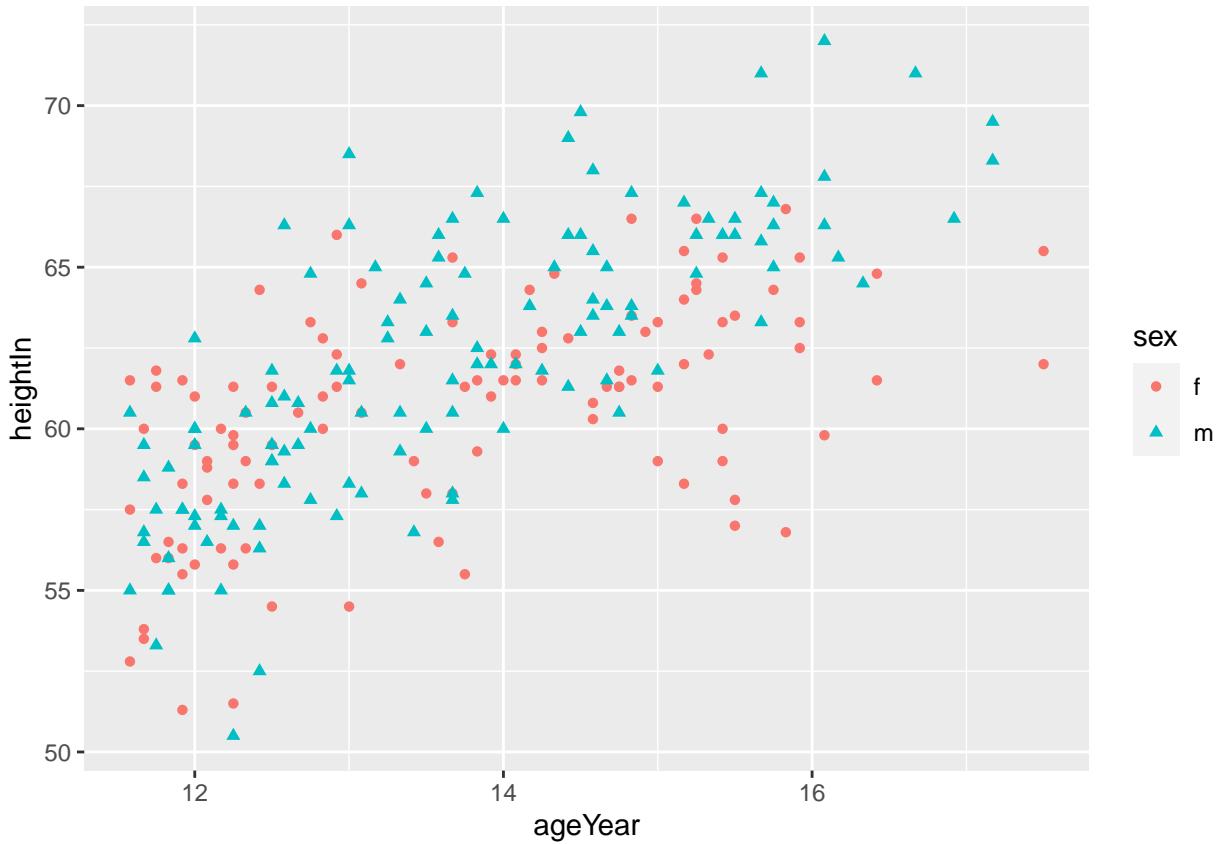
## 22	f	11.67	53.5
## 23	f	13.67	58.0
## 24	f	14.67	61.3
## 25	f	15.42	63.3
## 26	f	13.83	61.5
## 27	f	14.58	60.8
## 28	f	15.00	59.0
## 29	f	17.50	65.5
## 30	f	12.17	56.3
## 31	f	14.17	64.3
## 32	f	13.50	58.0
## 33	f	12.42	64.3
## 34	f	11.58	57.5
## 35	f	15.50	57.8
## 36	f	16.42	61.5
## 37	f	14.08	62.3
## 38	f	14.75	61.8
## 39	f	15.42	65.3
## 40	f	15.17	58.3
## 41	f	14.42	62.8
## 42	f	13.83	59.3
## 43	f	14.00	61.5
## 44	f	14.08	62.0
## 45	f	12.50	61.3
## 46	f	15.33	62.3
## 47	f	11.58	52.8
## 48	f	12.25	59.8
## 49	f	12.00	59.5
## 50	f	14.75	61.3
## 51	f	14.83	63.5
## 52	f	16.42	64.8
## 53	f	12.17	60.0
## 54	f	12.08	59.0
## 55	f	12.25	55.8
## 56	f	12.08	57.8
## 57	f	12.92	61.3
## 58	f	13.92	62.3
## 59	f	15.25	64.3
## 60	f	11.92	55.5
## 61	f	15.25	64.5
## 62	f	15.42	60.0
## 63	f	12.33	56.3
## 64	f	12.25	58.3
## 65	f	12.83	60.0
## 66	f	13.00	54.5
## 67	f	12.00	55.8
## 68	f	12.83	62.8
## 69	f	12.67	60.5
## 70	f	15.92	63.3
## 71	f	15.83	66.8
## 72	f	11.67	60.0
## 73	f	12.33	60.5
## 74	f	15.75	64.3
## 75	f	11.92	58.3

## 76	f	14.83	66.5
## 77	f	13.67	65.3
## 78	f	13.08	60.5
## 79	f	12.25	59.5
## 80	f	12.33	59.0
## 81	f	14.75	61.3
## 82	f	14.25	61.5
## 83	f	14.33	64.8
## 84	f	15.83	56.8
## 85	f	15.25	66.5
## 86	f	11.92	61.5
## 87	f	14.92	63.0
## 88	f	15.50	57.0
## 89	f	15.17	65.5
## 90	f	15.17	62.0
## 91	f	11.83	56.0
## 92	f	13.75	61.3
## 93	f	13.75	55.5
## 94	f	12.83	61.0
## 95	f	12.50	54.5
## 96	f	12.92	66.0
## 97	f	13.58	56.5
## 98	f	11.75	56.0
## 99	f	12.25	51.5
## 100	f	17.50	62.0
## 101	f	14.25	63.0
## 102	f	13.92	61.0
## 103	f	15.17	64.0
## 104	f	12.00	61.0
## 105	f	16.08	59.8
## 106	f	11.75	61.3
## 107	f	13.67	63.3
## 108	f	15.50	63.5
## 109	f	14.08	61.5
## 110	f	14.58	60.3
## 111	f	15.00	61.3
## 112	m	13.75	64.8
## 113	m	13.08	60.5
## 114	m	12.00	57.3
## 115	m	12.50	59.5
## 116	m	12.50	60.8
## 117	m	11.58	60.5
## 118	m	15.75	67.0
## 119	m	15.25	64.8
## 120	m	12.25	50.5
## 121	m	12.17	57.5
## 122	m	13.33	60.5
## 123	m	13.00	61.8
## 124	m	14.42	61.3
## 125	m	12.58	66.3
## 126	m	11.75	53.3
## 127	m	12.50	59.0
## 128	m	13.67	57.8
## 129	m	12.75	60.0

## 130	m	17.17	68.3
## 132	m	14.67	63.8
## 133	m	14.67	65.0
## 134	m	11.67	59.5
## 135	m	15.42	66.0
## 136	m	15.00	61.8
## 137	m	12.17	57.3
## 138	m	15.25	66.0
## 139	m	11.67	56.5
## 140	m	12.58	58.3
## 141	m	12.58	61.0
## 142	m	12.00	62.8
## 143	m	13.33	59.3
## 144	m	14.83	67.3
## 145	m	16.08	66.3
## 146	m	13.50	64.5
## 147	m	13.67	60.5
## 148	m	15.50	66.0
## 149	m	11.92	57.5
## 150	m	14.58	64.0
## 151	m	14.58	68.0
## 152	m	14.58	63.5
## 153	m	14.42	69.0
## 154	m	14.17	63.8
## 155	m	14.50	66.0
## 156	m	13.67	63.5
## 157	m	12.00	59.5
## 158	m	13.00	66.3
## 159	m	12.42	57.0
## 160	m	12.00	60.0
## 161	m	12.25	57.0
## 162	m	15.67	67.3
## 163	m	14.08	62.0
## 164	m	14.33	65.0
## 165	m	12.50	59.5
## 166	m	16.08	67.8
## 167	m	13.08	58.0
## 168	m	14.00	60.0
## 169	m	11.67	58.5
## 170	m	13.00	58.3
## 171	m	13.00	61.5
## 172	m	13.17	65.0
## 173	m	15.33	66.5
## 174	m	13.00	68.5
## 175	m	12.00	57.0
## 176	m	14.67	61.5
## 177	m	14.00	66.5
## 178	m	12.42	52.5
## 179	m	11.83	55.0
## 180	m	15.67	71.0
## 181	m	16.92	66.5
## 182	m	11.83	58.8
## 183	m	15.75	66.3
## 184	m	15.67	65.8

## 185	m	16.67	71.0
## 186	m	12.67	59.5
## 187	m	14.50	69.8
## 188	m	13.83	62.5
## 189	m	12.08	56.5
## 190	m	11.92	57.5
## 191	m	13.58	65.3
## 192	m	13.83	67.3
## 193	m	15.17	67.0
## 194	m	14.42	66.0
## 195	m	12.92	61.8
## 196	m	13.50	60.0
## 197	m	14.75	63.0
## 198	m	14.75	60.5
## 199	m	14.58	65.5
## 200	m	13.83	62.0
## 201	m	12.50	59.0
## 202	m	12.50	61.8
## 203	m	15.67	63.3
## 204	m	13.58	66.0
## 205	m	14.25	61.8
## 206	m	13.50	63.0
## 207	m	11.75	57.5
## 208	m	14.50	63.0
## 209	m	11.83	56.0
## 210	m	12.33	60.5
## 211	m	11.67	56.8
## 212	m	13.33	64.0
## 213	m	12.00	60.0
## 214	m	17.17	69.5
## 215	m	13.25	63.3
## 216	m	12.42	56.3
## 217	m	16.08	72.0
## 218	m	16.17	65.3
## 219	m	12.67	60.8
## 220	m	12.17	55.0
## 221	m	11.58	55.0
## 222	m	15.50	66.5
## 223	m	13.42	56.8
## 224	m	12.75	64.8
## 225	m	16.33	64.5
## 226	m	13.67	58.0
## 227	m	13.25	62.8
## 228	m	14.83	63.8
## 229	m	12.75	57.8
## 230	m	12.92	57.3
## 231	m	14.83	63.5
## 232	m	11.83	55.0
## 233	m	13.67	66.5
## 234	m	15.75	65.0
## 235	m	13.67	61.5
## 236	m	13.92	62.0
## 237	m	12.58	59.3

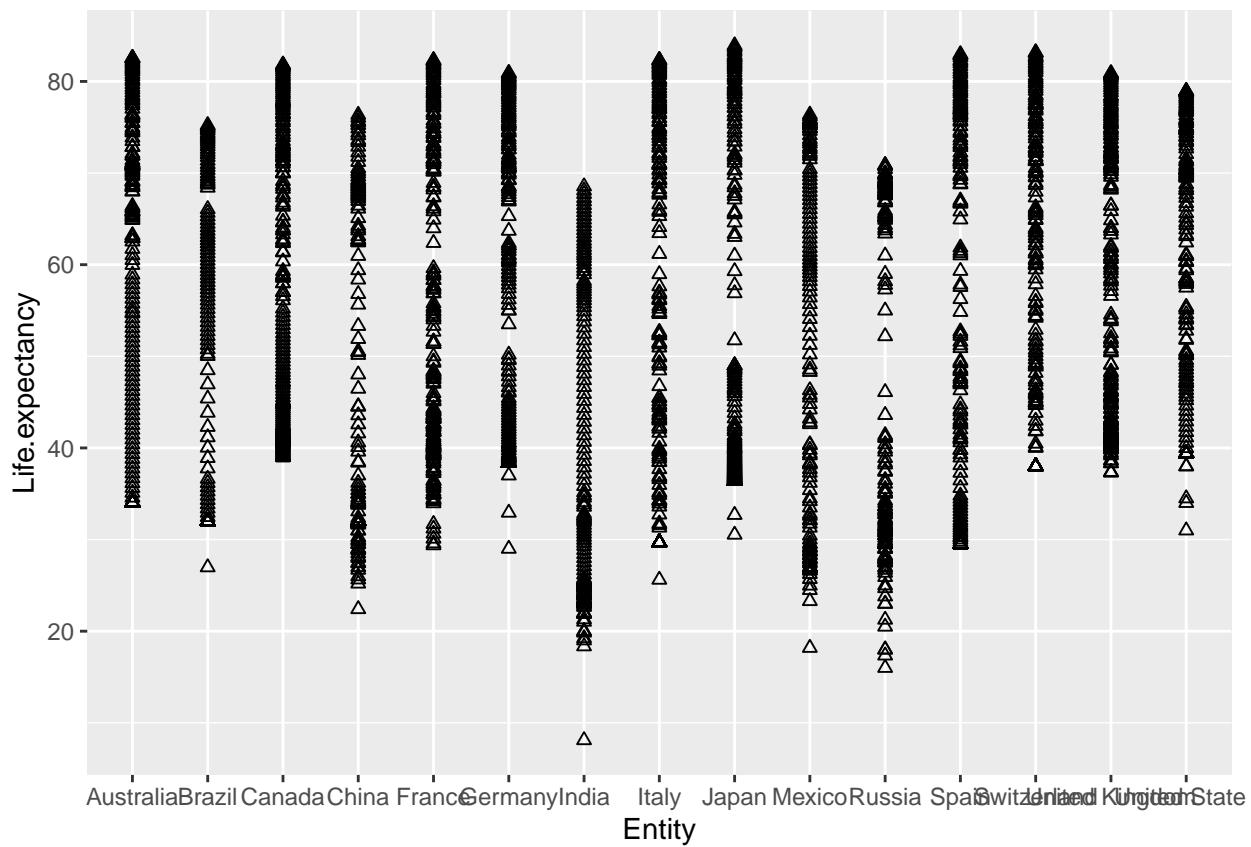
```
ggplot(heightweight, aes(x = ageYear, y = heightIn, shape = sex, colour = sex)) +  
  geom_point()
```



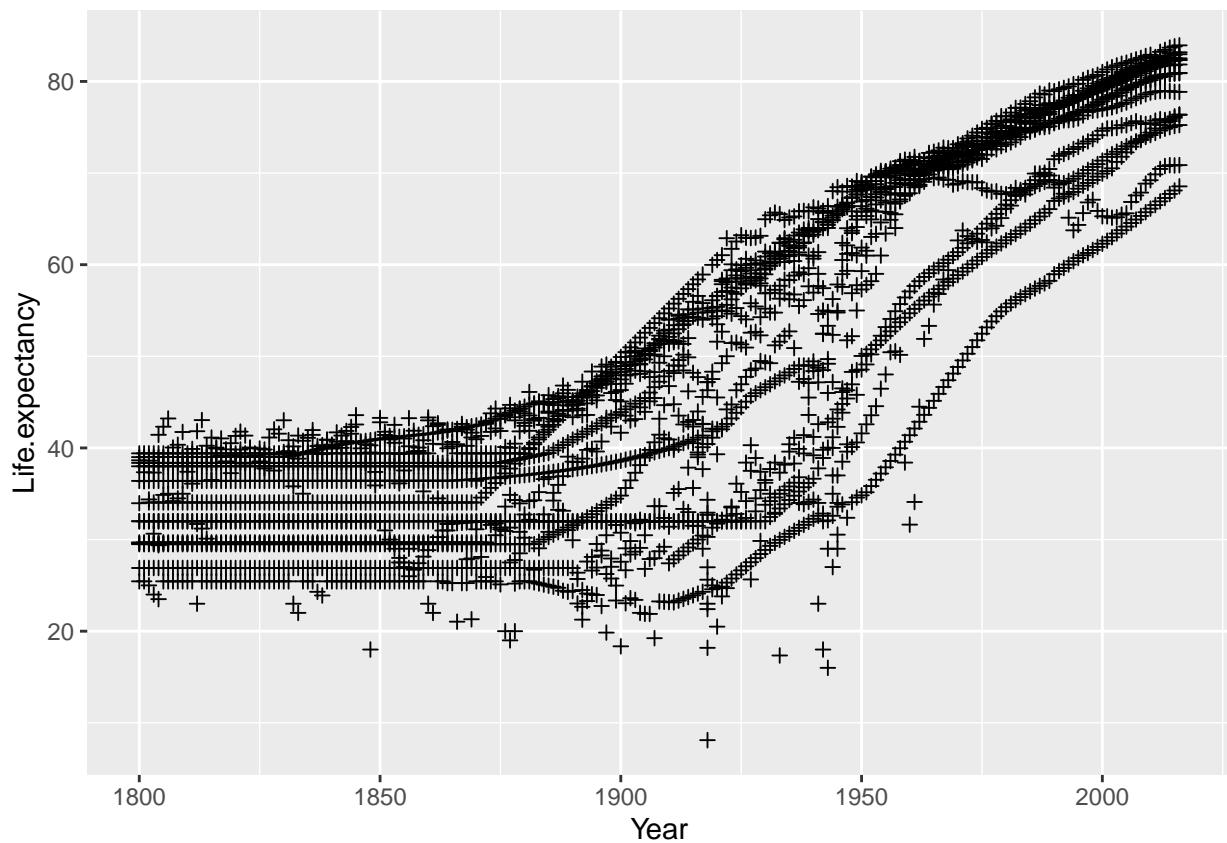
```
ggplot(heightweight, aes(x = ageYear, y = heightIn, shape = sex, colour = sex)) +  
  geom_point() +  
  scale_shape_manual(values = c(1,2)) +  
  scale_colour_brewer(palette = "Set2")
```



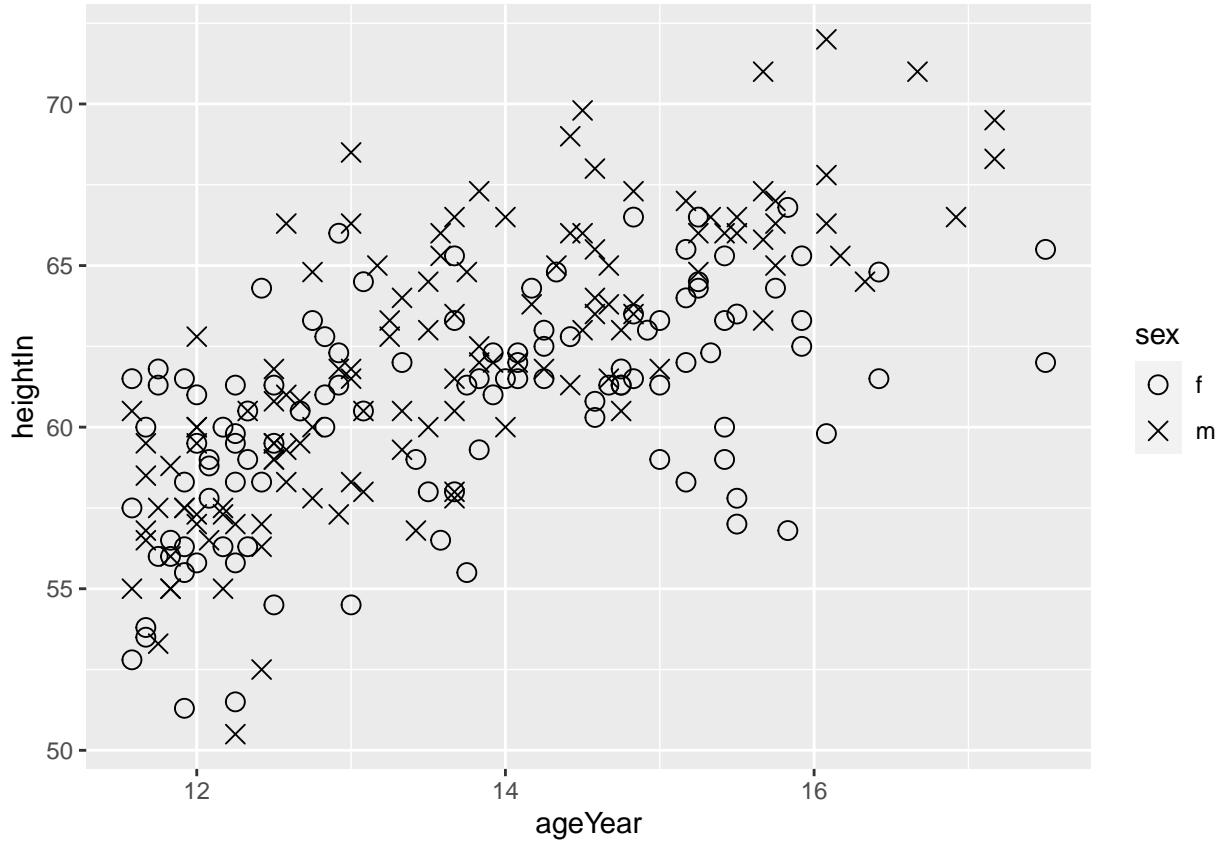
```
ggplot(df, aes(x = Entity, y = Life.expectancy)) +  
  geom_point(shape = 2)
```



```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_point(shape = 3)
```

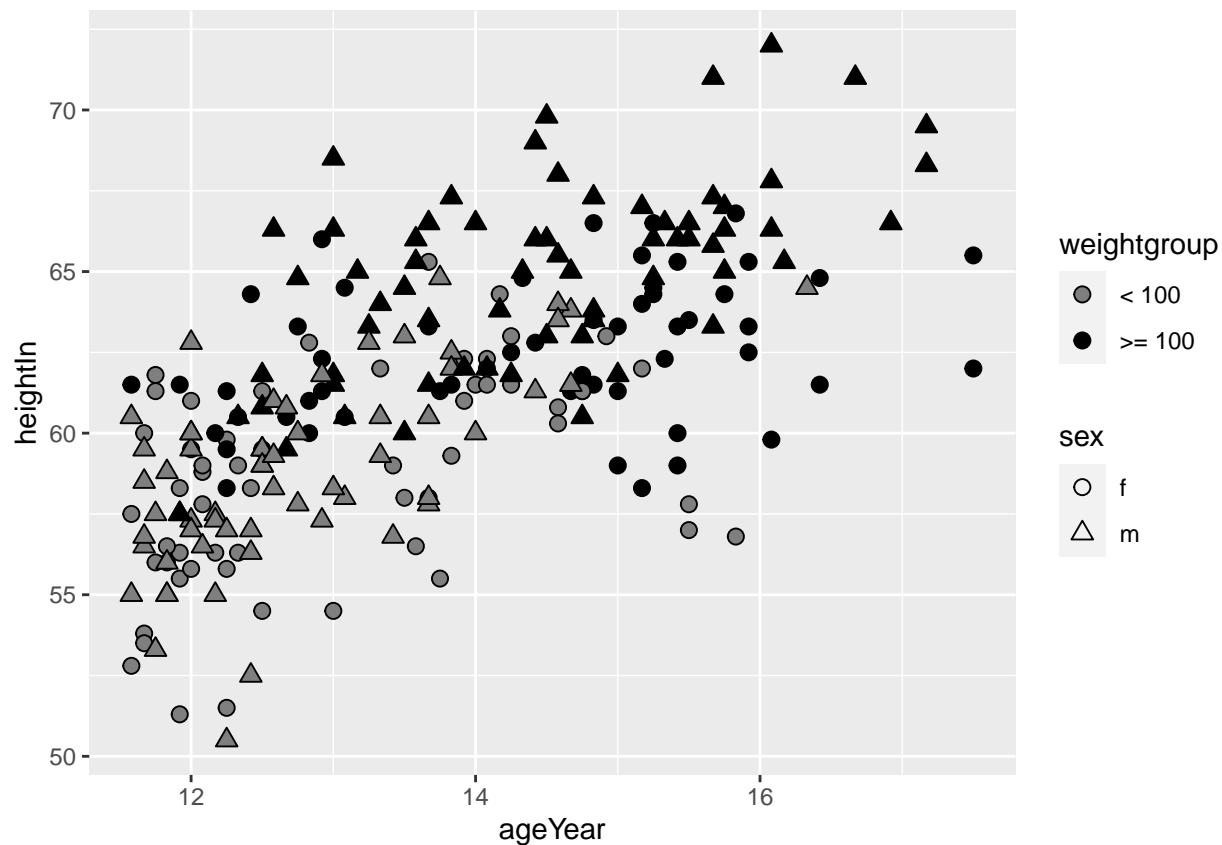


```
ggplot(heightweight, aes(x = ageYear, y = heightIn, shape = sex)) +  
  geom_point(size = 3) +  
  scale_shape_manual(values = c(1, 4))
```



```
ht <- heightweight %>%
  mutate(weightgroup = ifelse(weightLb < 100, "< 100", ">= 100"))
```

```
ggplot(ht, aes(x = ageYear, y = heightIn, shape = sex, fill = weightgroup)) +
  geom_point(size = 2.5) +
  scale_shape_manual(values = c(21, 24)) +
  scale_fill_manual(
    values = c(NA, "black"),
    guide = guide_legend(override.aes = list(shape = 21))
  )
```



```
heightweight %>%
  select(sex, ageYear, heightIn, weightLb)
```

```
##   sex ageYear heightIn weightLb
## 1   f    11.92     56.3    85.0
## 2   f    12.92     62.3   105.0
## 3   f    12.75     63.3   108.0
## 4   f    13.42     59.0    92.0
## 5   f    15.92     62.5   112.5
## 6   f    14.25     62.5   112.0
## 7   f    15.42     59.0   104.0
## 8   f    11.83     56.5    69.0
## 9   f    13.33     62.0    94.5
## 10  f    11.67     53.8    68.5
## 11  f    11.58     61.5   104.0
## 12  f    14.83     61.5   103.5
## 13  f    13.08     64.5   123.5
## 14  f    12.42     58.3    93.0
## 15  f    11.92     51.3    50.5
## 16  f    12.08     58.8    89.0
## 17  f    15.92     65.3   107.0
## 18  f    12.50     59.5    78.5
## 19  f    12.25     61.3   115.0
## 20  f    15.00     63.3   114.0
## 21  f    11.75     61.8    85.0
```

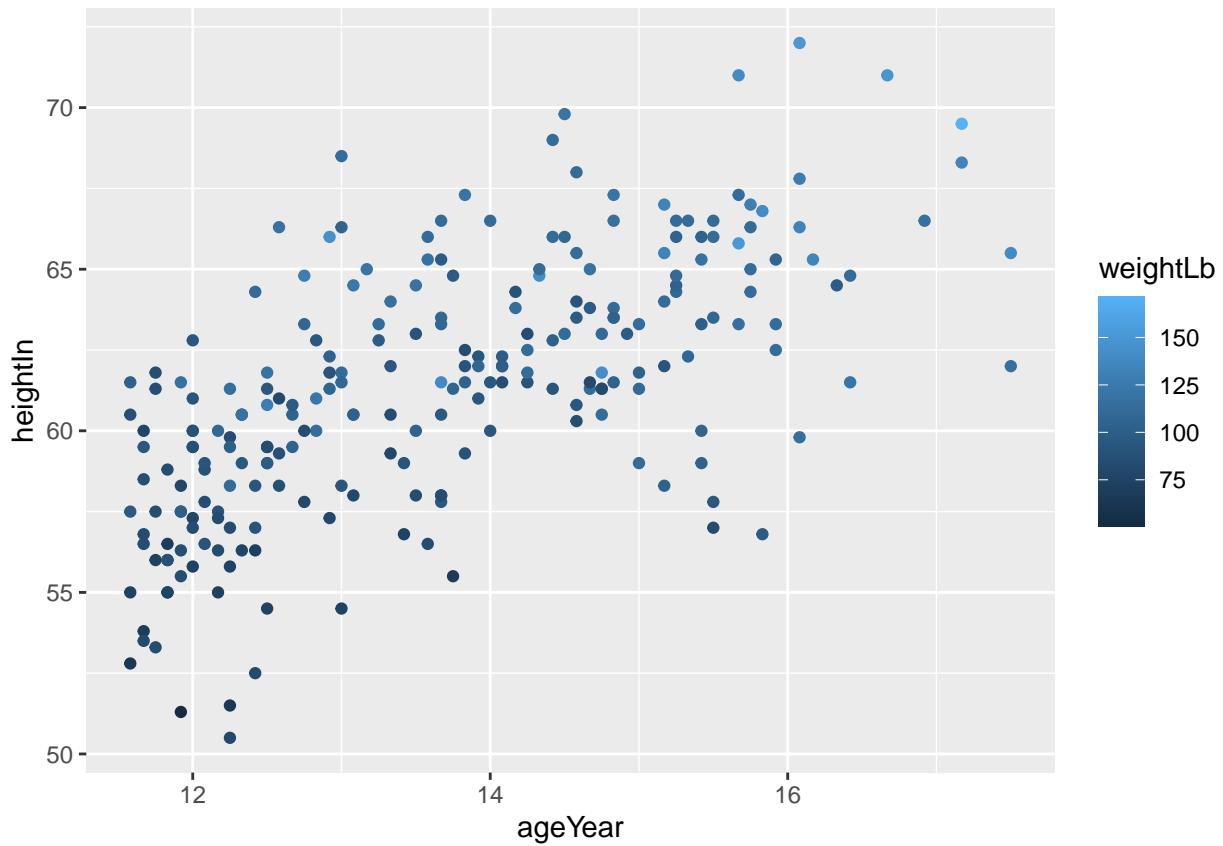
## 22	f	11.67	53.5	81.0
## 23	f	13.67	58.0	83.5
## 24	f	14.67	61.3	112.0
## 25	f	15.42	63.3	101.0
## 26	f	13.83	61.5	103.5
## 27	f	14.58	60.8	93.5
## 28	f	15.00	59.0	112.0
## 29	f	17.50	65.5	140.0
## 30	f	12.17	56.3	83.5
## 31	f	14.17	64.3	90.0
## 32	f	13.50	58.0	84.0
## 33	f	12.42	64.3	110.5
## 34	f	11.58	57.5	96.0
## 35	f	15.50	57.8	95.0
## 36	f	16.42	61.5	121.0
## 37	f	14.08	62.3	99.5
## 38	f	14.75	61.8	142.5
## 39	f	15.42	65.3	118.0
## 40	f	15.17	58.3	104.5
## 41	f	14.42	62.8	102.5
## 42	f	13.83	59.3	89.5
## 43	f	14.00	61.5	95.0
## 44	f	14.08	62.0	98.5
## 45	f	12.50	61.3	94.0
## 46	f	15.33	62.3	108.0
## 47	f	11.58	52.8	63.5
## 48	f	12.25	59.8	84.5
## 49	f	12.00	59.5	93.5
## 50	f	14.75	61.3	112.0
## 51	f	14.83	63.5	148.5
## 52	f	16.42	64.8	112.0
## 53	f	12.17	60.0	109.0
## 54	f	12.08	59.0	91.5
## 55	f	12.25	55.8	75.0
## 56	f	12.08	57.8	84.0
## 57	f	12.92	61.3	107.0
## 58	f	13.92	62.3	92.5
## 59	f	15.25	64.3	109.5
## 60	f	11.92	55.5	84.0
## 61	f	15.25	64.5	102.5
## 62	f	15.42	60.0	106.0
## 63	f	12.33	56.3	77.0
## 64	f	12.25	58.3	111.5
## 65	f	12.83	60.0	114.0
## 66	f	13.00	54.5	75.0
## 67	f	12.00	55.8	73.5
## 68	f	12.83	62.8	93.5
## 69	f	12.67	60.5	105.0
## 70	f	15.92	63.3	113.5
## 71	f	15.83	66.8	140.0
## 72	f	11.67	60.0	77.0
## 73	f	12.33	60.5	84.5
## 74	f	15.75	64.3	113.5
## 75	f	11.92	58.3	77.5

## 76	f	14.83	66.5	117.5
## 77	f	13.67	65.3	98.0
## 78	f	13.08	60.5	112.0
## 79	f	12.25	59.5	101.0
## 80	f	12.33	59.0	95.0
## 81	f	14.75	61.3	81.0
## 82	f	14.25	61.5	91.0
## 83	f	14.33	64.8	142.0
## 84	f	15.83	56.8	98.5
## 85	f	15.25	66.5	112.0
## 86	f	11.92	61.5	116.5
## 87	f	14.92	63.0	98.5
## 88	f	15.50	57.0	83.5
## 89	f	15.17	65.5	133.0
## 90	f	15.17	62.0	91.5
## 91	f	11.83	56.0	72.5
## 92	f	13.75	61.3	106.5
## 93	f	13.75	55.5	67.0
## 94	f	12.83	61.0	122.5
## 95	f	12.50	54.5	74.0
## 96	f	12.92	66.0	144.5
## 97	f	13.58	56.5	84.0
## 98	f	11.75	56.0	72.5
## 99	f	12.25	51.5	64.0
## 100	f	17.50	62.0	116.0
## 101	f	14.25	63.0	84.0
## 102	f	13.92	61.0	93.5
## 103	f	15.17	64.0	111.5
## 104	f	12.00	61.0	92.0
## 105	f	16.08	59.8	115.0
## 106	f	11.75	61.3	85.0
## 107	f	13.67	63.3	108.0
## 108	f	15.50	63.5	108.0
## 109	f	14.08	61.5	85.0
## 110	f	14.58	60.3	86.0
## 111	f	15.00	61.3	110.5
## 112	m	13.75	64.8	98.0
## 113	m	13.08	60.5	105.0
## 114	m	12.00	57.3	76.5
## 115	m	12.50	59.5	84.0
## 116	m	12.50	60.8	128.0
## 117	m	11.58	60.5	87.0
## 118	m	15.75	67.0	128.0
## 119	m	15.25	64.8	111.0
## 120	m	12.25	50.5	79.0
## 121	m	12.17	57.5	90.0
## 122	m	13.33	60.5	84.0
## 123	m	13.00	61.8	112.0
## 124	m	14.42	61.3	93.0
## 125	m	12.58	66.3	117.0
## 126	m	11.75	53.3	84.0
## 127	m	12.50	59.0	99.5
## 128	m	13.67	57.8	95.0
## 129	m	12.75	60.0	84.0

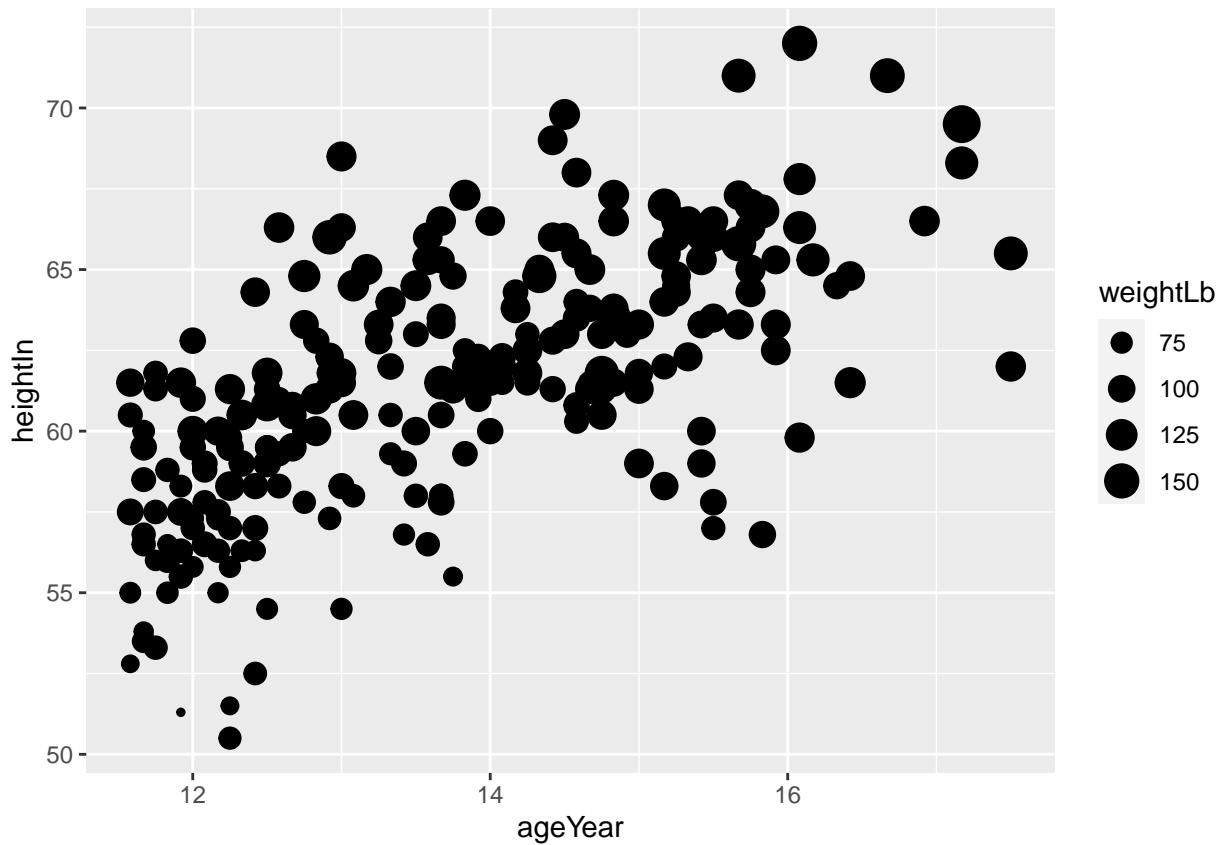
## 130	m	17.17	68.3	134.0
## 132	m	14.67	63.8	98.5
## 133	m	14.67	65.0	118.5
## 134	m	11.67	59.5	94.5
## 135	m	15.42	66.0	105.0
## 136	m	15.00	61.8	104.0
## 137	m	12.17	57.3	83.0
## 138	m	15.25	66.0	105.5
## 139	m	11.67	56.5	84.0
## 140	m	12.58	58.3	86.0
## 141	m	12.58	61.0	81.0
## 142	m	12.00	62.8	94.0
## 143	m	13.33	59.3	78.5
## 144	m	14.83	67.3	119.5
## 145	m	16.08	66.3	133.0
## 146	m	13.50	64.5	119.0
## 147	m	13.67	60.5	95.0
## 148	m	15.50	66.0	112.0
## 149	m	11.92	57.5	75.0
## 150	m	14.58	64.0	92.0
## 151	m	14.58	68.0	112.0
## 152	m	14.58	63.5	98.5
## 153	m	14.42	69.0	112.5
## 154	m	14.17	63.8	112.5
## 155	m	14.50	66.0	108.0
## 156	m	13.67	63.5	108.0
## 157	m	12.00	59.5	88.0
## 158	m	13.00	66.3	106.0
## 159	m	12.42	57.0	92.0
## 160	m	12.00	60.0	117.5
## 161	m	12.25	57.0	84.0
## 162	m	15.67	67.3	112.0
## 163	m	14.08	62.0	100.0
## 164	m	14.33	65.0	112.0
## 165	m	12.50	59.5	84.0
## 166	m	16.08	67.8	127.5
## 167	m	13.08	58.0	80.5
## 168	m	14.00	60.0	93.5
## 169	m	11.67	58.5	86.5
## 170	m	13.00	58.3	92.5
## 171	m	13.00	61.5	108.5
## 172	m	13.17	65.0	121.0
## 173	m	15.33	66.5	112.0
## 174	m	13.00	68.5	114.0
## 175	m	12.00	57.0	84.0
## 176	m	14.67	61.5	81.0
## 177	m	14.00	66.5	111.5
## 178	m	12.42	52.5	81.0
## 179	m	11.83	55.0	70.0
## 180	m	15.67	71.0	140.0
## 181	m	16.92	66.5	117.0
## 182	m	11.83	58.8	84.0
## 183	m	15.75	66.3	112.0
## 184	m	15.67	65.8	150.5

## 185	m	16.67	71.0	147.0
## 186	m	12.67	59.5	105.0
## 187	m	14.50	69.8	119.5
## 188	m	13.83	62.5	84.0
## 189	m	12.08	56.5	91.0
## 190	m	11.92	57.5	101.0
## 191	m	13.58	65.3	117.5
## 192	m	13.83	67.3	121.0
## 193	m	15.17	67.0	133.0
## 194	m	14.42	66.0	112.0
## 195	m	12.92	61.8	91.5
## 196	m	13.50	60.0	105.0
## 197	m	14.75	63.0	111.0
## 198	m	14.75	60.5	112.0
## 199	m	14.58	65.5	114.0
## 200	m	13.83	62.0	91.0
## 201	m	12.50	59.0	98.0
## 202	m	12.50	61.8	118.0
## 203	m	15.67	63.3	115.5
## 204	m	13.58	66.0	112.0
## 205	m	14.25	61.8	112.0
## 206	m	13.50	63.0	91.0
## 207	m	11.75	57.5	85.0
## 208	m	14.50	63.0	112.0
## 209	m	11.83	56.0	87.5
## 210	m	12.33	60.5	118.0
## 211	m	11.67	56.8	83.5
## 212	m	13.33	64.0	116.0
## 213	m	12.00	60.0	89.0
## 214	m	17.17	69.5	171.5
## 215	m	13.25	63.3	112.0
## 216	m	12.42	56.3	72.0
## 217	m	16.08	72.0	150.0
## 218	m	16.17	65.3	134.5
## 219	m	12.67	60.8	97.0
## 220	m	12.17	55.0	71.5
## 221	m	11.58	55.0	73.5
## 222	m	15.50	66.5	112.0
## 223	m	13.42	56.8	75.0
## 224	m	12.75	64.8	128.0
## 225	m	16.33	64.5	98.0
## 226	m	13.67	58.0	84.0
## 227	m	13.25	62.8	99.0
## 228	m	14.83	63.8	112.0
## 229	m	12.75	57.8	79.5
## 230	m	12.92	57.3	80.5
## 231	m	14.83	63.5	102.5
## 232	m	11.83	55.0	76.0
## 233	m	13.67	66.5	112.0
## 234	m	15.75	65.0	114.0
## 235	m	13.67	61.5	140.0
## 236	m	13.92	62.0	107.5
## 237	m	12.58	59.3	87.0

```
ggplot(heightweight, aes(x = ageYear, y = heightIn, colour = weightLb)) +  
  geom_point()
```



```
ggplot(heightweight, aes(x = ageYear, y = heightIn, size = weightLb)) +  
  geom_point()
```

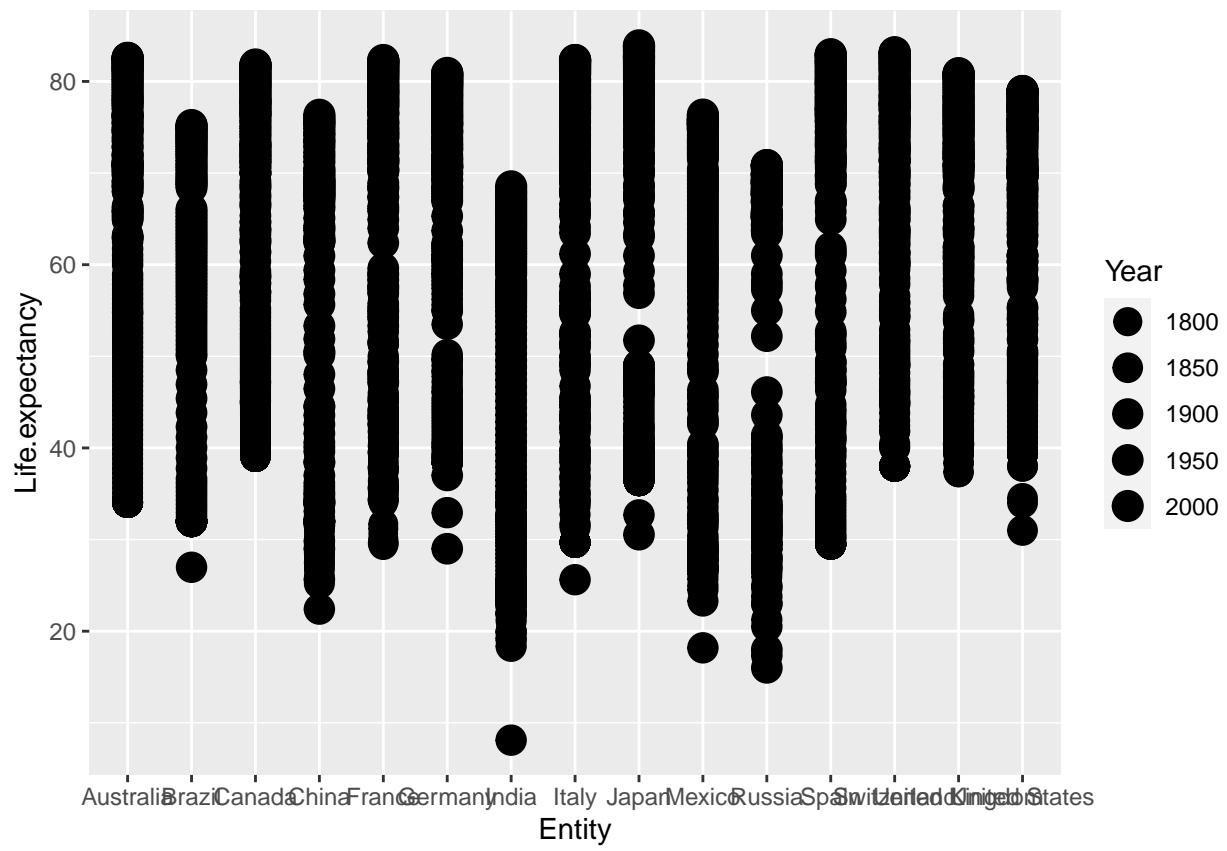


```
range(df$Year)
## [1] 1800 2016

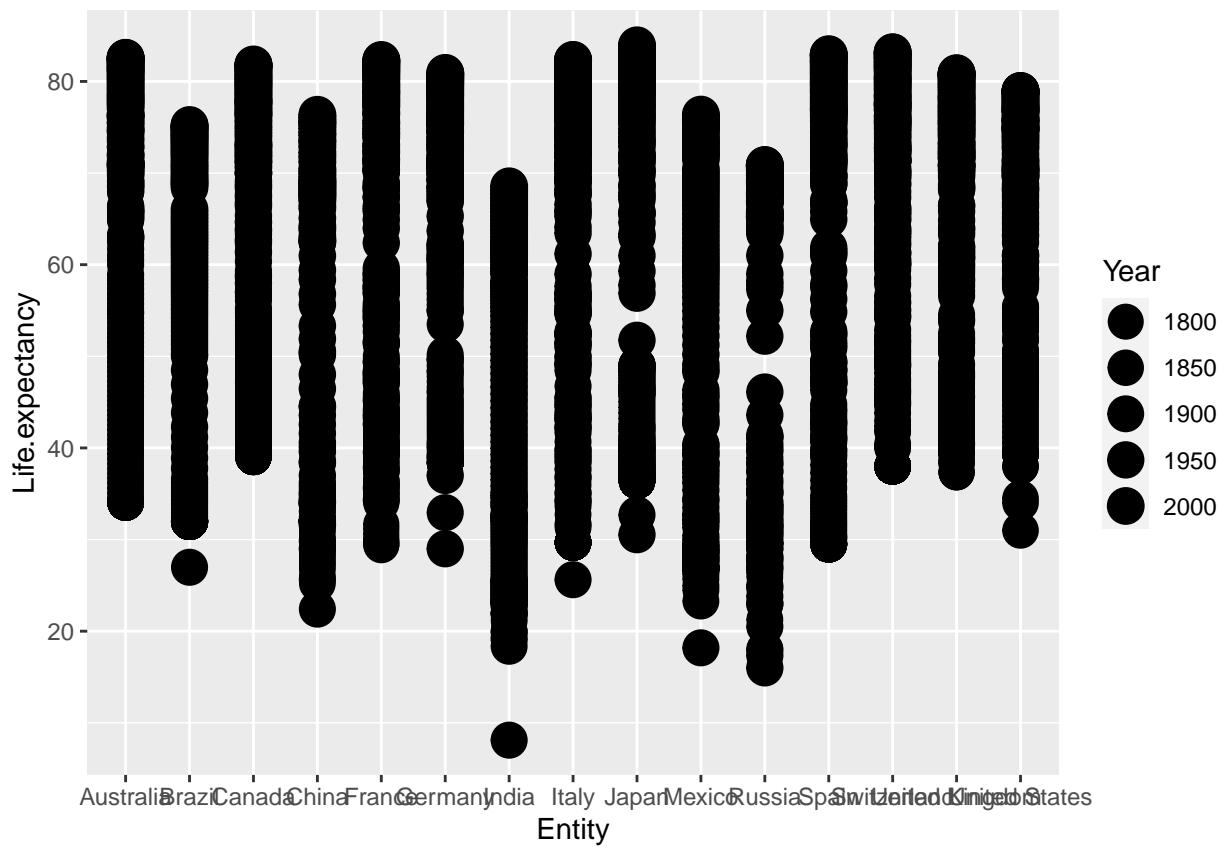
sz_range <- range(df$Year) / max(df$Year) * 5

sz_range
## [1] 4.464286 5.000000

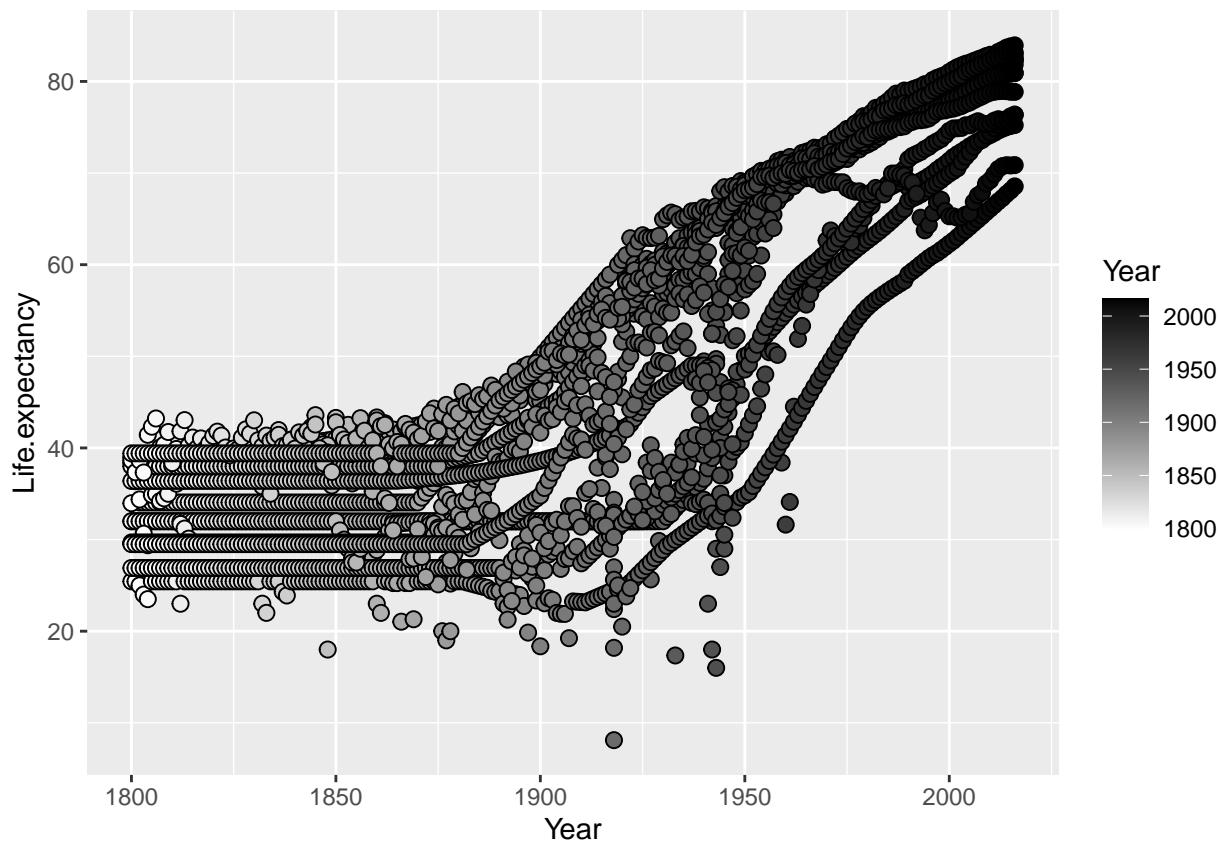
ggplot(df, aes(x = Entity, y = Life.expectancy, size = Year)) +
  geom_point() +
  scale_size_continuous(range = sz_range)
```



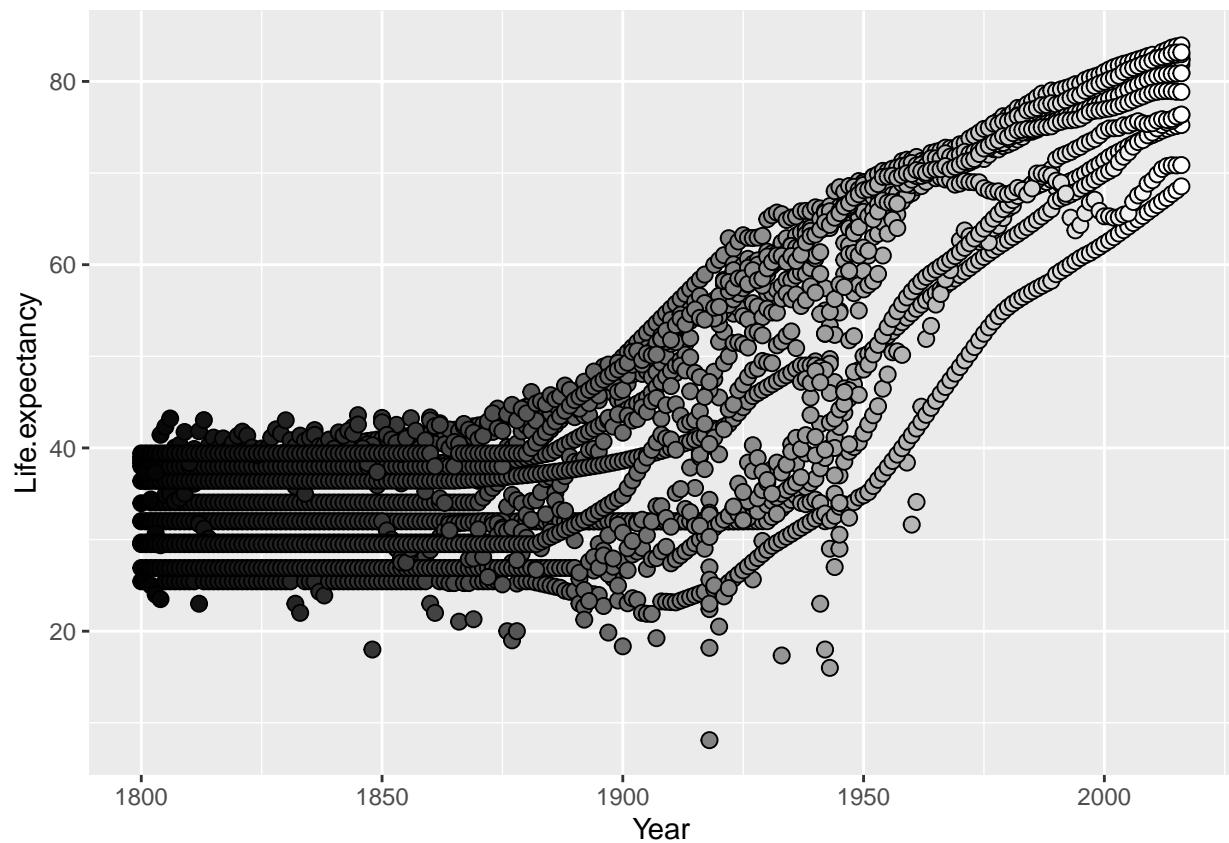
```
ggplot(df, aes(x = Entity, y = Life.expectancy, size = Year)) +
  geom_point() +
  scale_size_area()
```



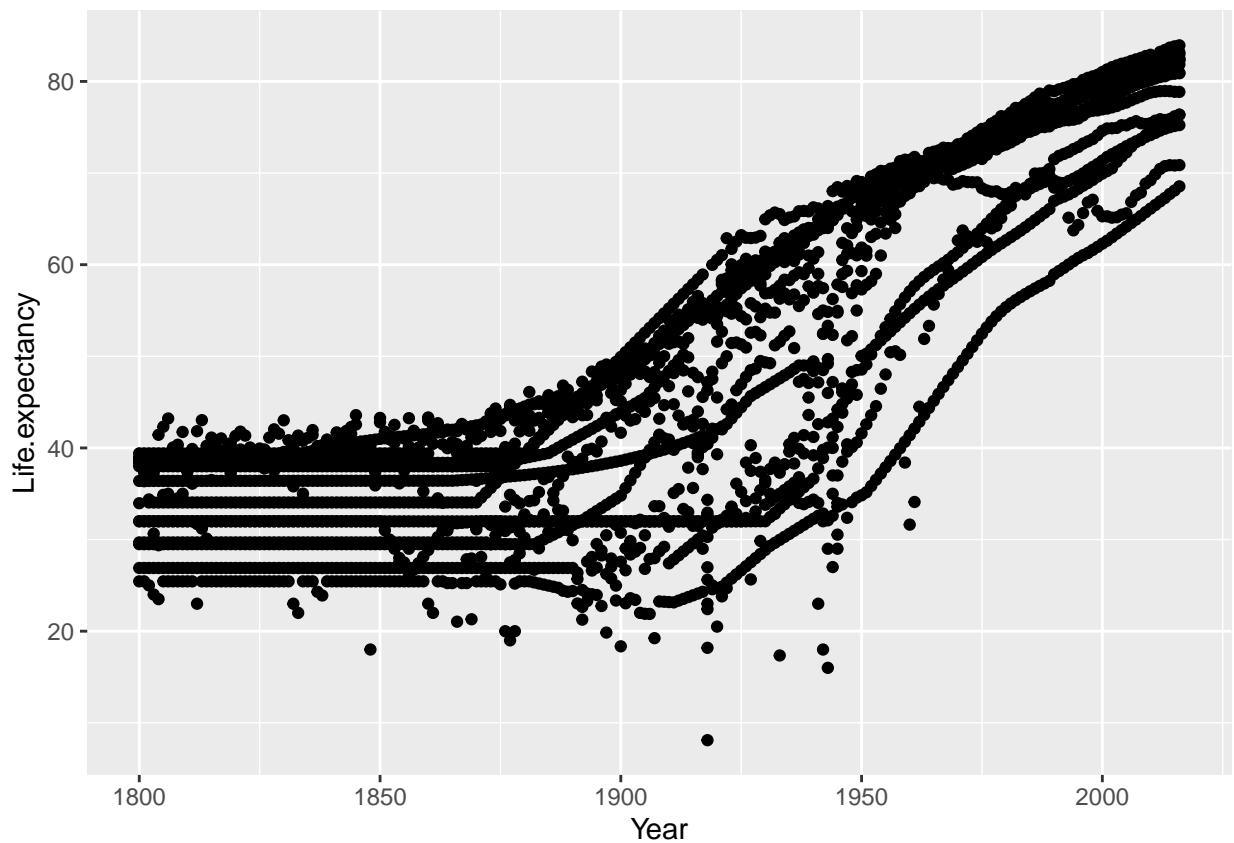
```
ggplot(df, aes(x = Year, y = Life.expectancy, fill = Year)) +  
  geom_point(shape = 21, size = 2.5) +  
  scale_fill_gradient(low = "white", high = "black")
```



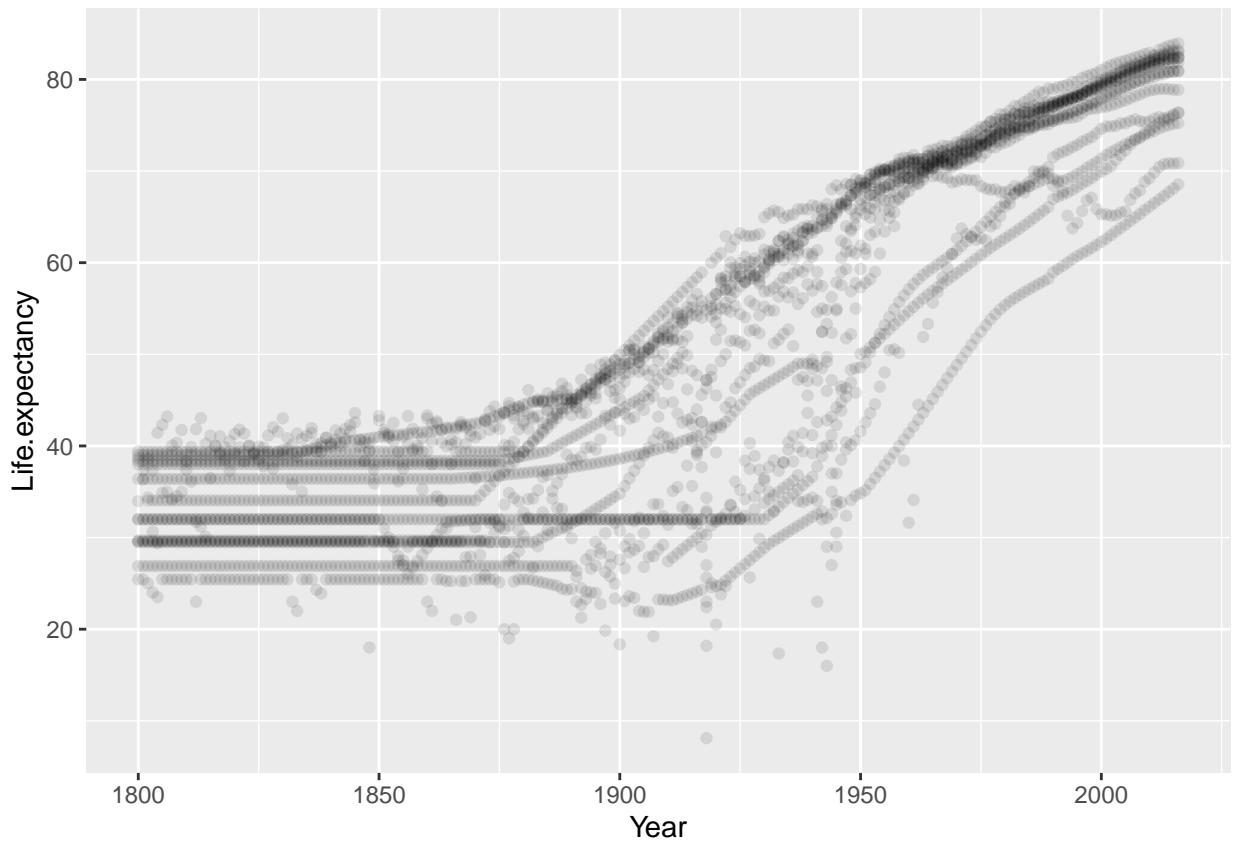
```
ggplot(df, aes(x = Year, y = Life.expectancy, fill = Year)) +  
  geom_point(shape = 21, size = 2.5) +  
  scale_fill_gradient(  
    low = "black", high = "white",  
    breaks = seq(70, 170, by = 20),  
    guide = guide_legend()  
)
```



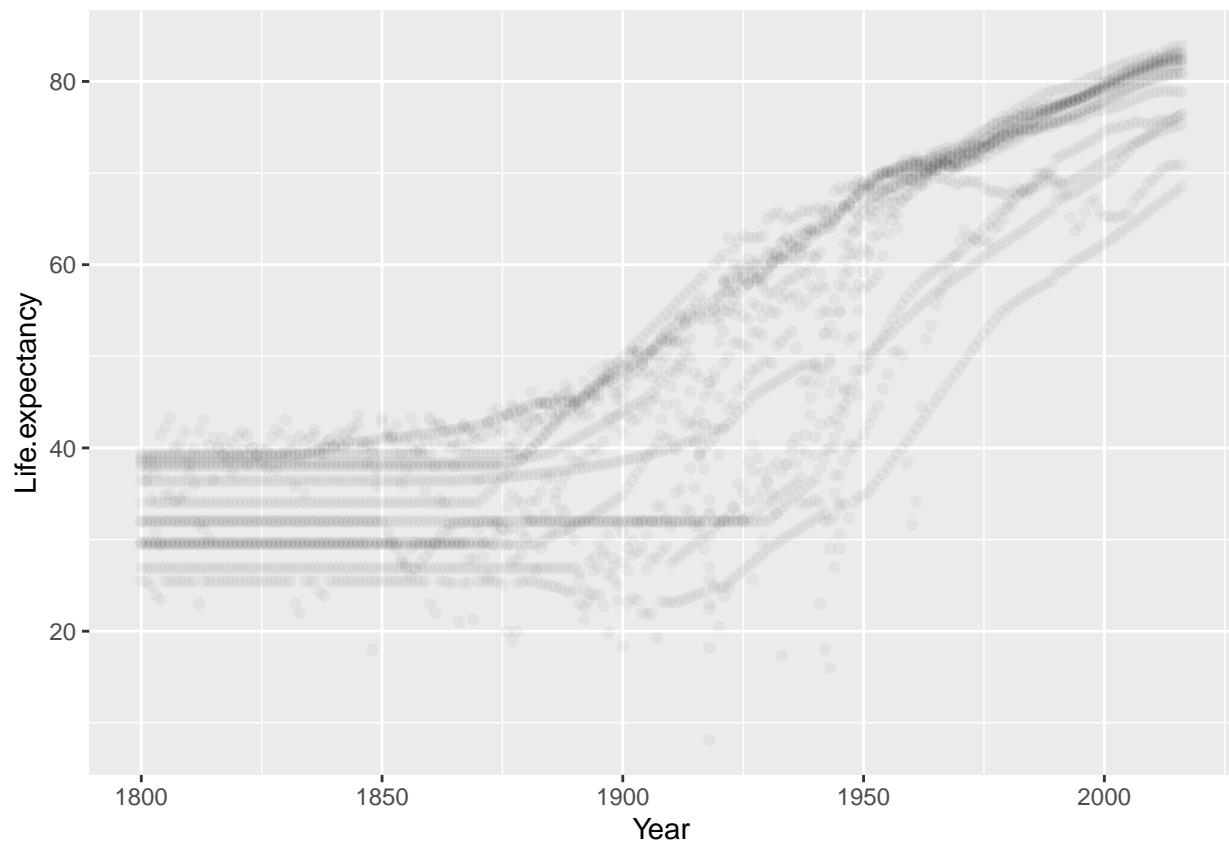
```
dmnd_sp <- ggplot(df, aes(x = Year, y = Life.expectancy))  
dmnd_sp +  
  geom_point()
```



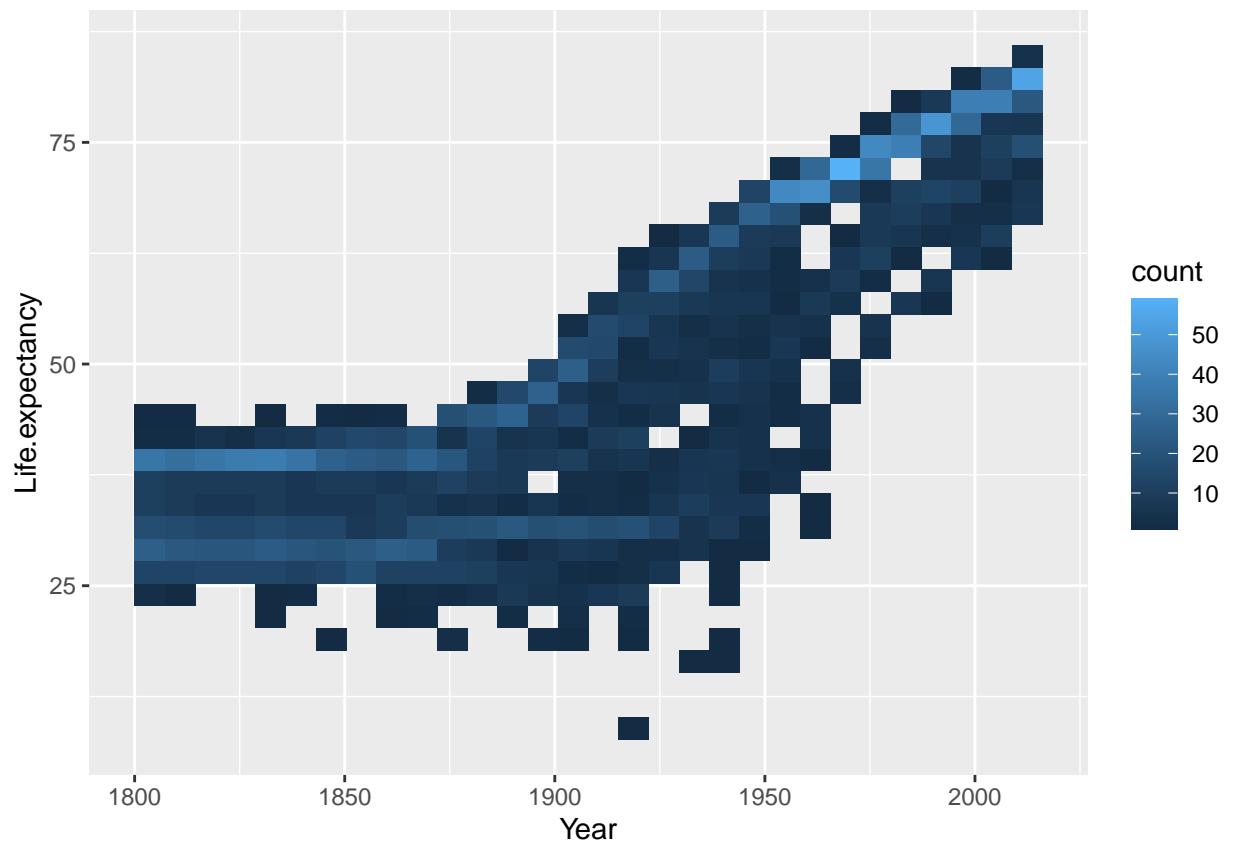
```
dmnd_sp +  
geom_point(alpha = .1)
```



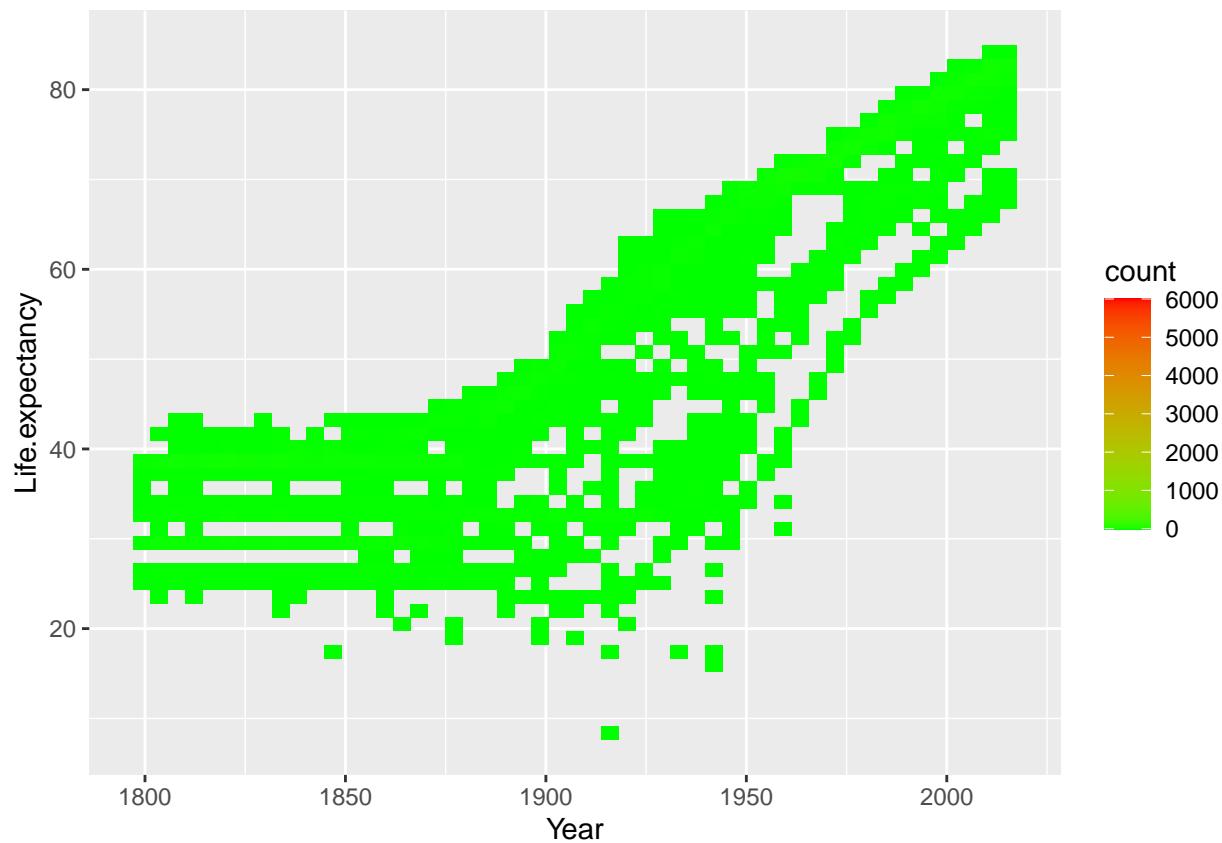
```
dmnd_sp +  
geom_point(alpha = .04)
```



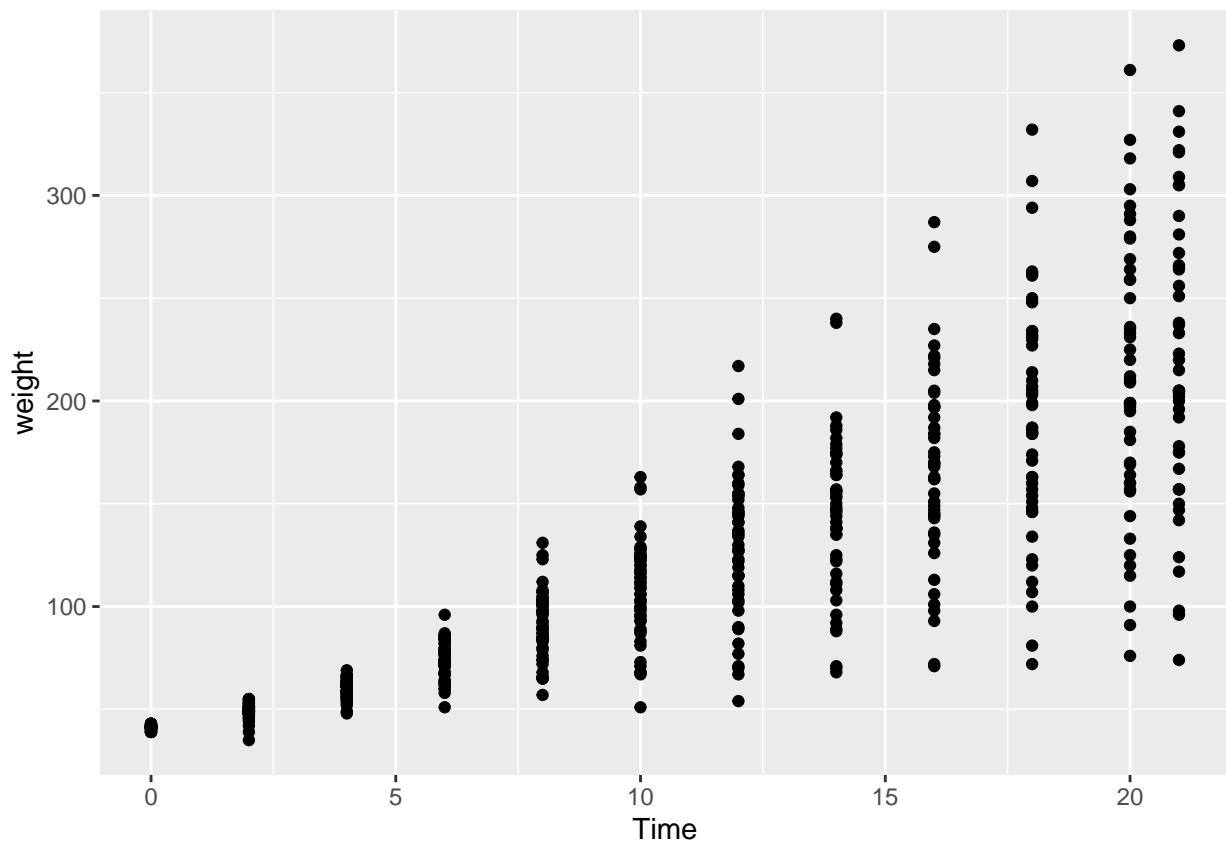
```
dmnd_sp +  
stat_bin2d()
```



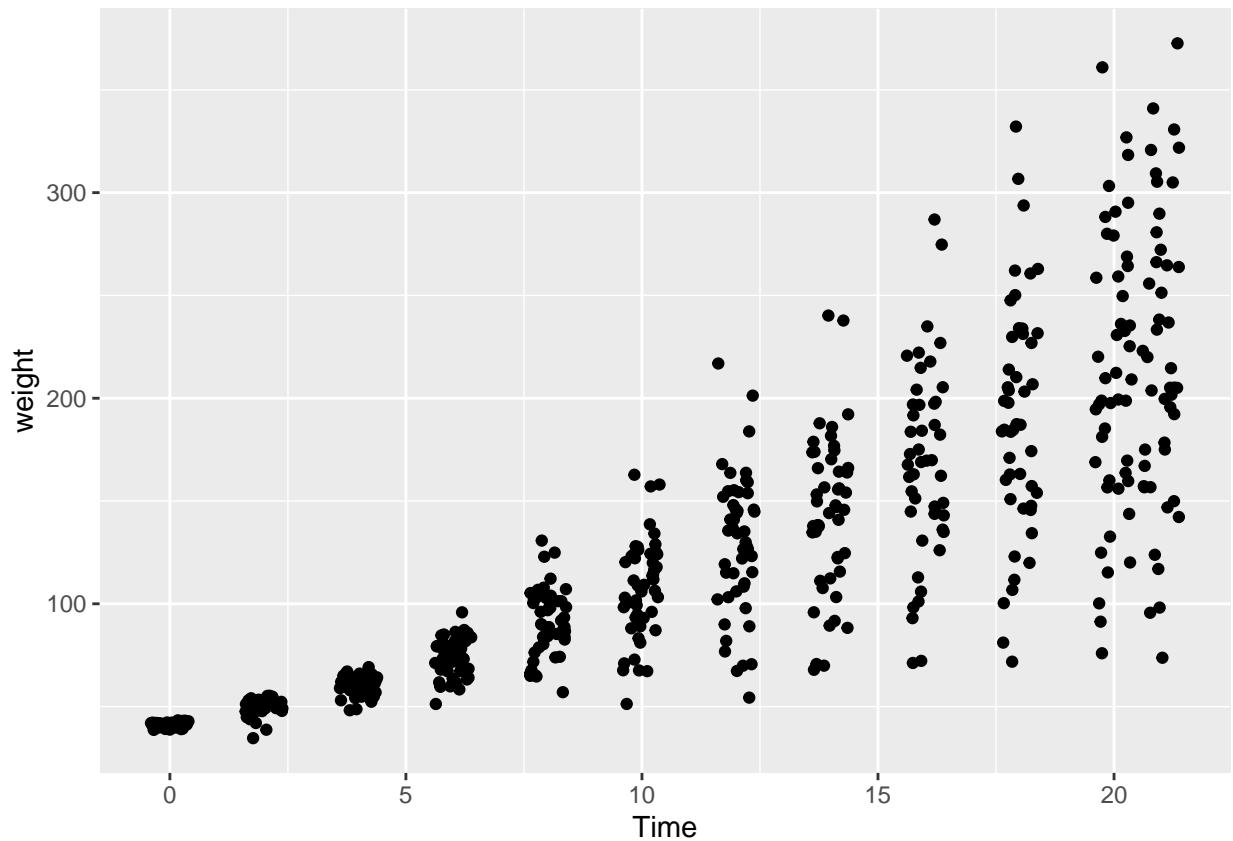
```
dmnd_sp +
stat_bin2d(bins = 50) +
scale_fill_gradient(low = "green", high = "red", limits = c(0, 6000))
```



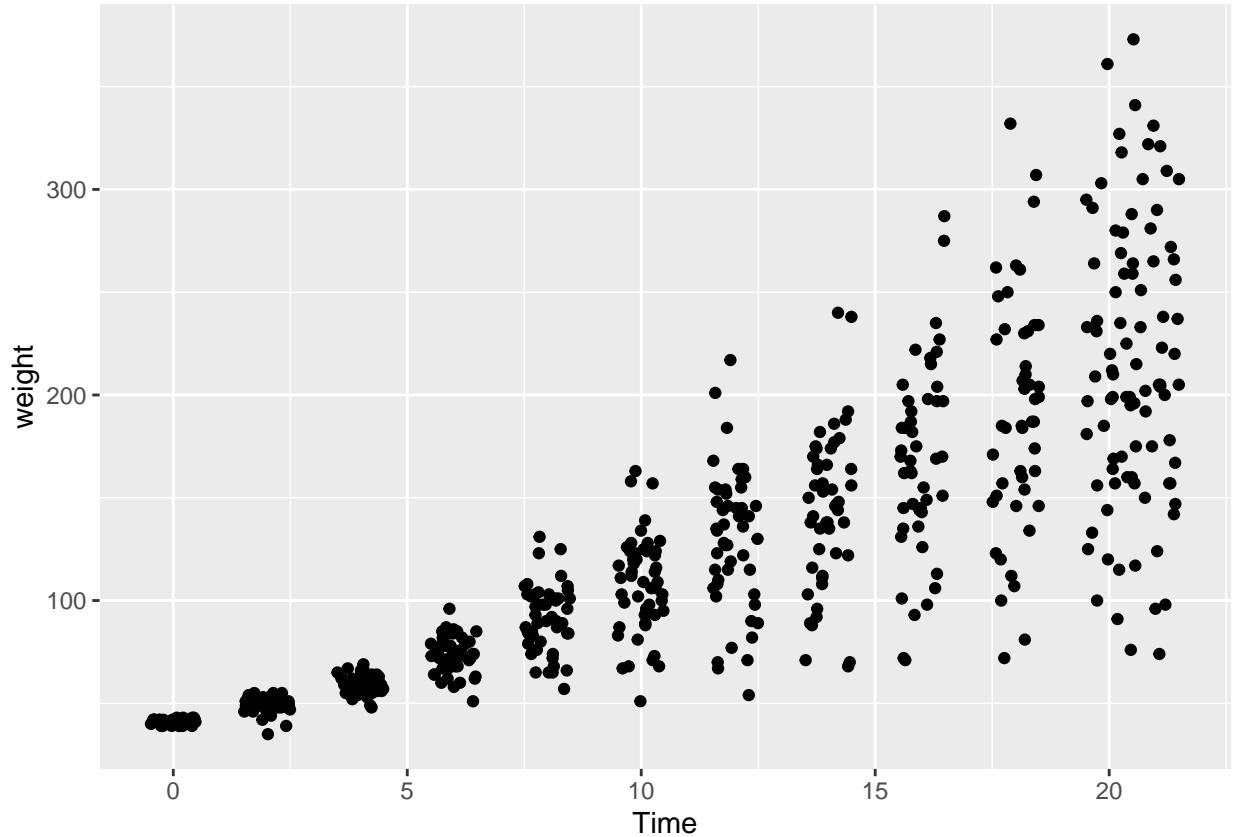
```
cw_sp <- ggplot(ChickWeight, aes(x = Time, y = weight))  
cw_sp +  
  geom_point()
```



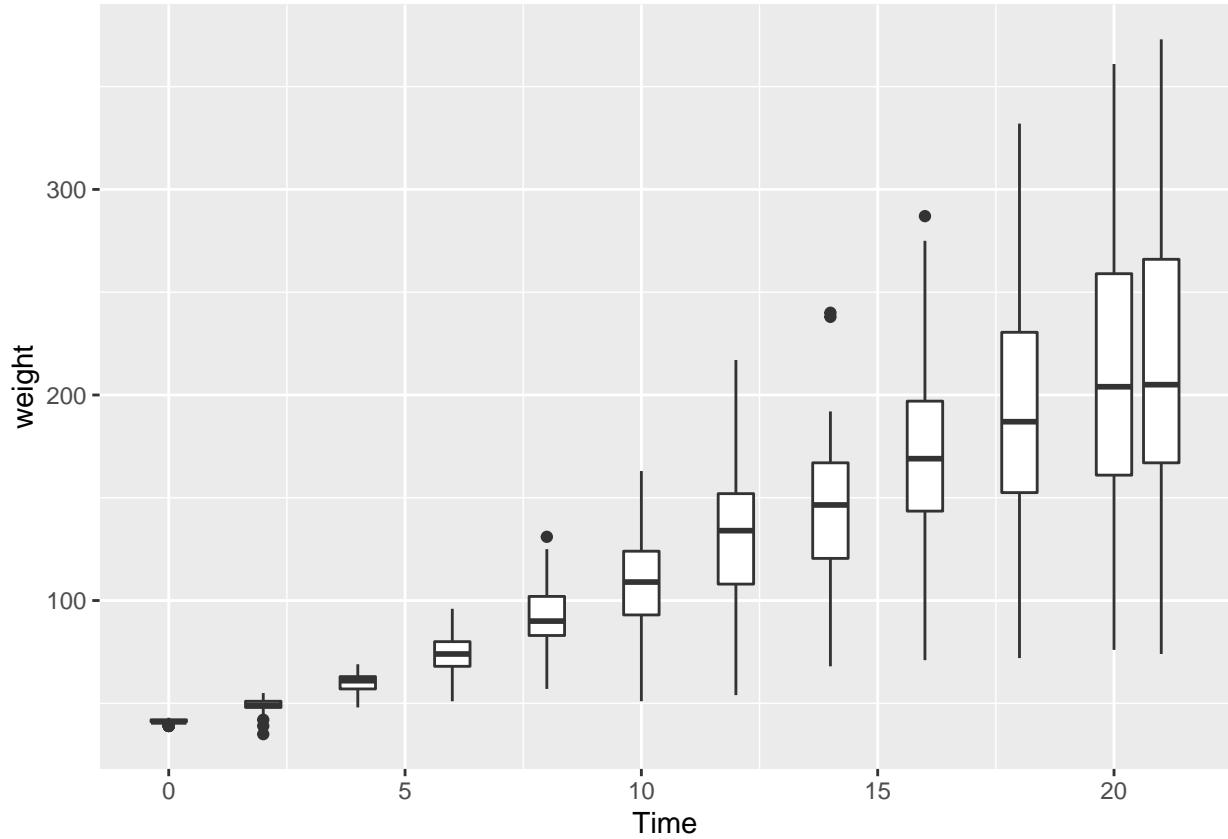
```
cw_sp +  
geom_point(position = "jitter")
```



```
cw_sp +  
geom_point(position = position_jitter(width = .5, height = 0))
```

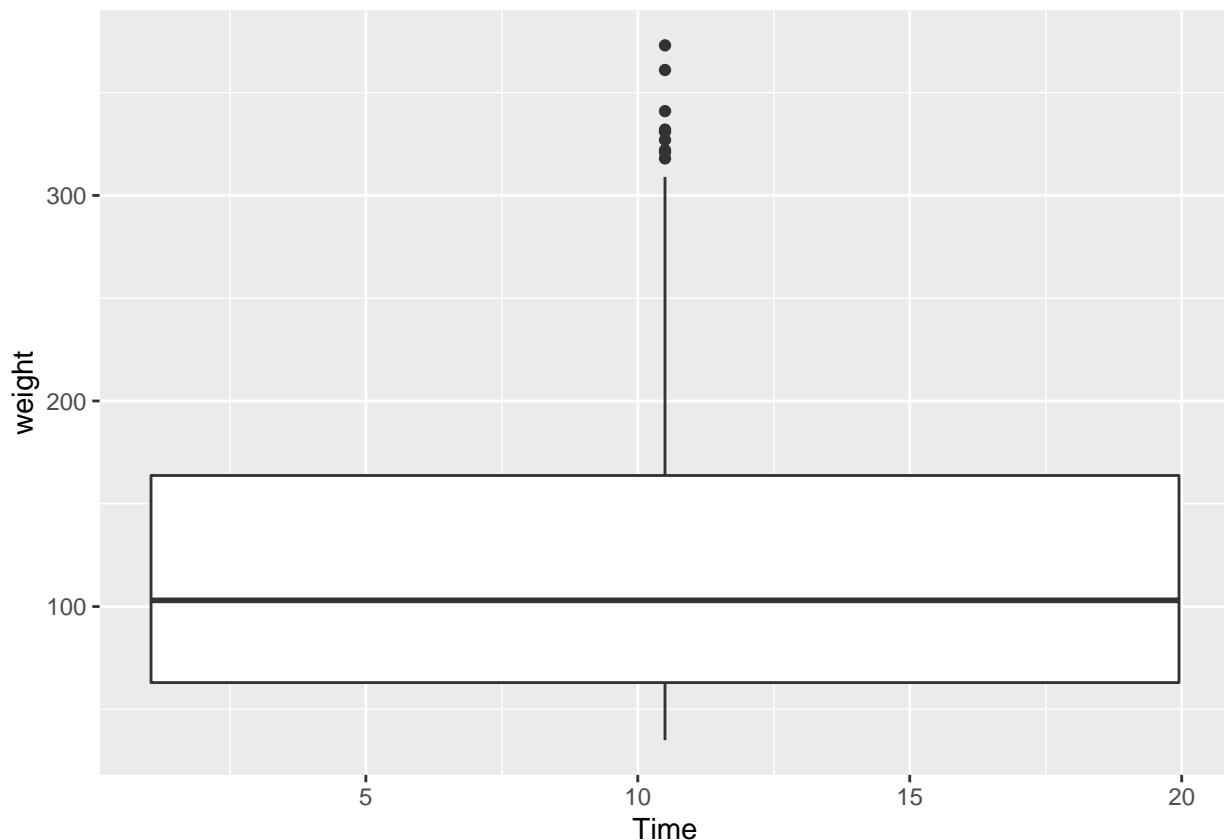


```
cw_sp +  
geom_boxplot(aes(group = Time))
```



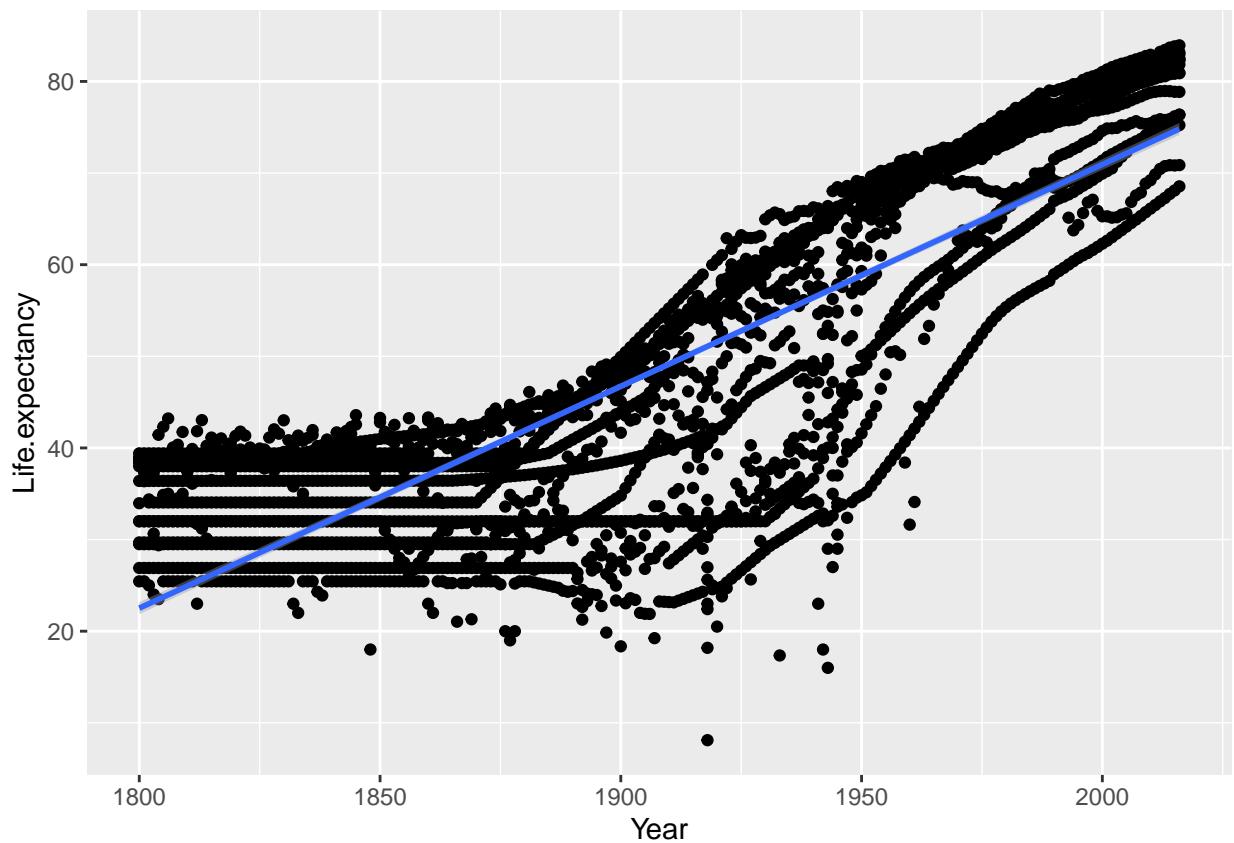
```
cw_sp +  
geom_boxplot()
```

```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?
```



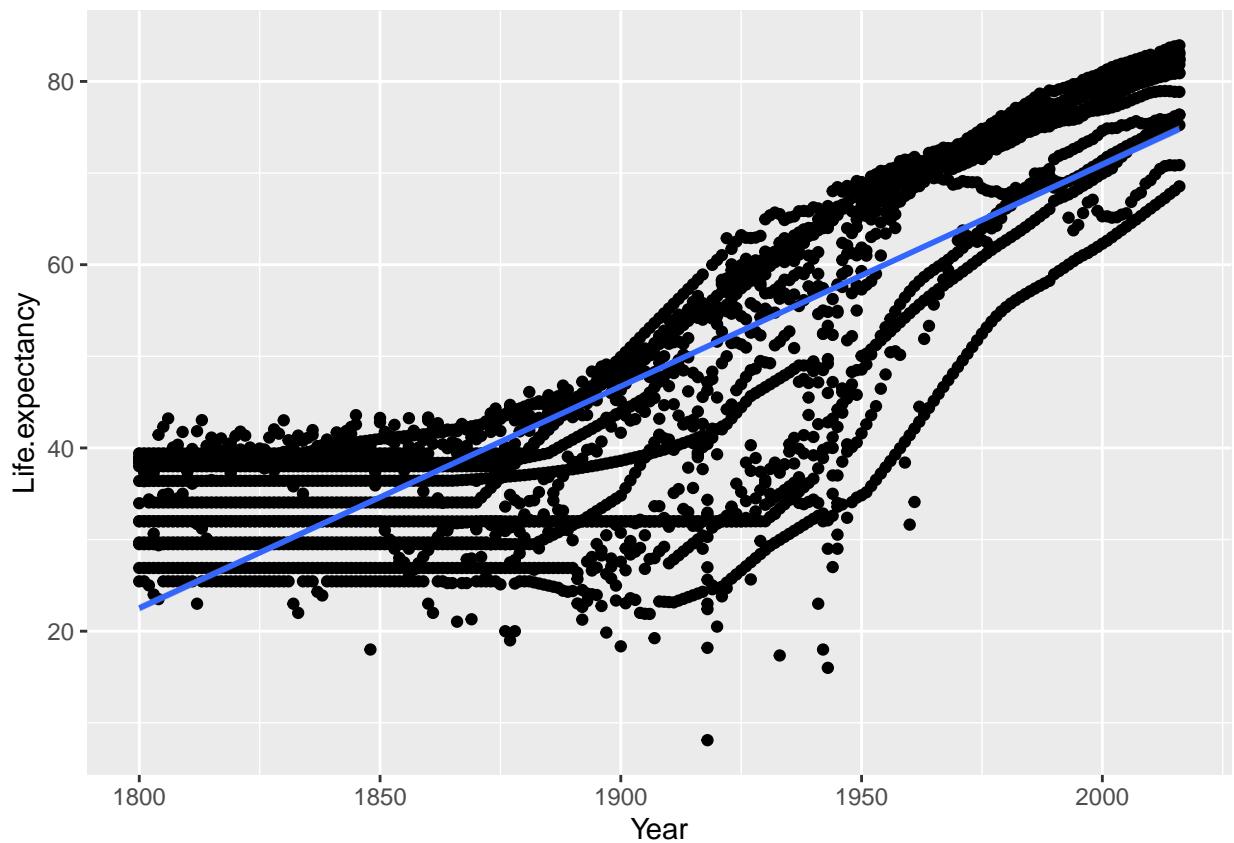
```
dmnd_sp +
geom_point() +
stat_smooth(method = lm)

## `geom_smooth()` using formula 'y ~ x'
```



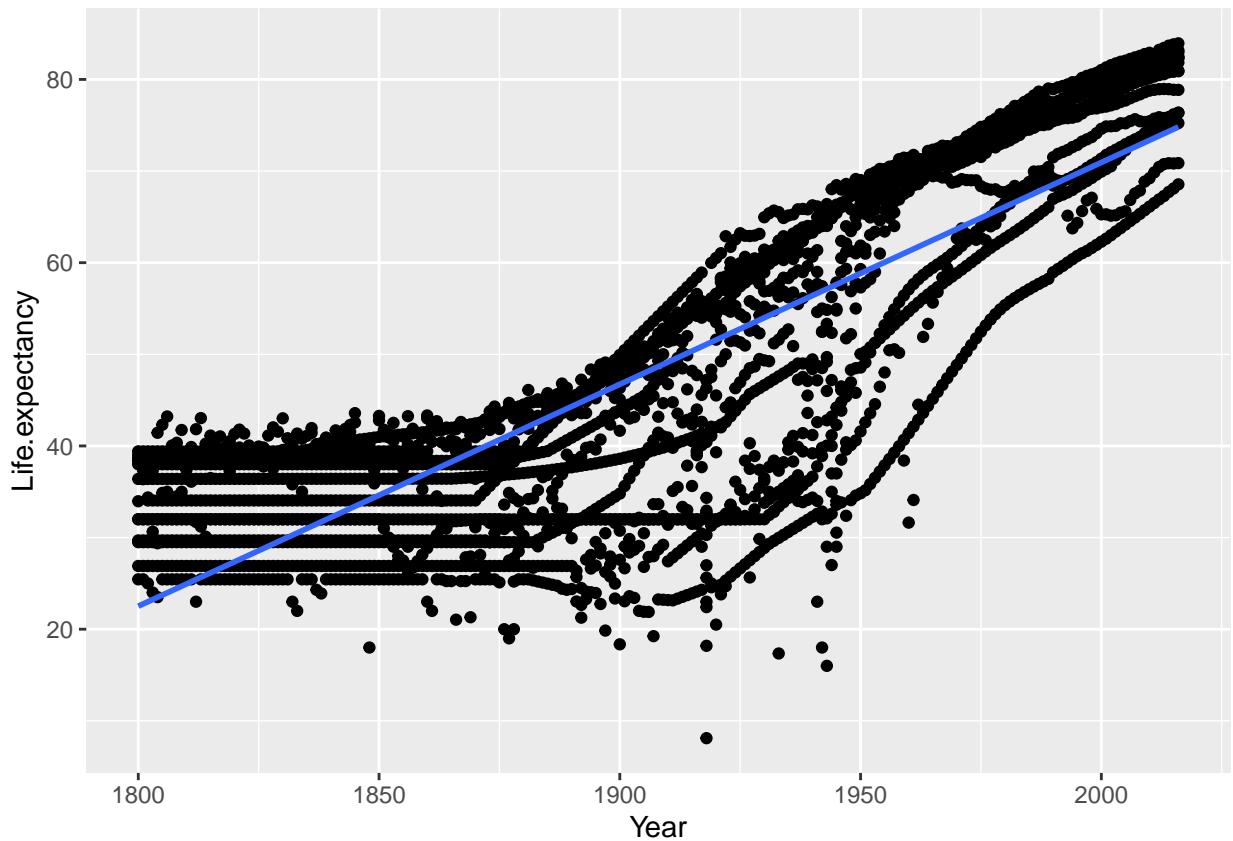
```
dmnd_sp +  
geom_point() +  
stat_smooth(method = lm, level = 0.8)
```

```
## `geom_smooth()` using formula 'y ~ x'
```



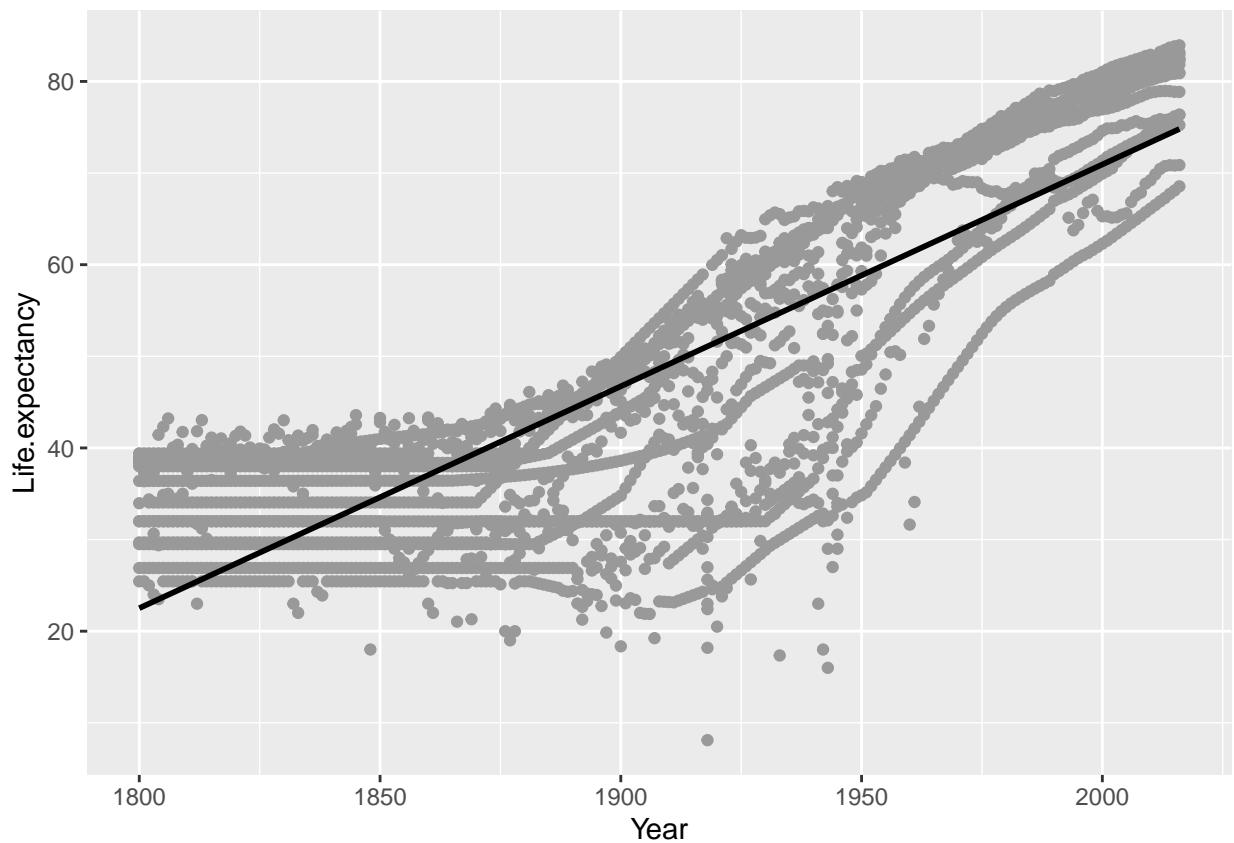
```
dmnd_sp +  
geom_point() +  
stat_smooth(method = lm, se = FALSE)
```

```
## `geom_smooth()` using formula 'y ~ x'
```



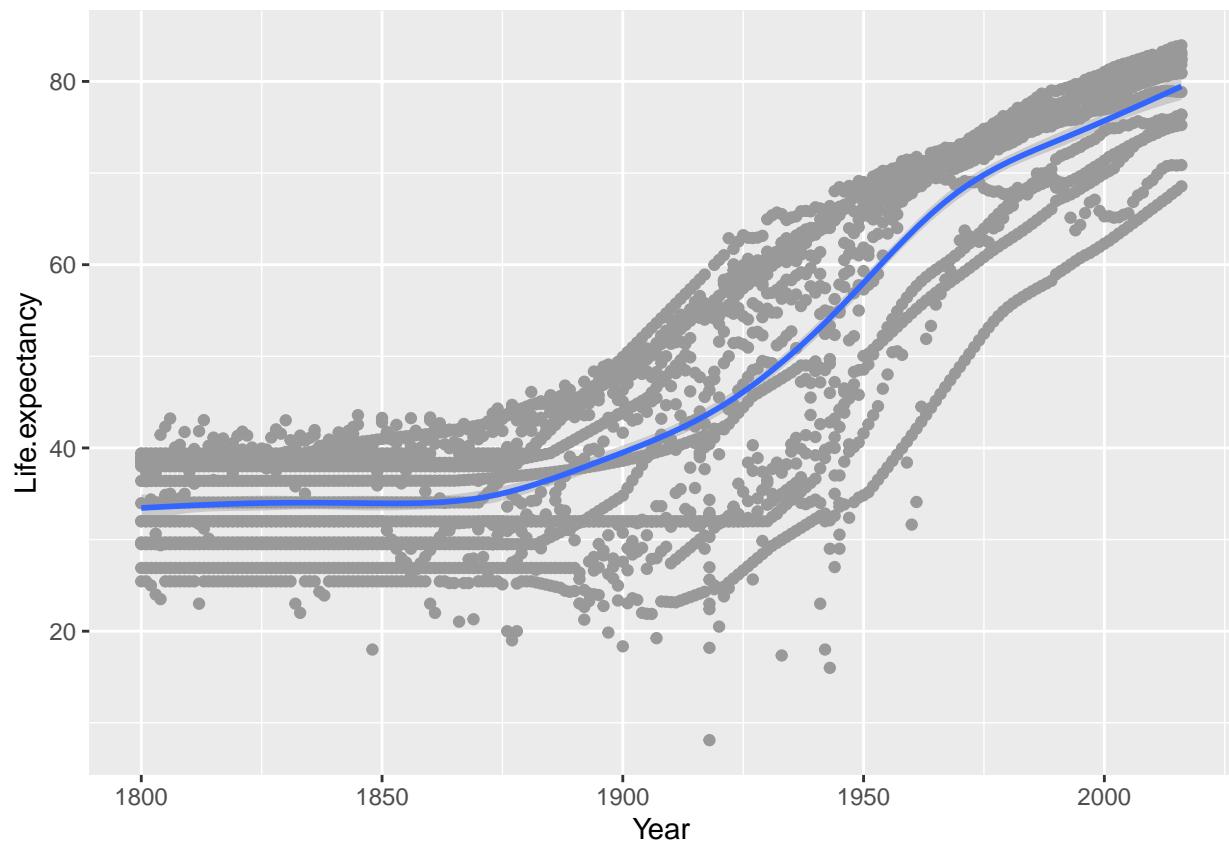
```
dmnd_sp +
  geom_point(colour = "grey60") +
  stat_smooth(method = lm, se = FALSE, colour = "black")
```

```
## `geom_smooth()` using formula 'y ~ x'
```



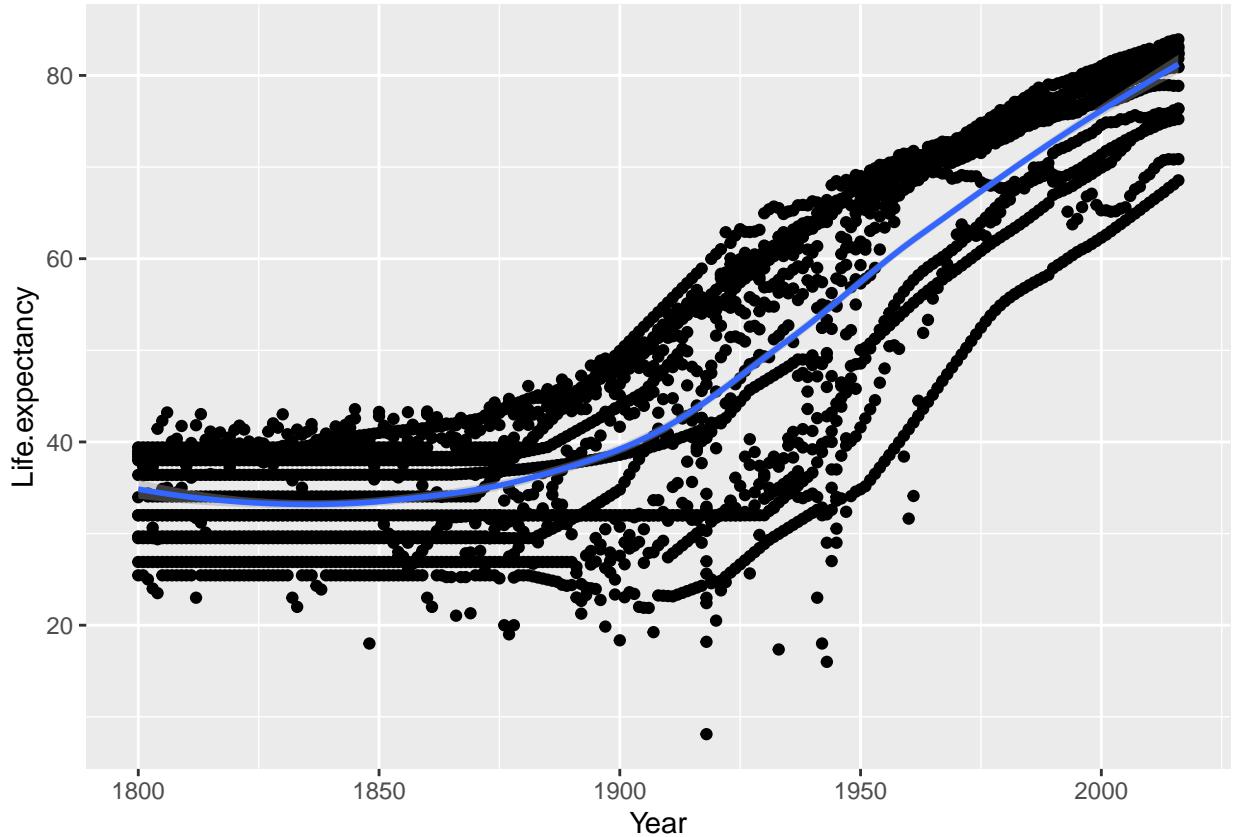
```
dmnd_sp +
geom_point(colour = "grey60") +
stat_smooth()

## `geom_smooth()` using method = 'gam' and formula 'y ~ s(x, bs = "cs")'
```



```
dmnd_sp + geom_point(colour = "black") +  
stat_smooth(method = loess)
```

```
## 'geom_smooth()' using formula 'y ~ x'
```



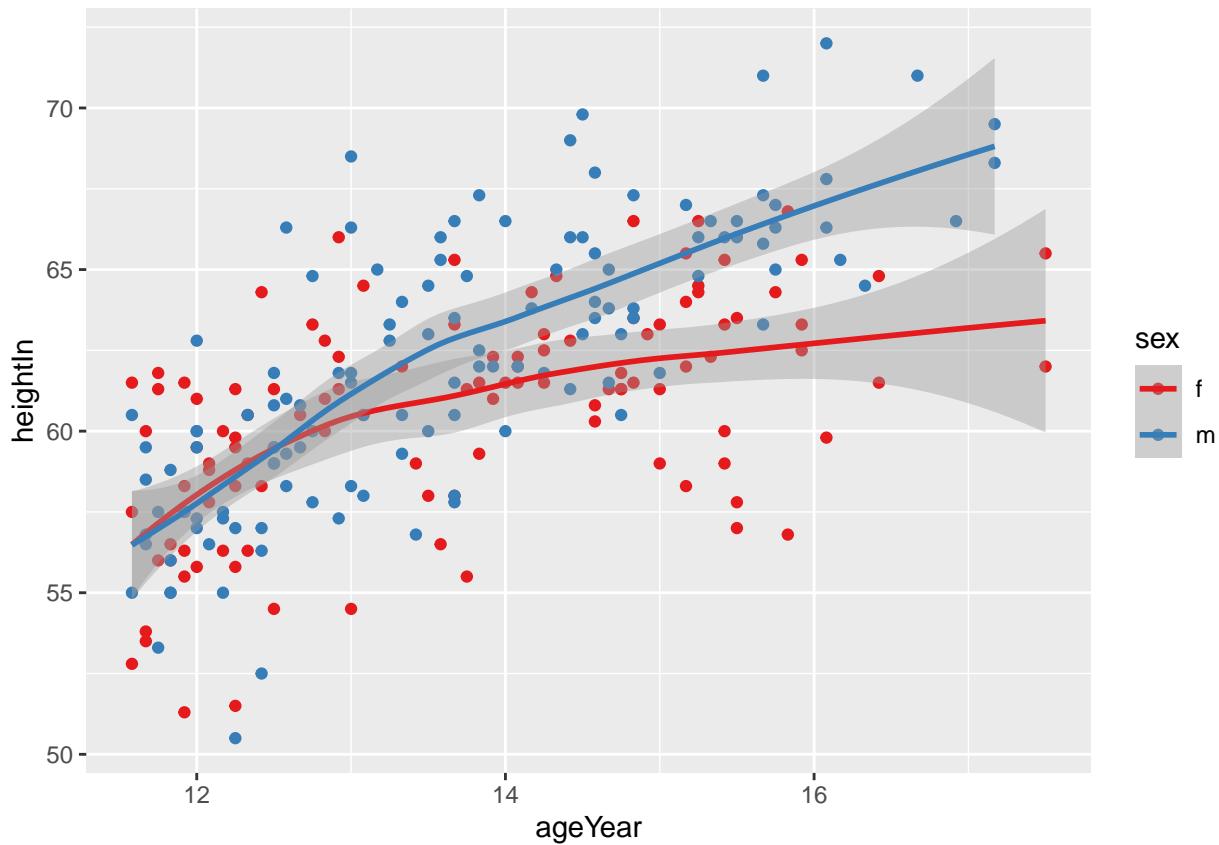
```
library(MASS)
```

```
##
## Attaching package: 'MASS'

## The following object is masked from 'package:dplyr':
##      select

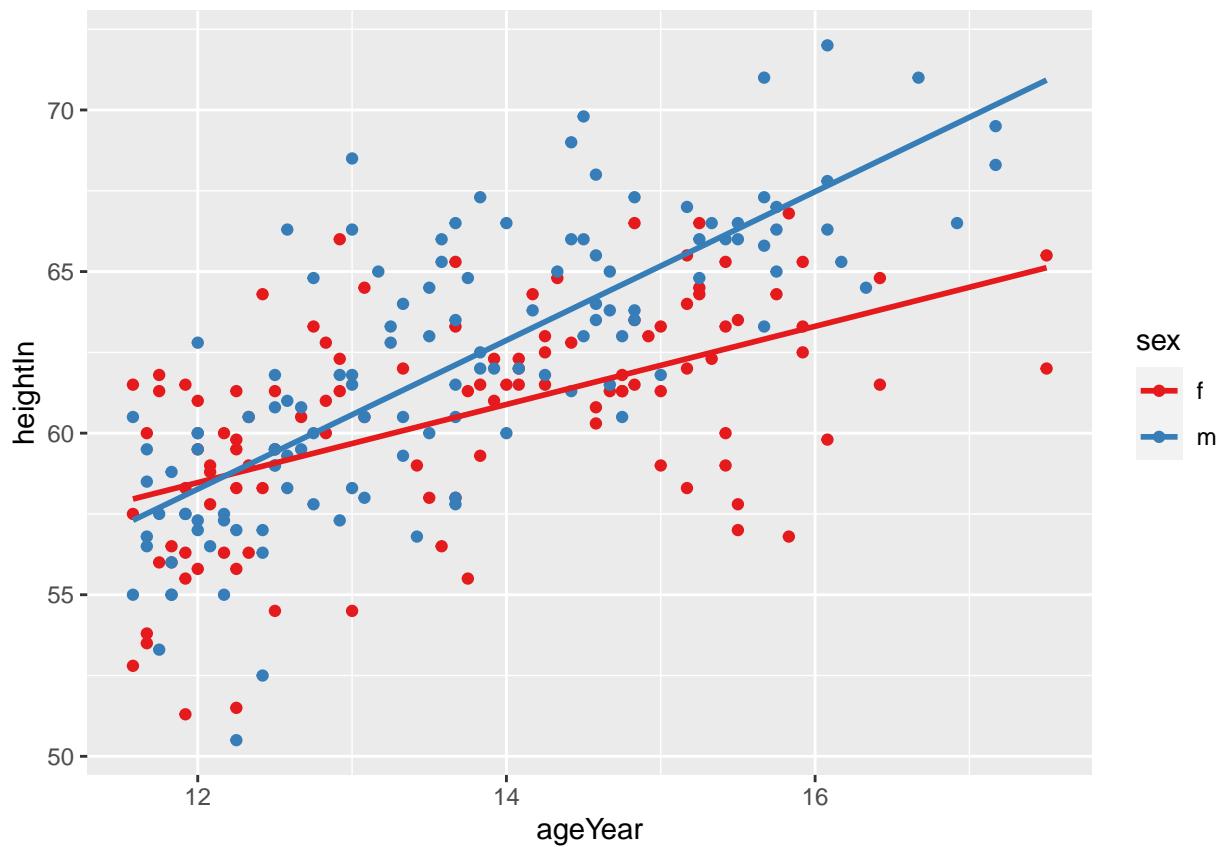
hw_sp <- ggplot(heightweight, aes(x = ageYear, y = heightIn, colour = sex)) +
  geom_point() +
  scale_colour_brewer(palette = "Set1")
hw_sp +
  geom_smooth()
```

‘geom_smooth()’ using method = ‘loess’ and formula ‘y ~ x’

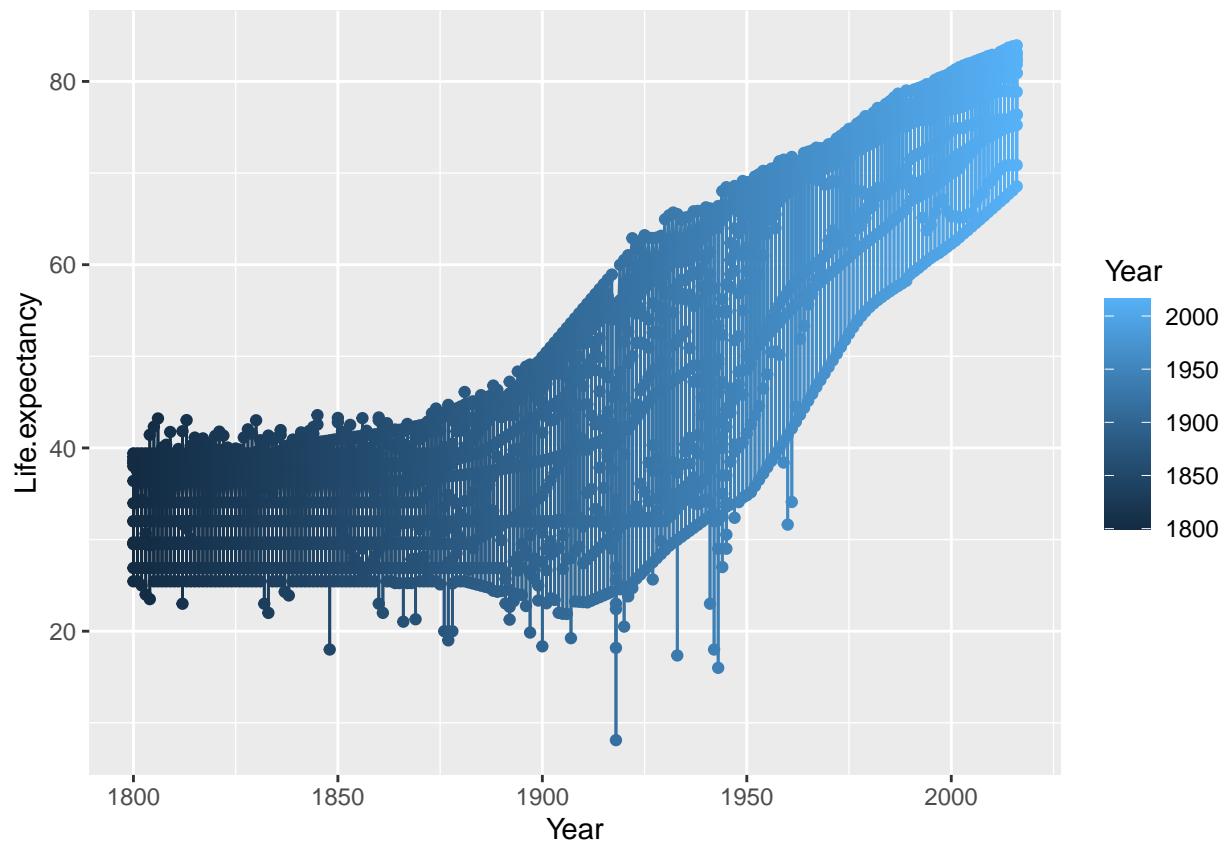


```
hw_sp +
geom_smooth(method = lm, se = FALSE, fullrange = TRUE)
```

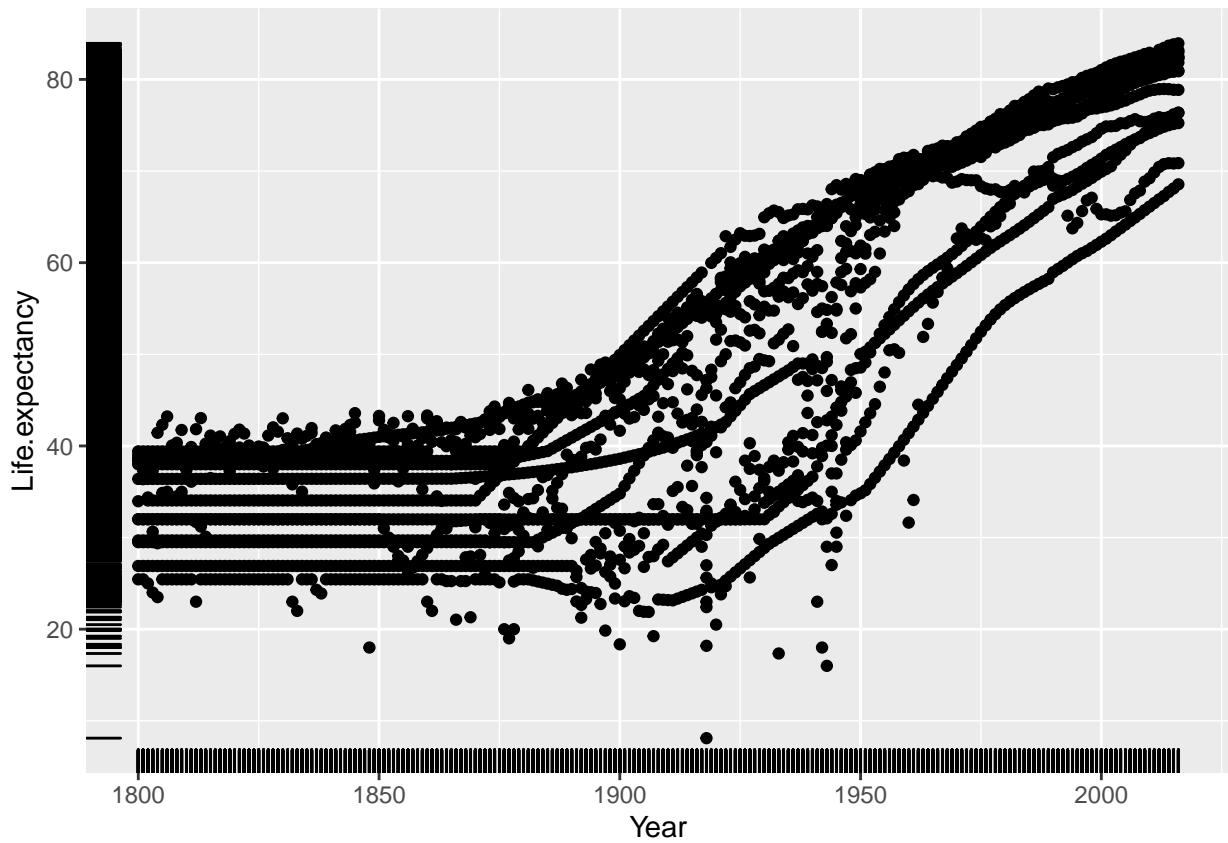
```
## `geom_smooth()` using formula 'y ~ x'
```



```
ggplot(df, aes(x = Year, y = Life.expectancy, colour = Year)) +  
  geom_point() +  
  geom_line(data = df)
```



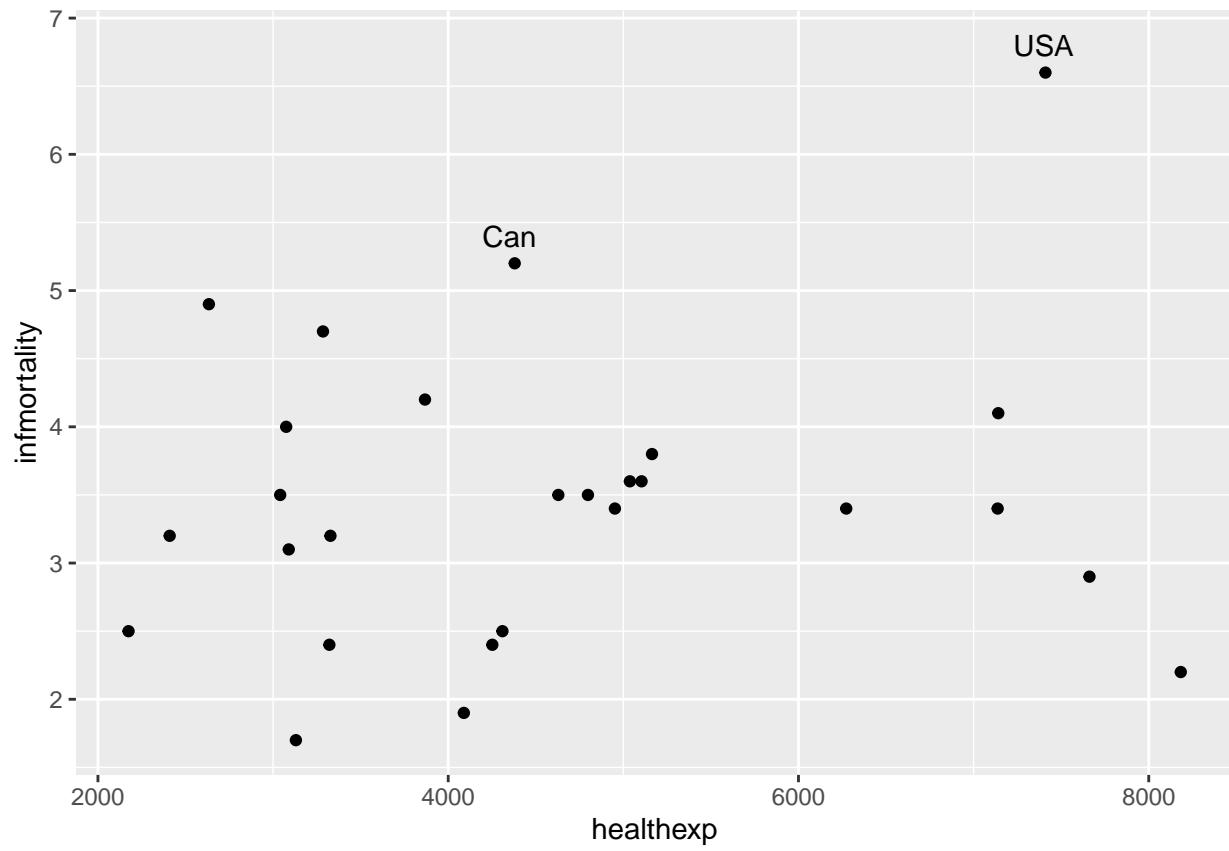
```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_point() +  
  geom_rug()
```



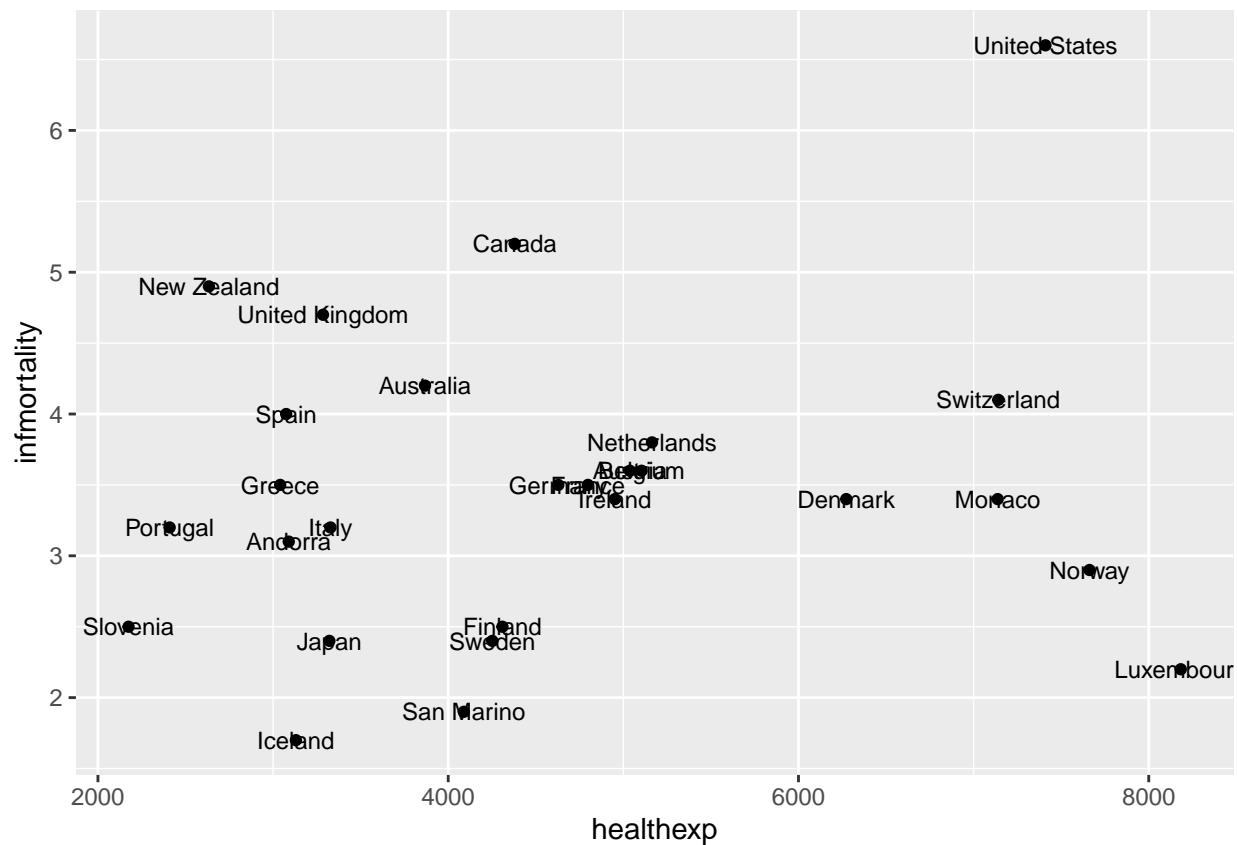
```

countries_sub <- countries %>%
filter(Year == 2009 & healthexp > 2000)
countries_sp <- ggplot(countries_sub, aes(x = healthexp, y = infmortality)) +
geom_point()
countries_sp +
annotate("text", x = 4350, y = 5.4, label = "Can") +
annotate("text", x = 7400, y = 6.8, label = "USA")

```

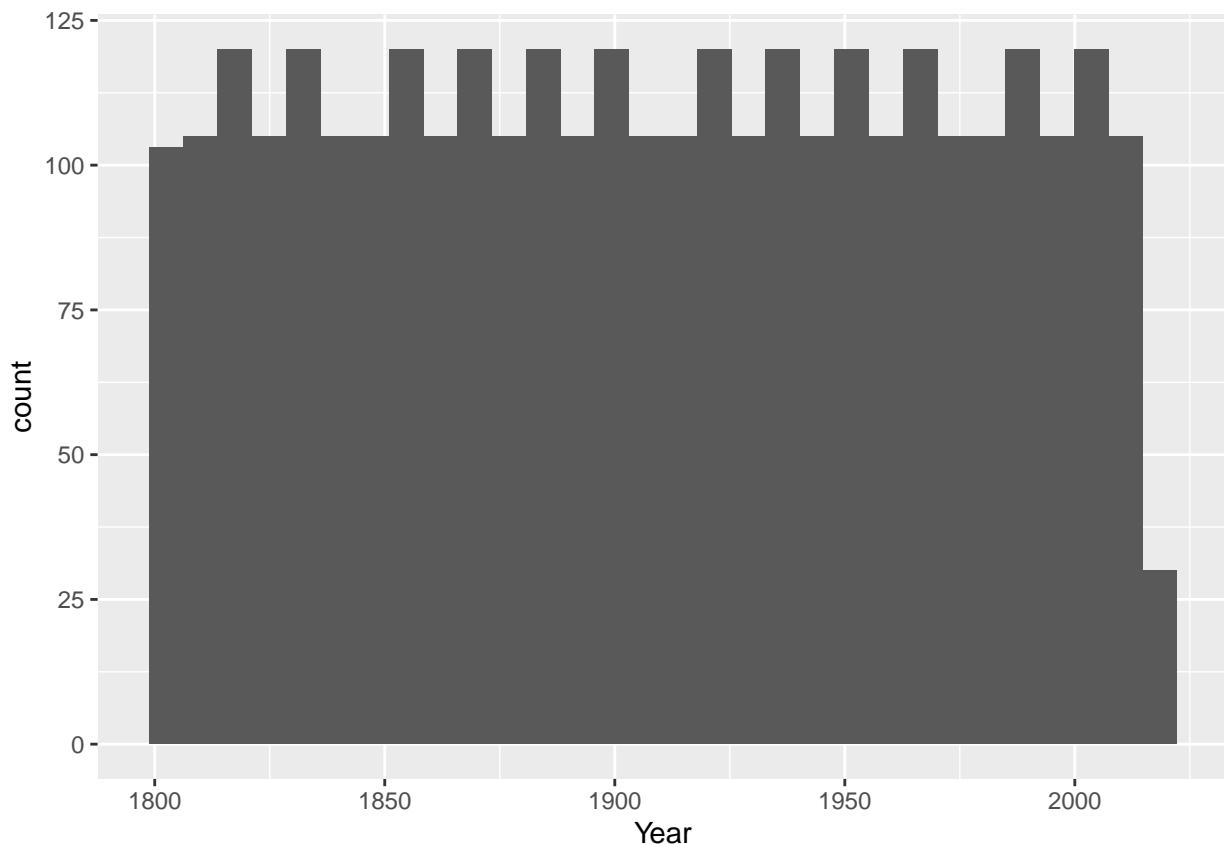


```
countries_sp +  
geom_text(aes(label = Name), size = 3)
```

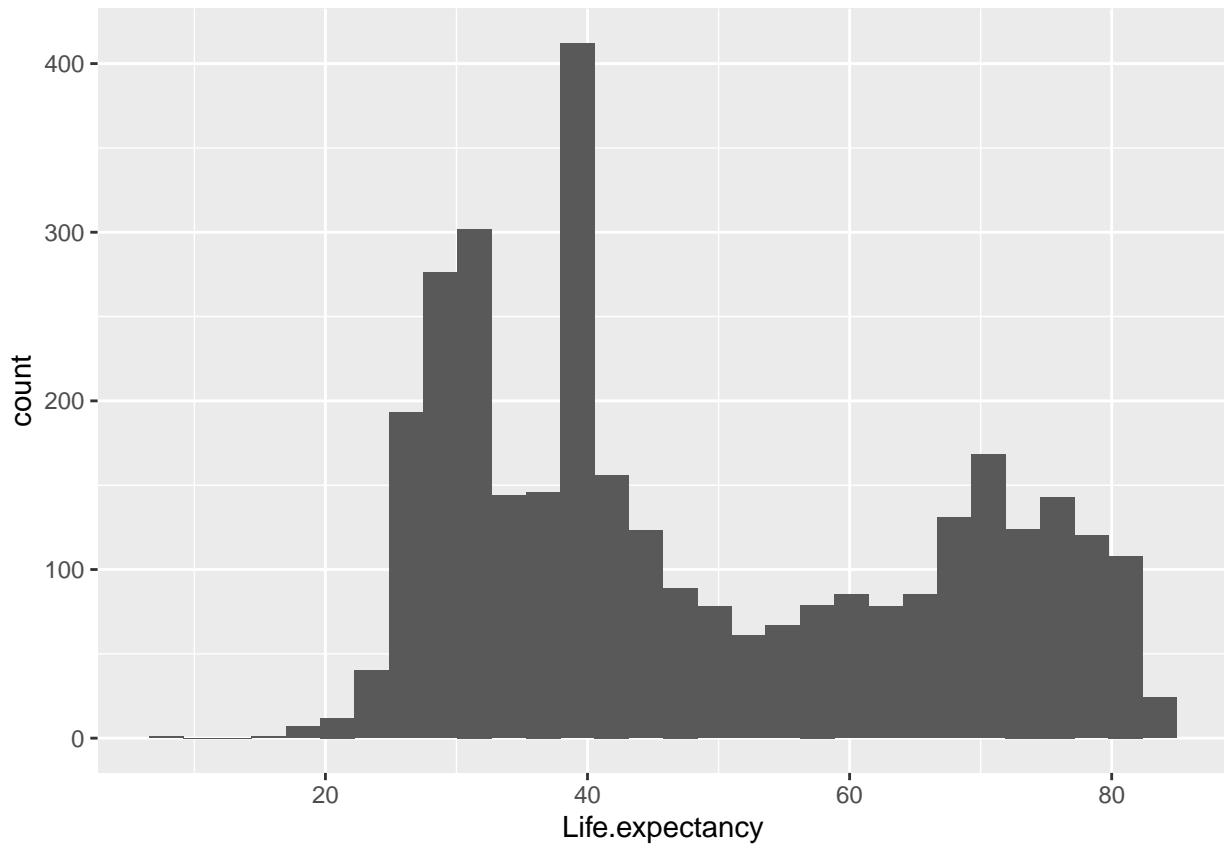


```
ggplot(df, aes(x = Year)) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

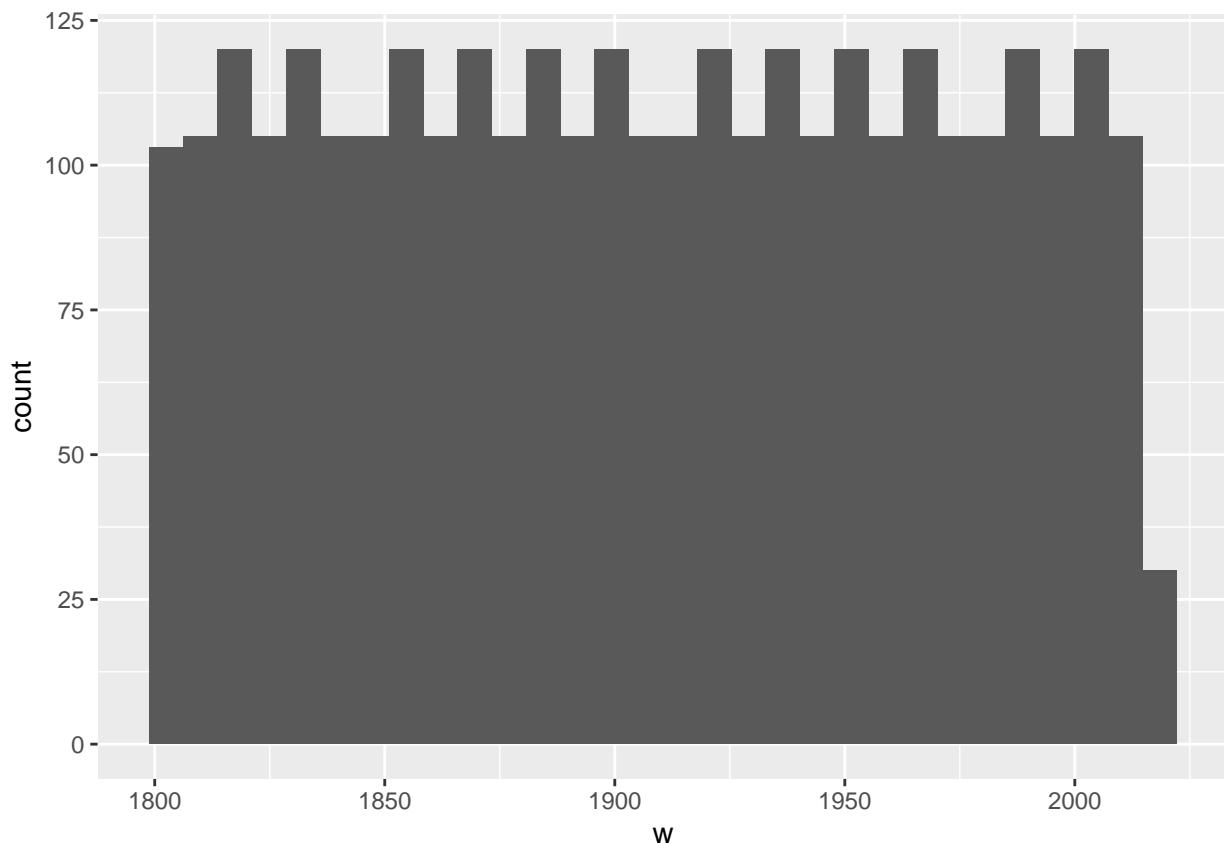


```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_histogram()  
  
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

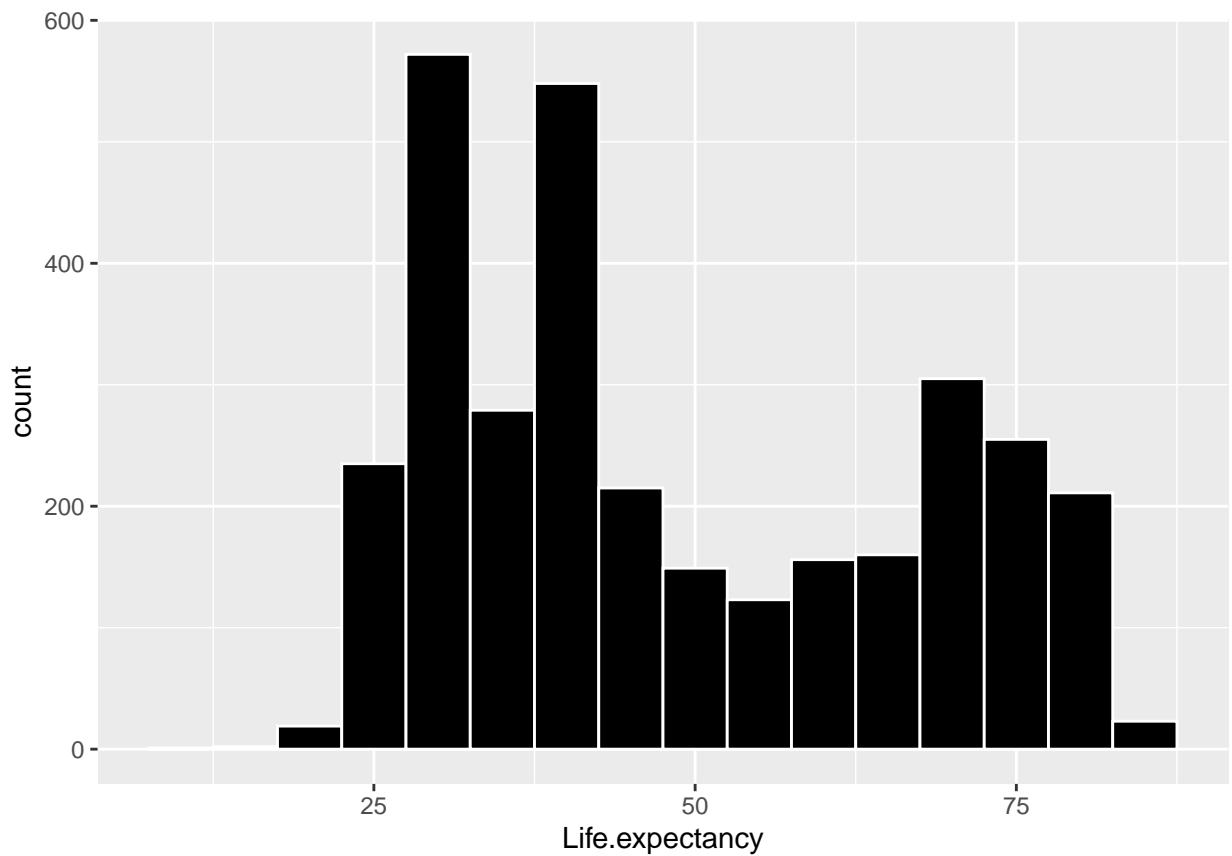


```
w <- df$Year  
ggplot(NULL, aes(x = w)) +  
geom_histogram()
```

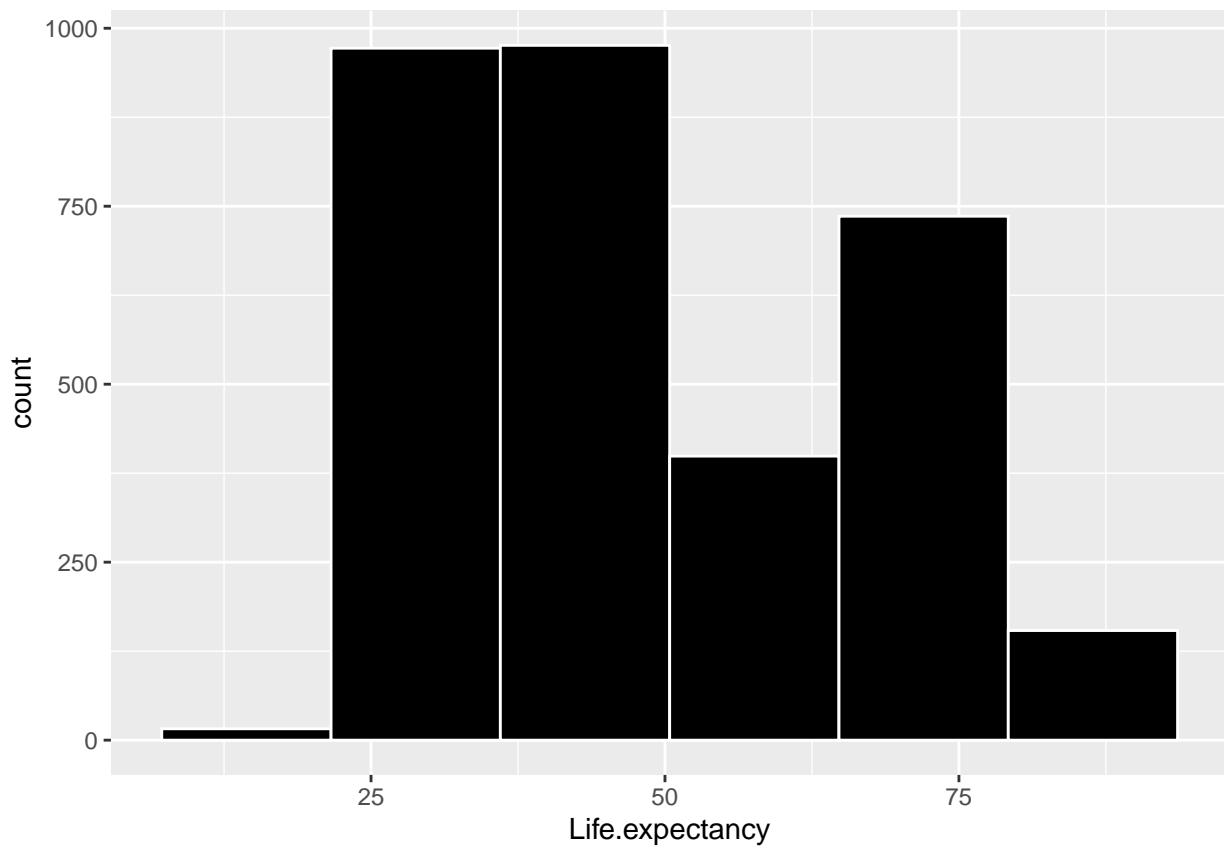
```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```



```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_histogram(binwidth = 5, fill = "black", colour = "white")
```

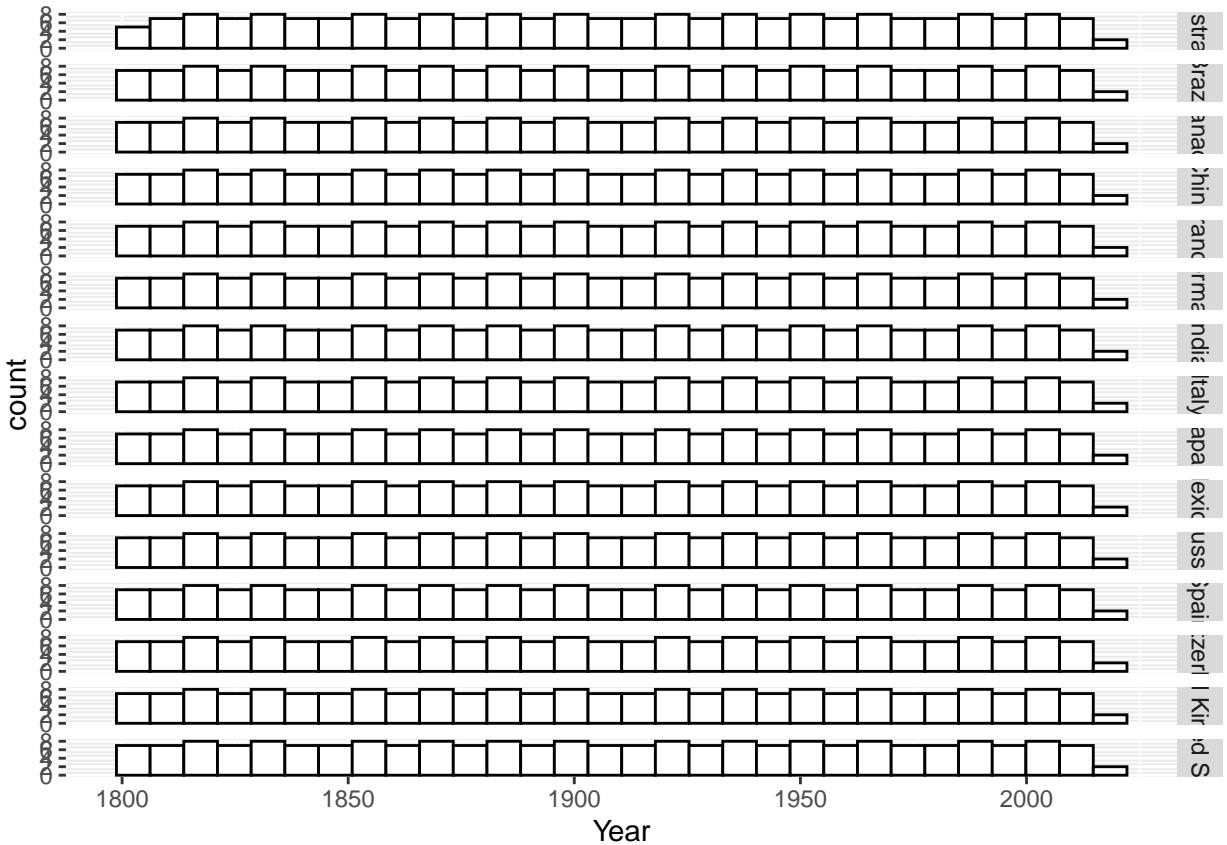


```
bs <- diff(range(df$Year))/15
ggplot(df, aes(x = Life.expectancy)) +
  geom_histogram(binwidth = bs, fill = "black", colour = "white")
```



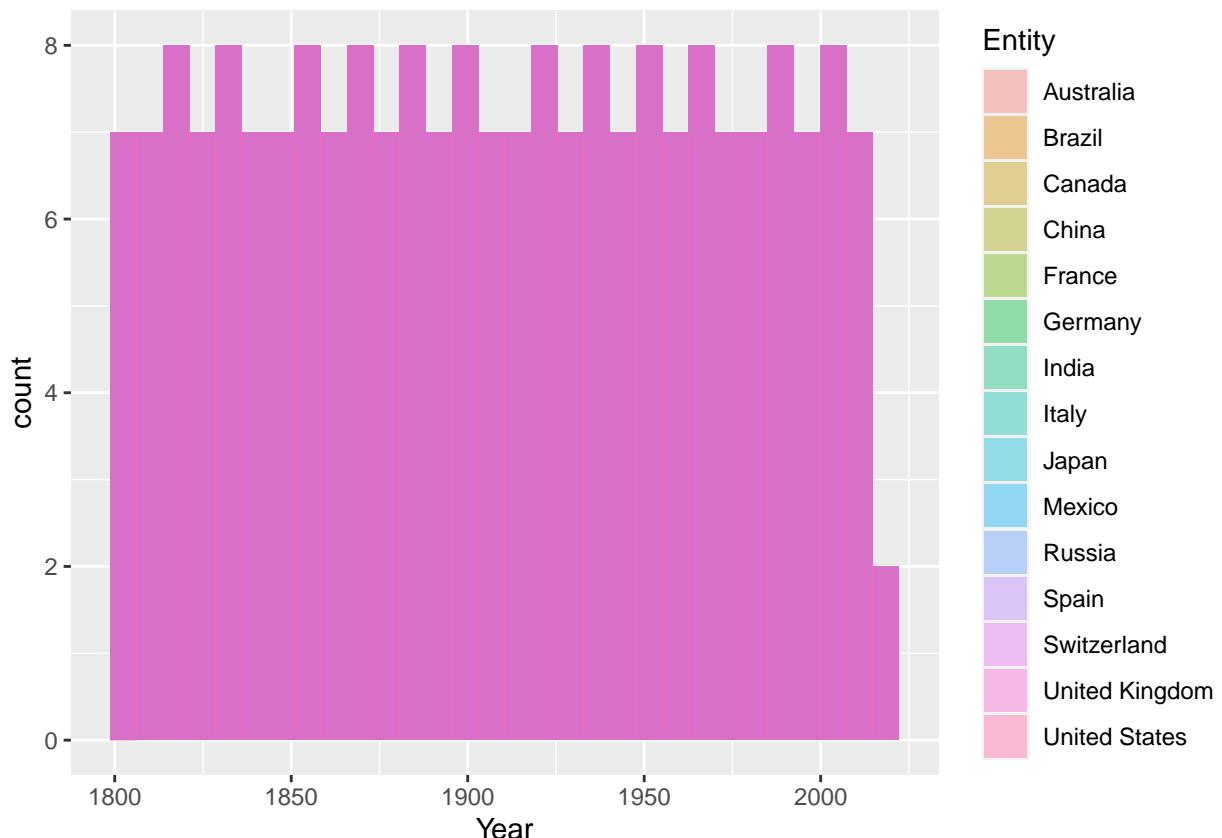
```
ggplot(df, aes(x = Year)) + geom_histogram(fill = "white", colour = "black") +  
facet_grid(Entity ~ .)
```

```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```

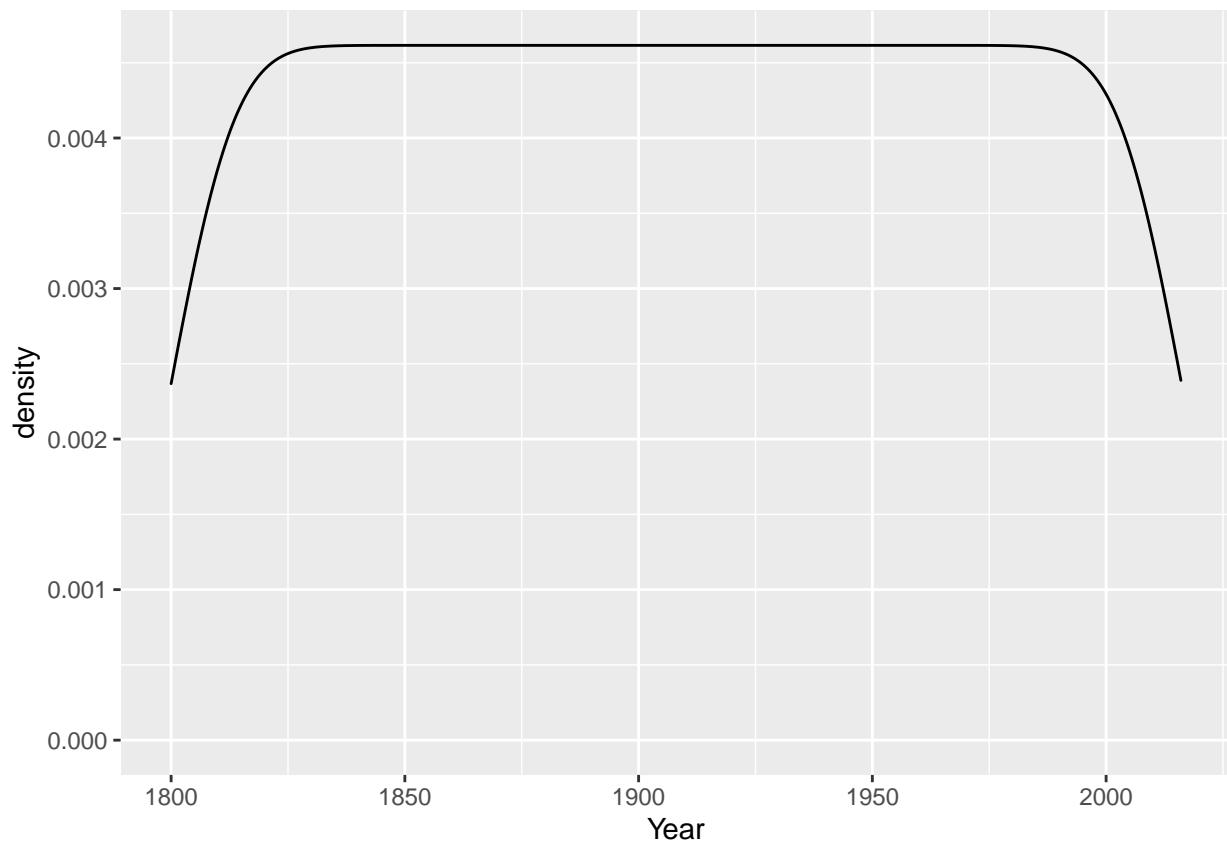


```
ggplot(df, aes(x = Year, fill = Entity)) +
  geom_histogram(position = "identity", alpha = 0.4)
```

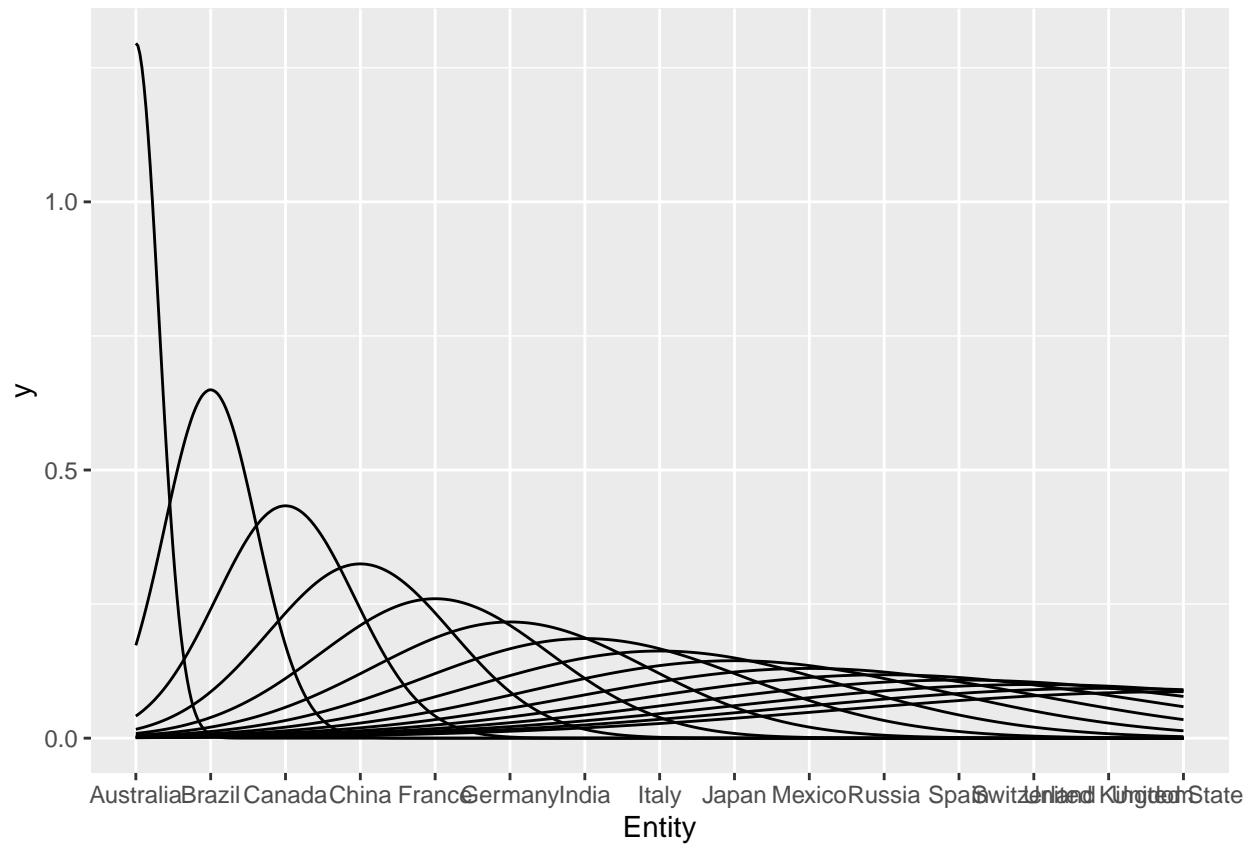
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



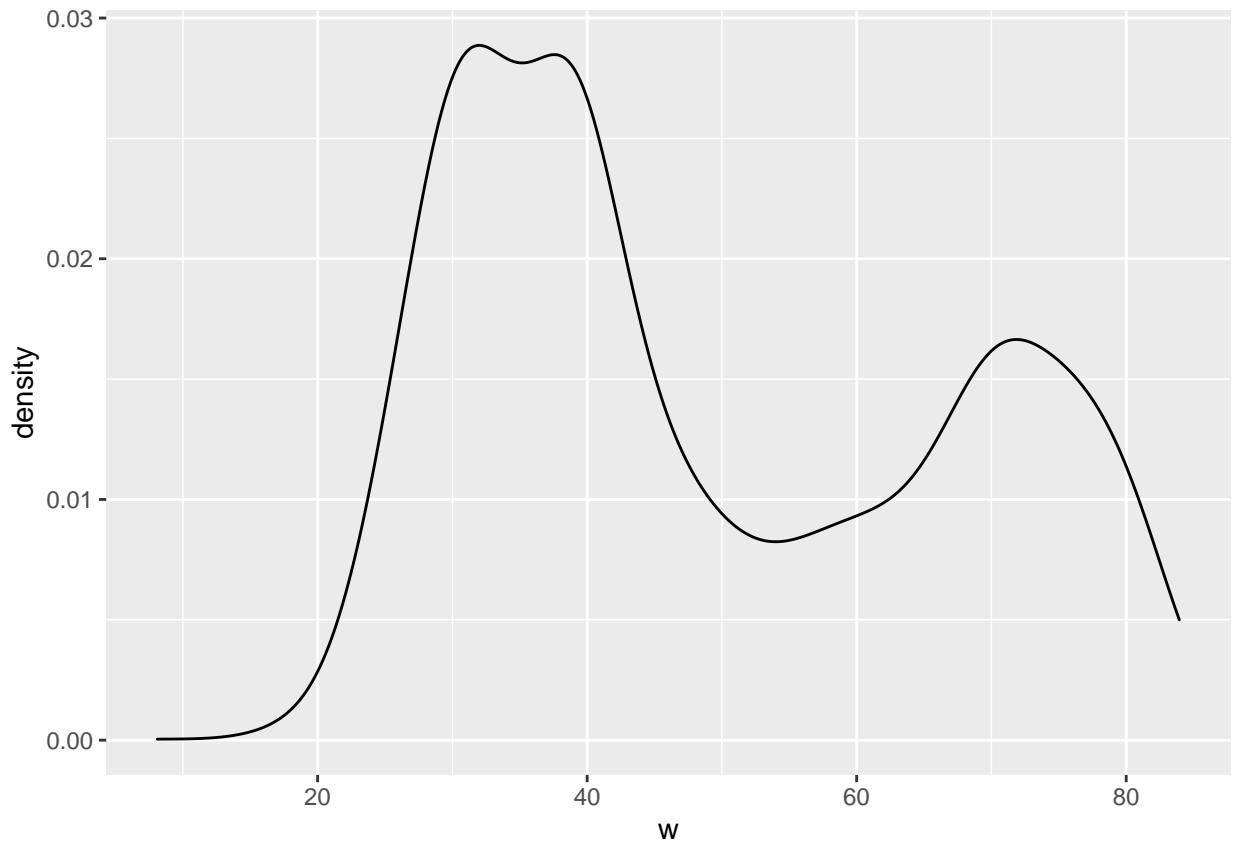
```
ggplot(df, aes(x = Year)) +  
  geom_density()
```



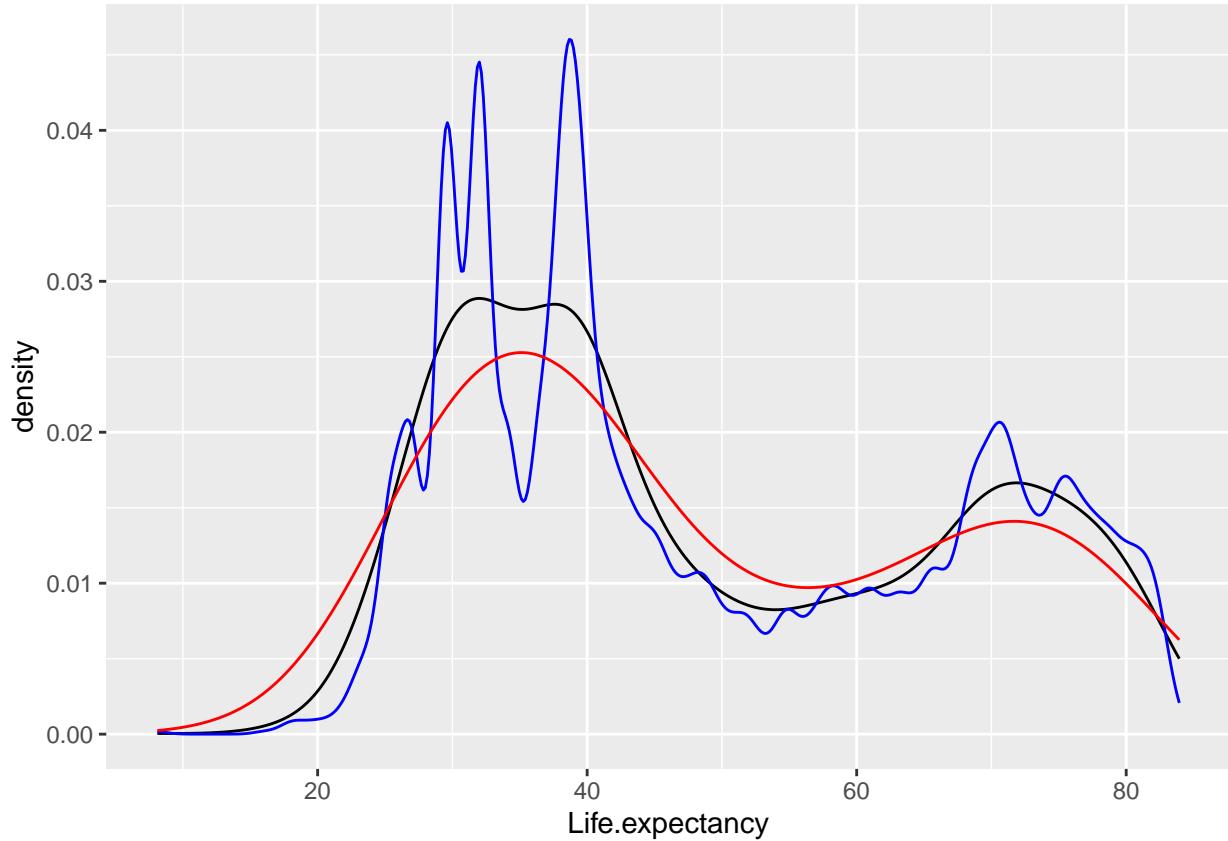
```
ggplot(df, aes(x = Entity)) +  
  geom_line(stat = "density") +  
  expand_limits(y = 0)
```



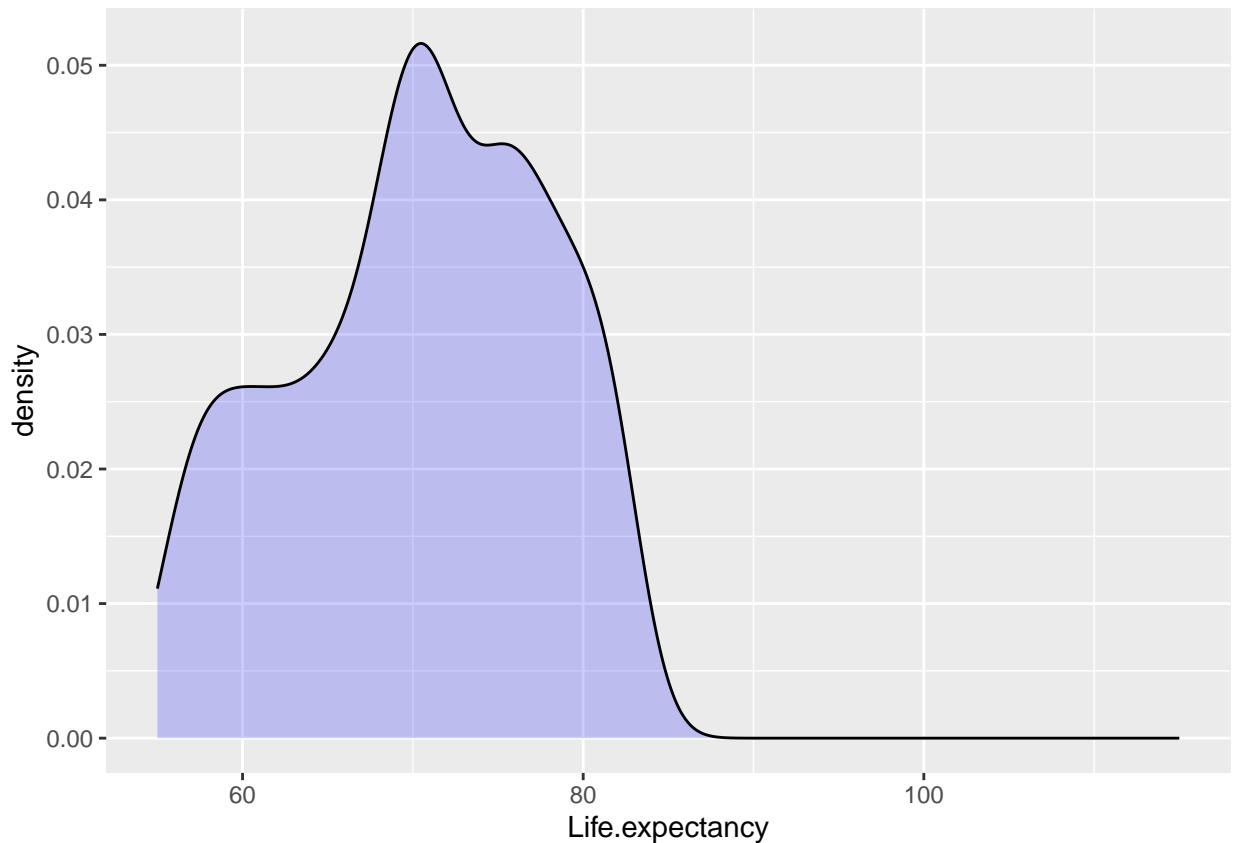
```
w <- df$Life.expectancy  
ggplot(NULL, aes(x = w)) +  
geom_density()
```



```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_line(stat = "density") +  
  geom_line(stat = "density", adjust = .25, colour = "blue") +  
  geom_line(stat = "density", adjust = 2, colour = "red")
```

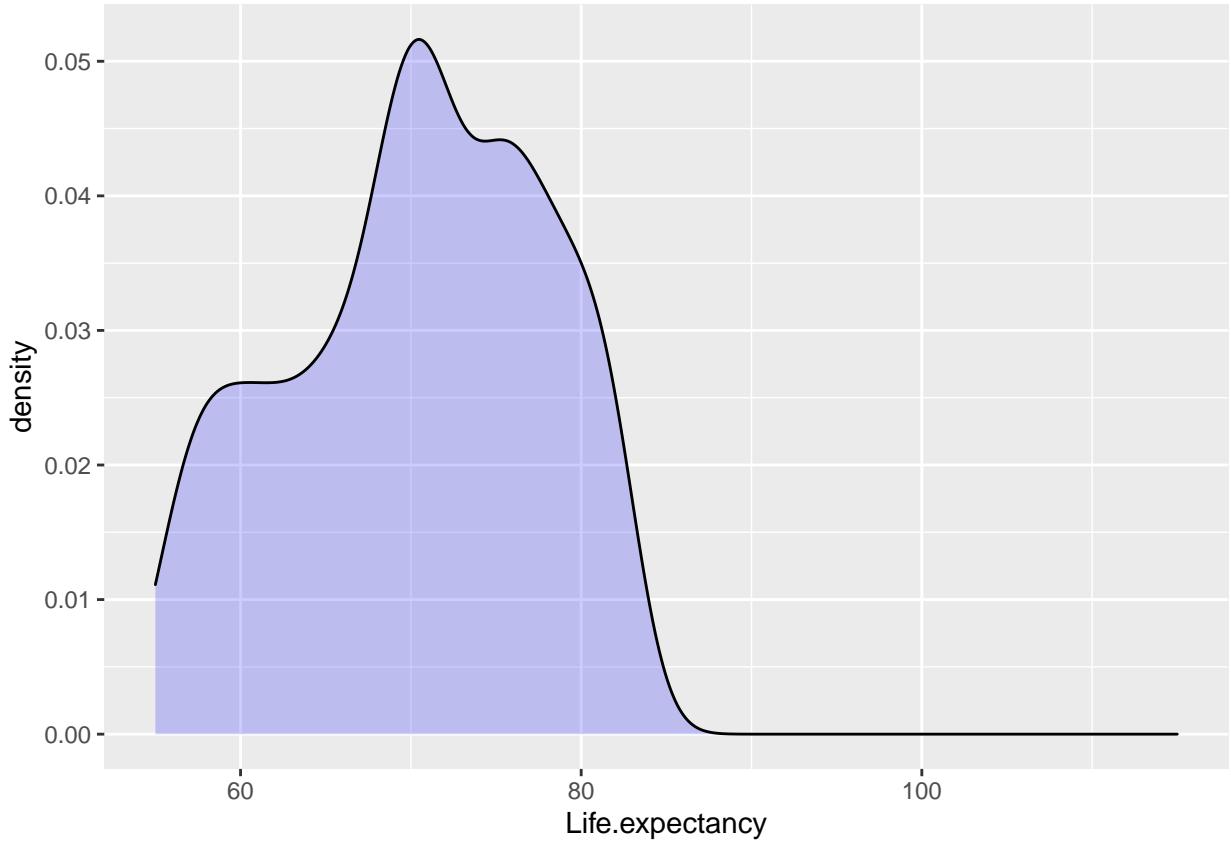


```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_density(fill = "blue", alpha = .2, colour = NA) +  
  xlim(55, 115) +  
  geom_line(stat = "density")  
  
## Warning: Removed 2079 rows containing non-finite values (stat_density).  
## Removed 2079 rows containing non-finite values (stat_density).
```



```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_density(fill = "blue", alpha = .2) +  
  xlim(55, 115)
```

```
## Warning: Removed 2079 rows containing non-finite values (stat_density).
```



```

ggplot(df, aes(x = Life.expectancy, y = ..density..)) +
  geom_histogram(fill = "cornsilk", colour = "green", size = .2) +
  geom_density() +
  xlim(25, 95)

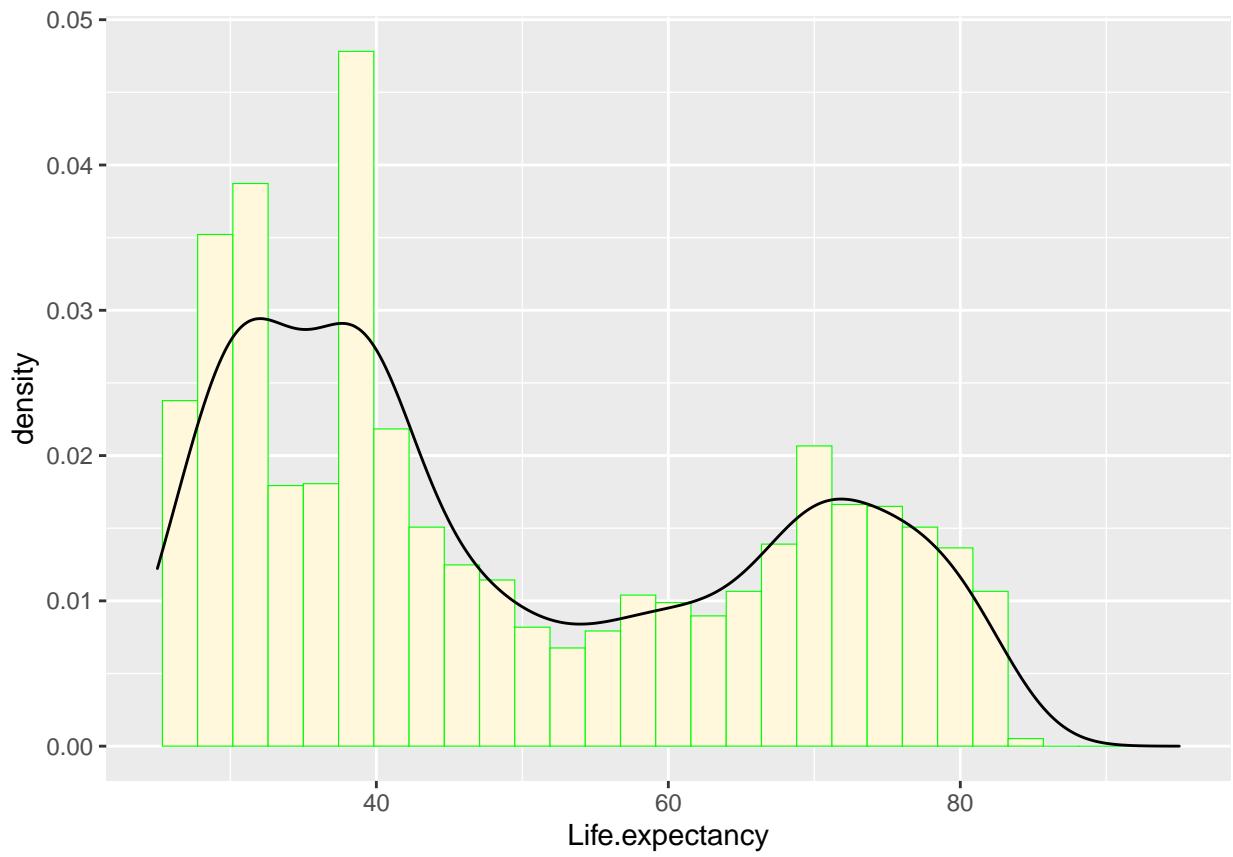
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 65 rows containing non-finite values (stat_bin).

## Warning: Removed 65 rows containing non-finite values (stat_density).

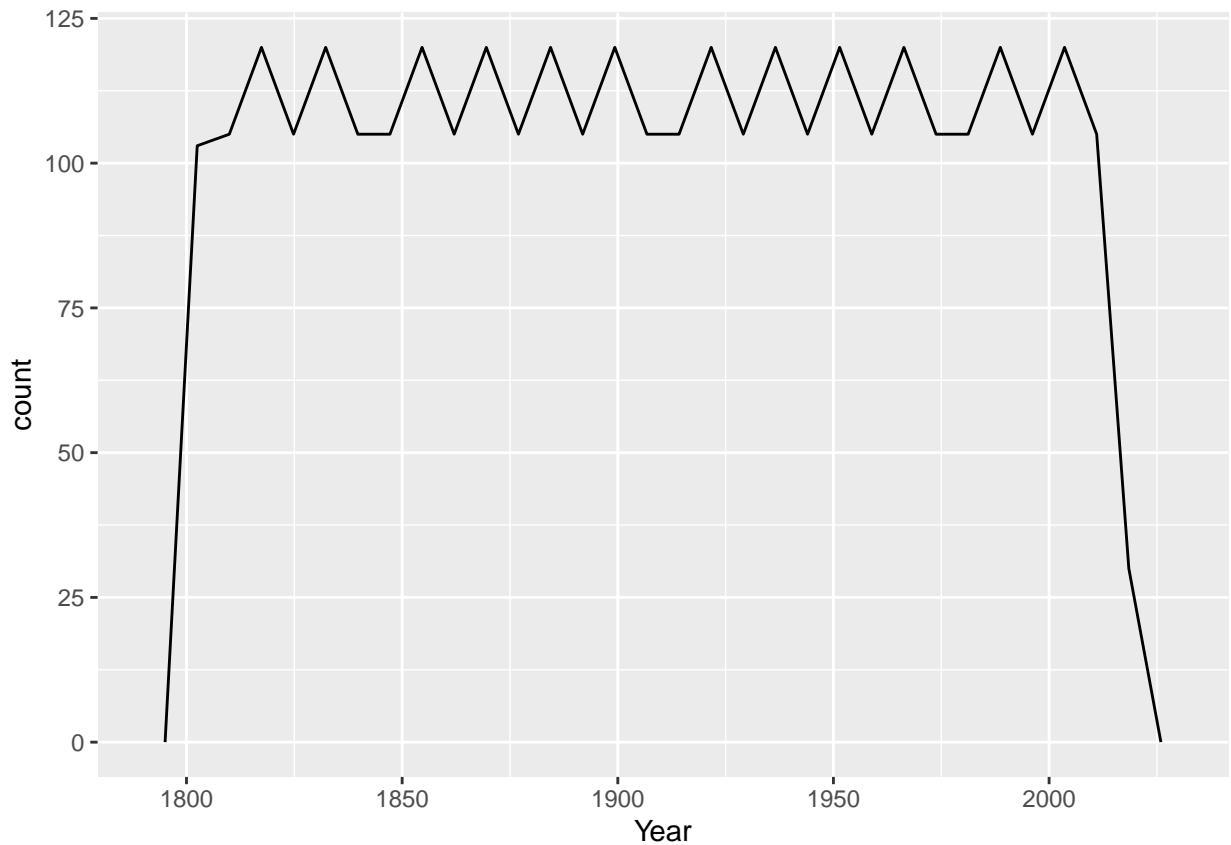
## Warning: Removed 2 rows containing missing values (geom_bar).

```

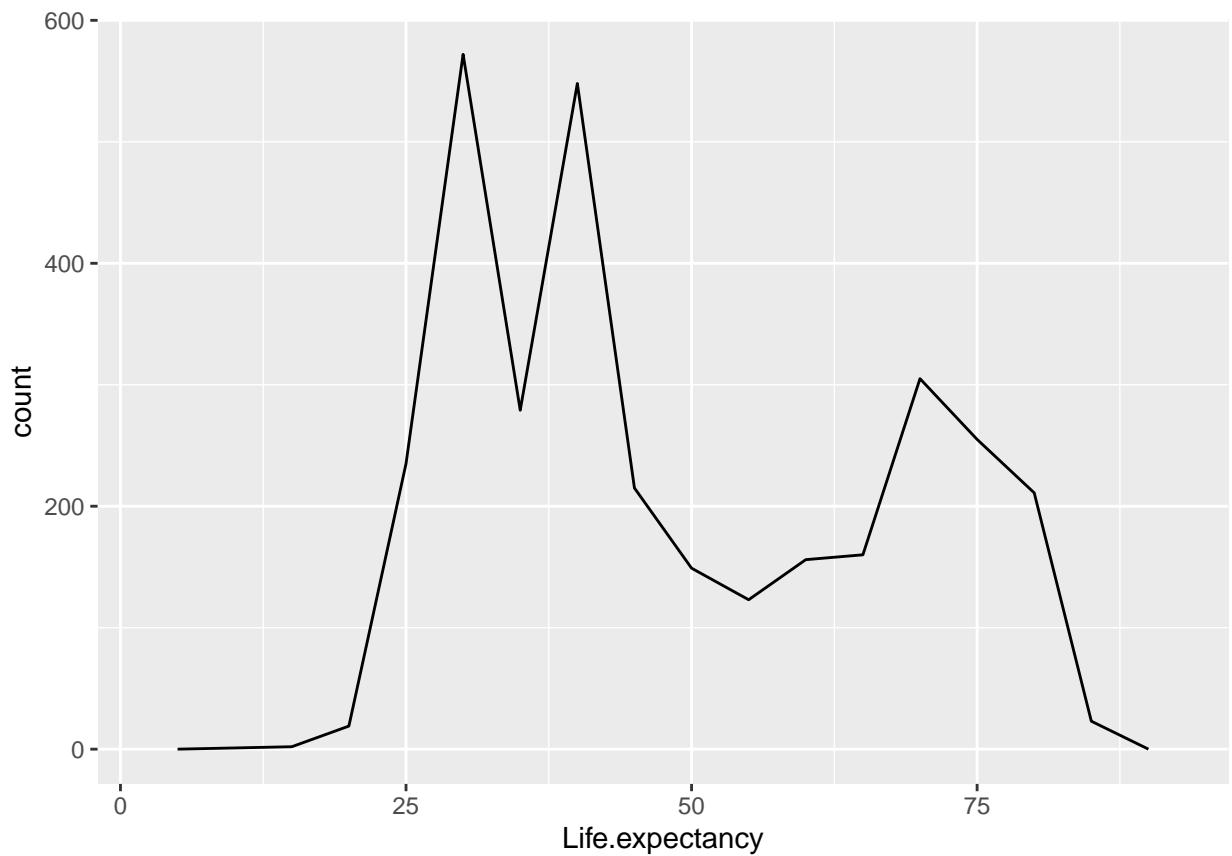


```
ggplot(df, aes(x=Year)) +  
  geom_freqpoly()
```

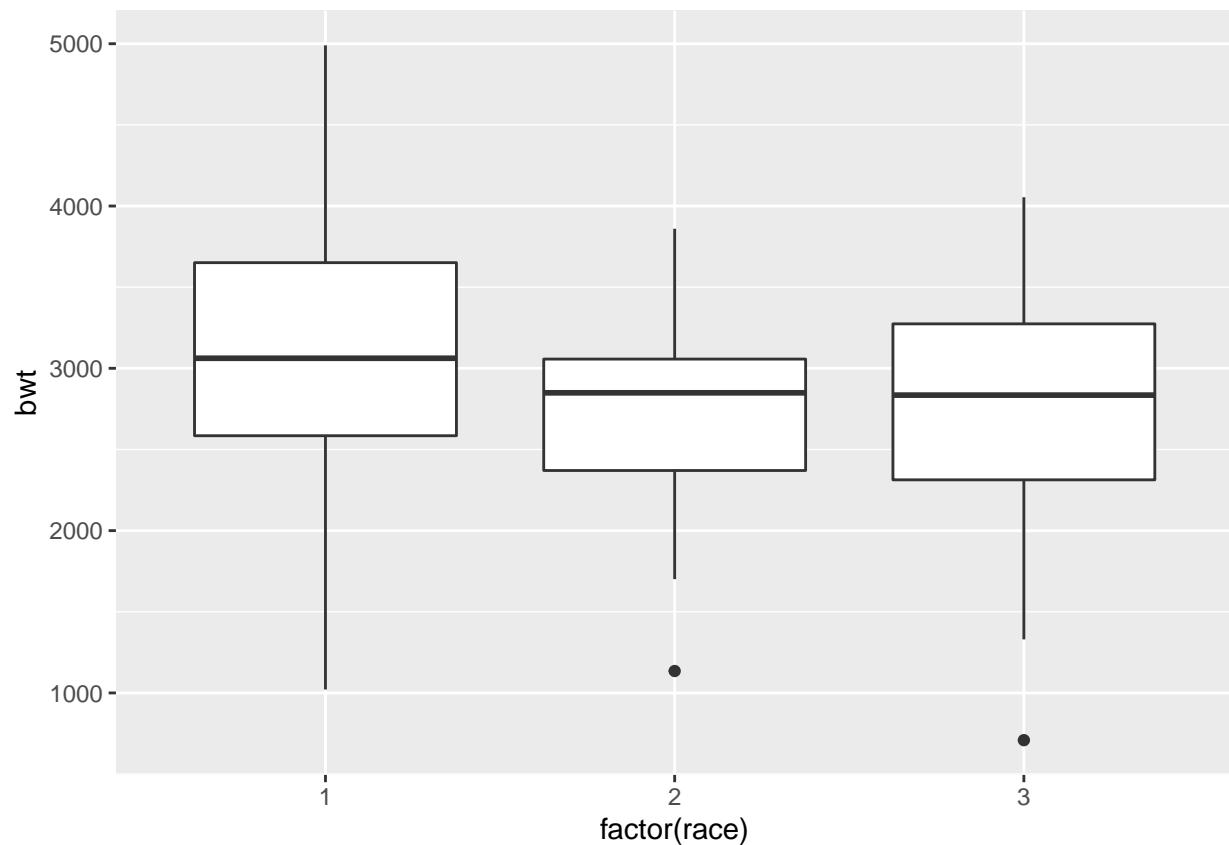
```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```



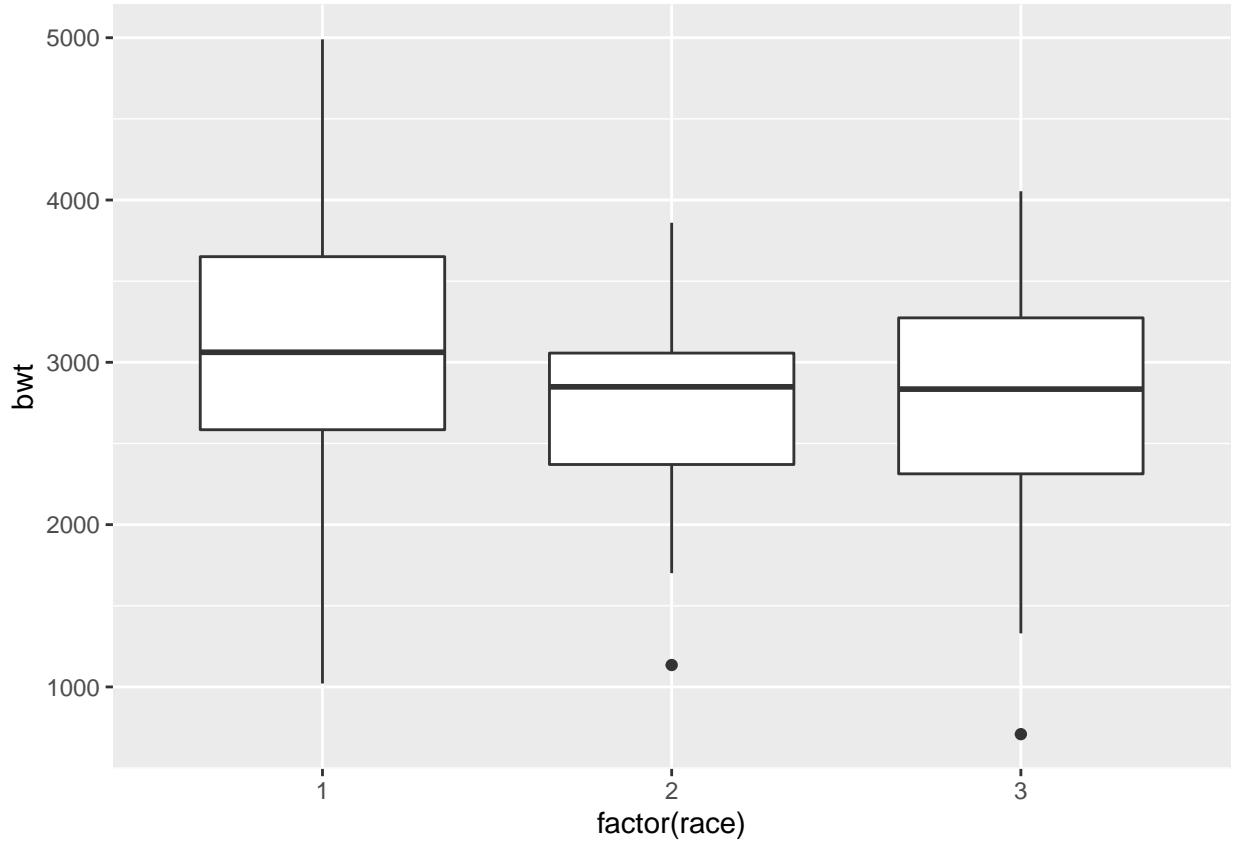
```
ggplot(df, aes(x = Life.expectancy)) +  
  geom_freqpoly(binwidth = 5)
```



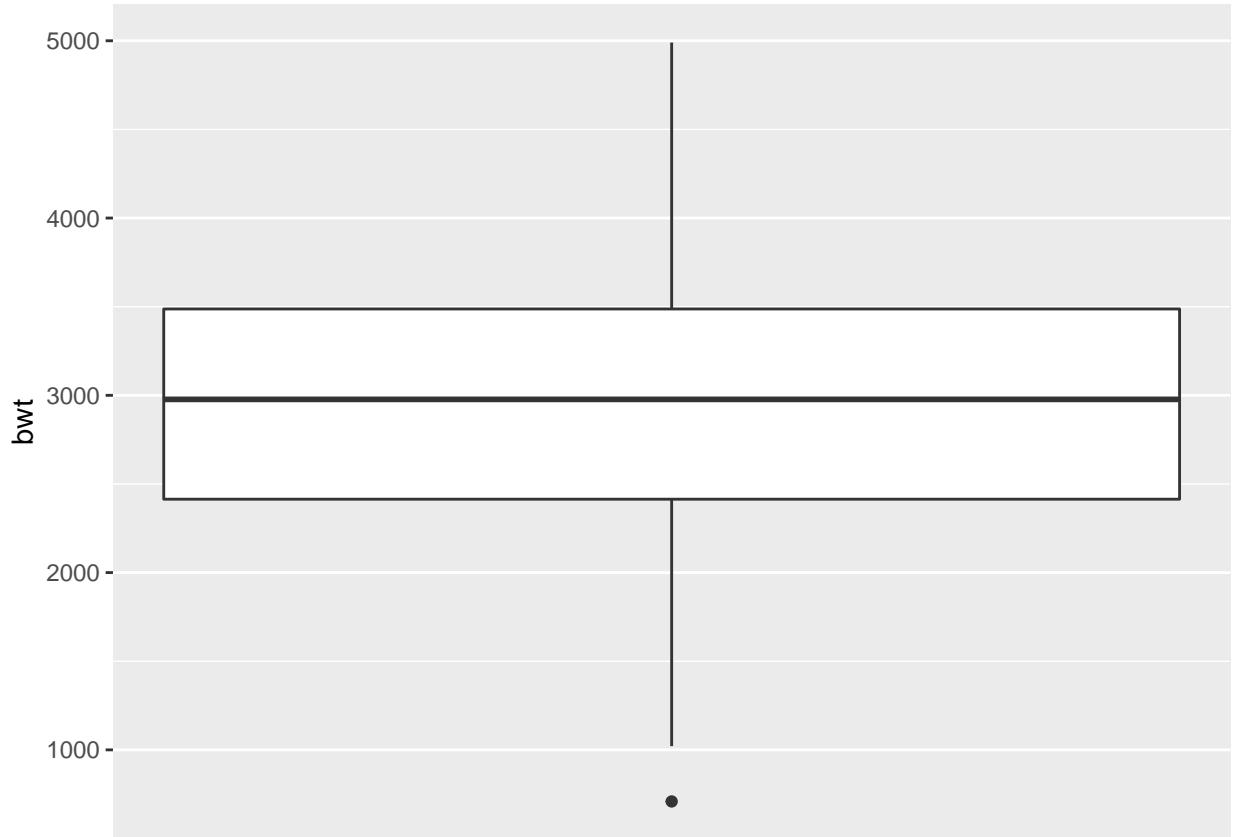
```
ggplot(birthwt, aes(x = factor(race), y = bwt)) +  
  geom_boxplot()
```



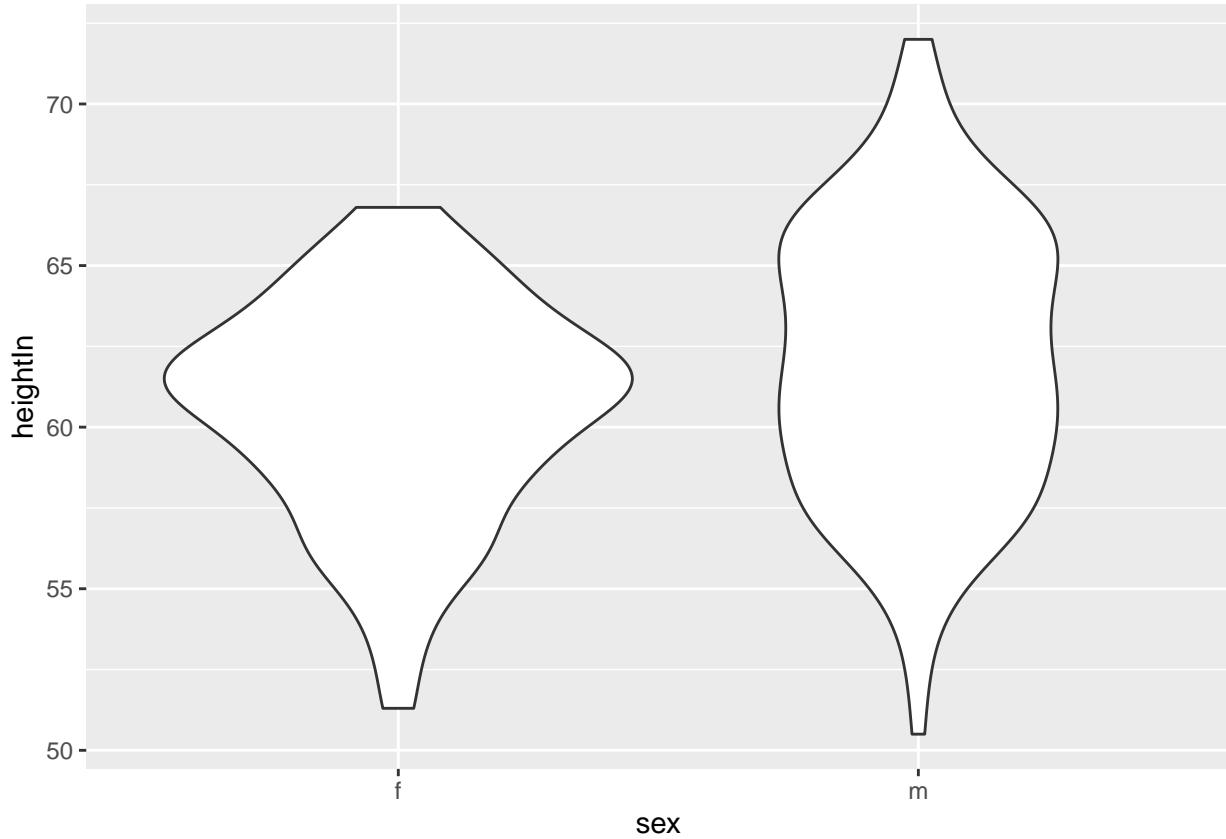
```
ggplot(birthwt, aes(x = factor(race), y = bwt)) +  
  geom_boxplot(width = .7)
```



```
ggplot(birthwt, aes(x = 1, y = bwt)) +  
  geom_boxplot() +  
  scale_x_continuous(breaks = NULL) +  
  theme(axis.title.x = element_blank())
```

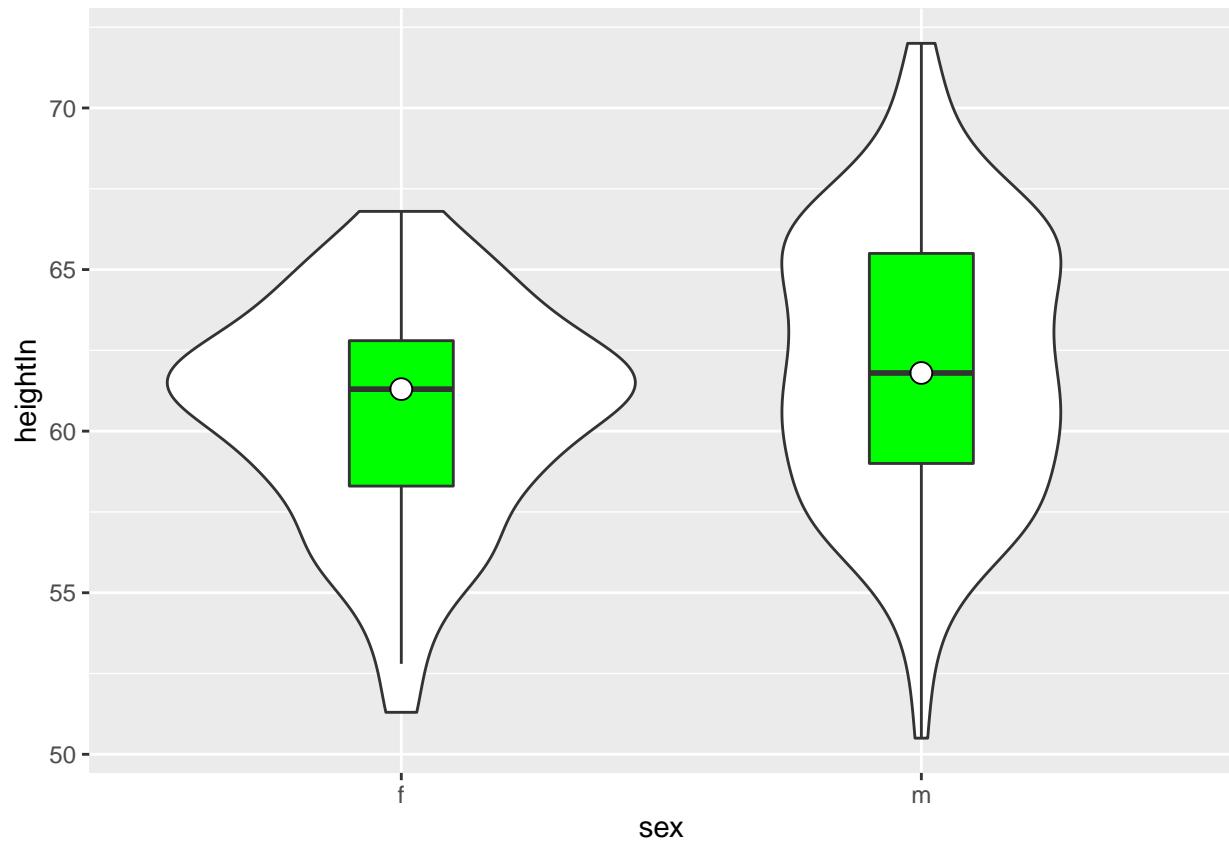


```
hw_ <- ggplot(heightweight, aes(x = sex, y = heightIn))  
hw_ +  
  geom_violin()
```

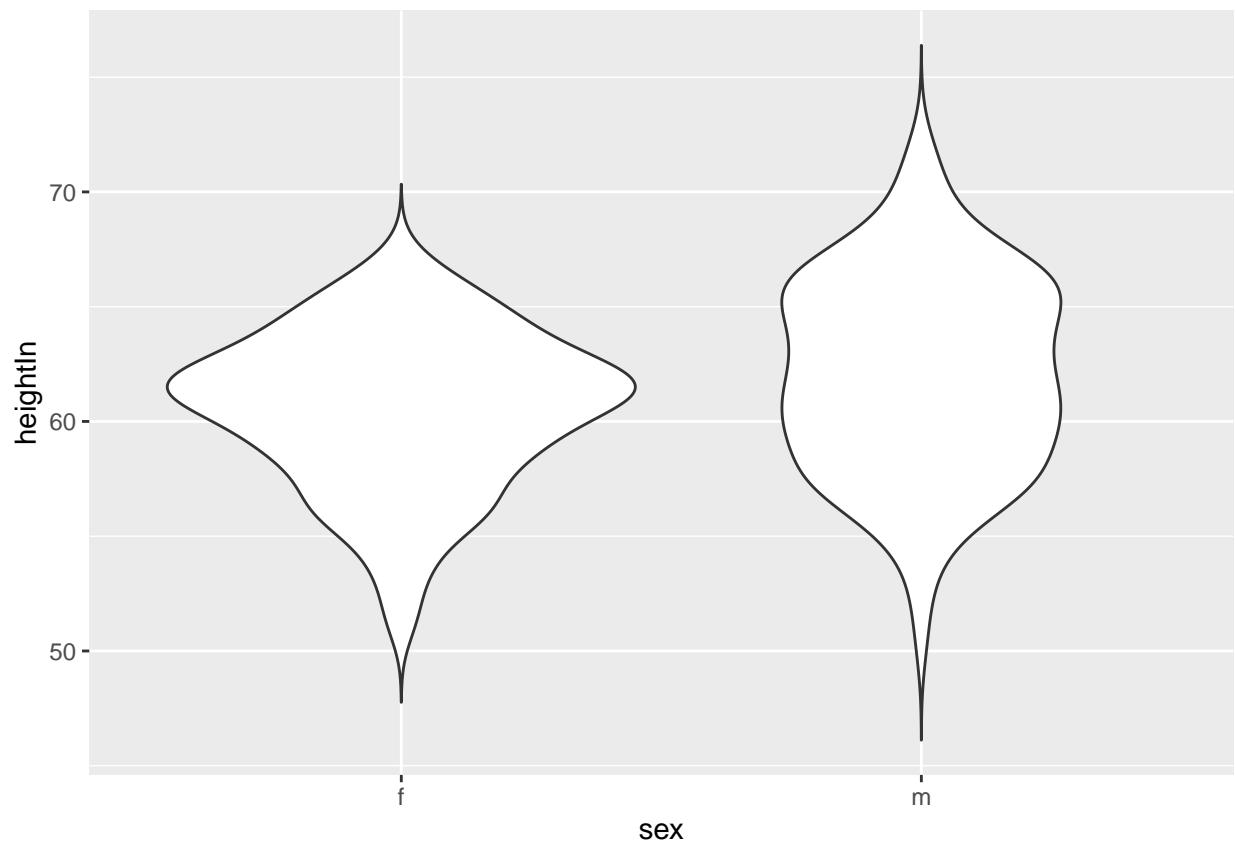


```
hw_ +
geom_violin() +
geom_boxplot(width = .2, fill = "green", outlier.colour = NA) +
stat_summary(fun.y = median, geom = "point", fill = "white", shape = 21,
size = 3.5)
```

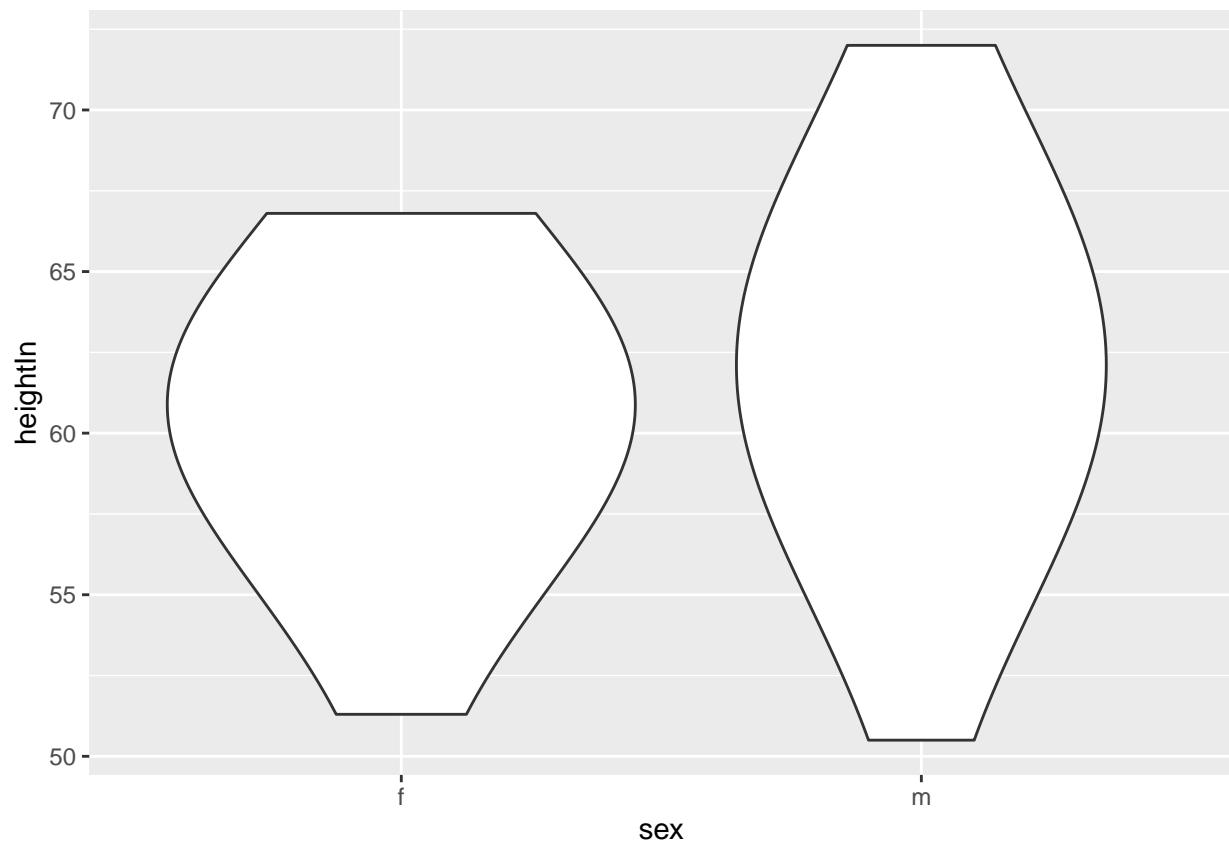
Warning: 'fun.y' is deprecated. Use 'fun' instead.



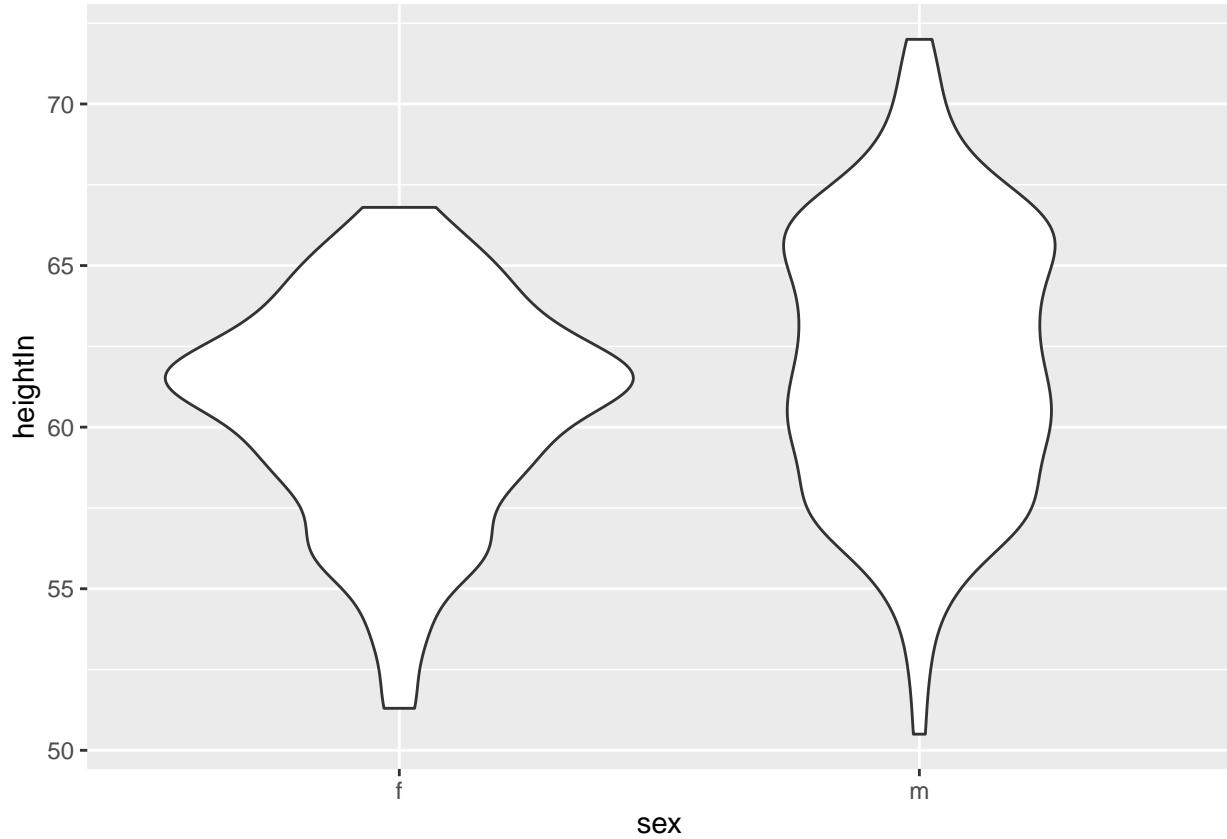
```
hw_ +  
geom_violin(trim = FALSE)
```



```
hw_ +  
geom_violin(adjust = 4)
```

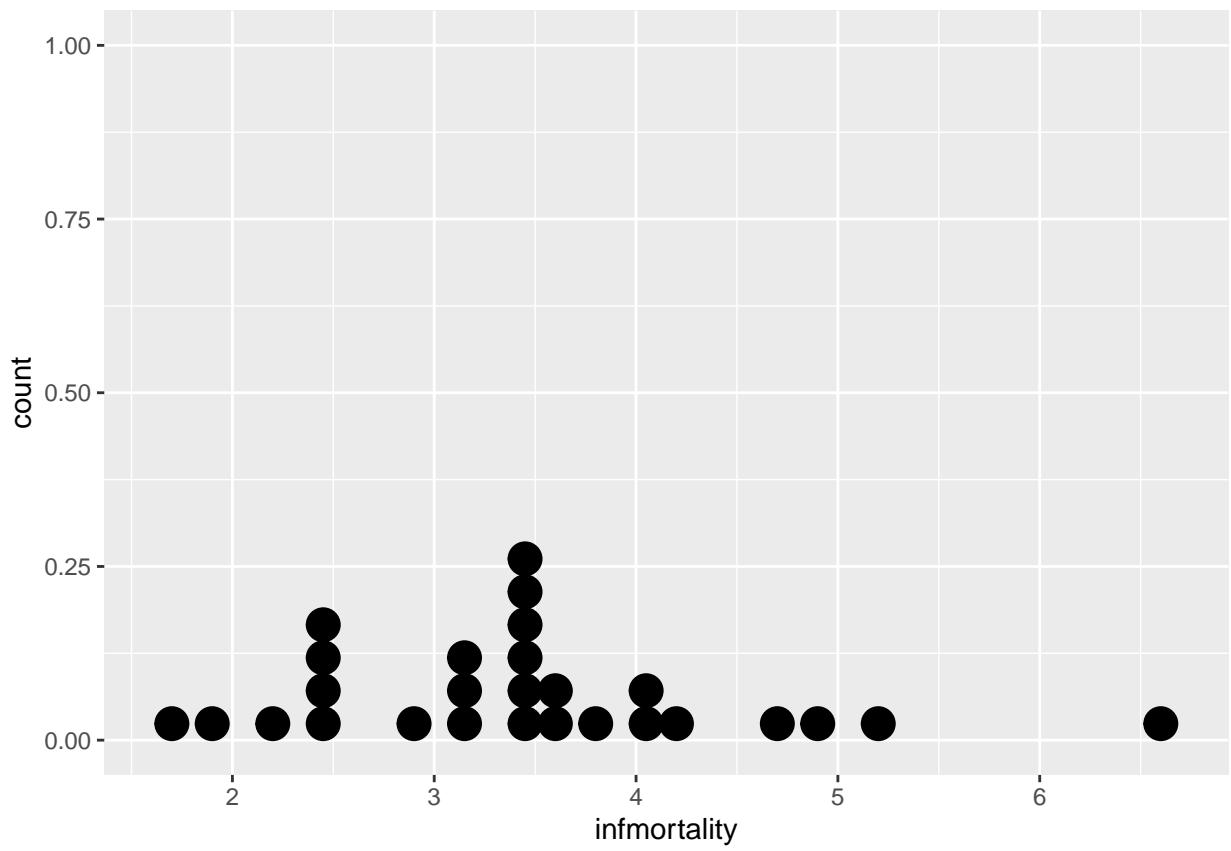


```
hw_ +  
geom_violin(adjust = .8)
```

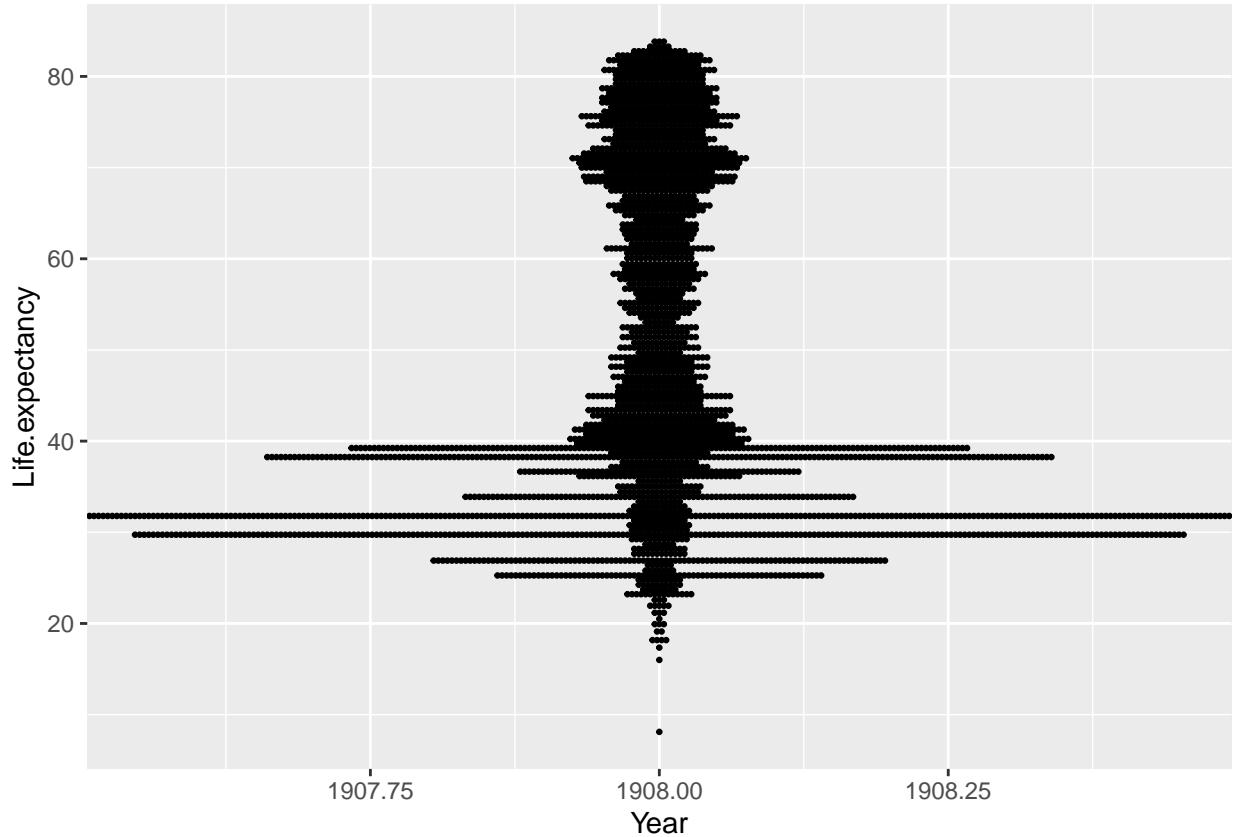


```
c <- countries %>%
filter(Year == 2009 & healthexp > 2000)
c_p <- ggplot(c, aes(x = infmortality))
c_p +
geom_dotplot()
```

```
## Bin width defaults to 1/30 of the range of the data. Pick better value with 'binwidth'.
```

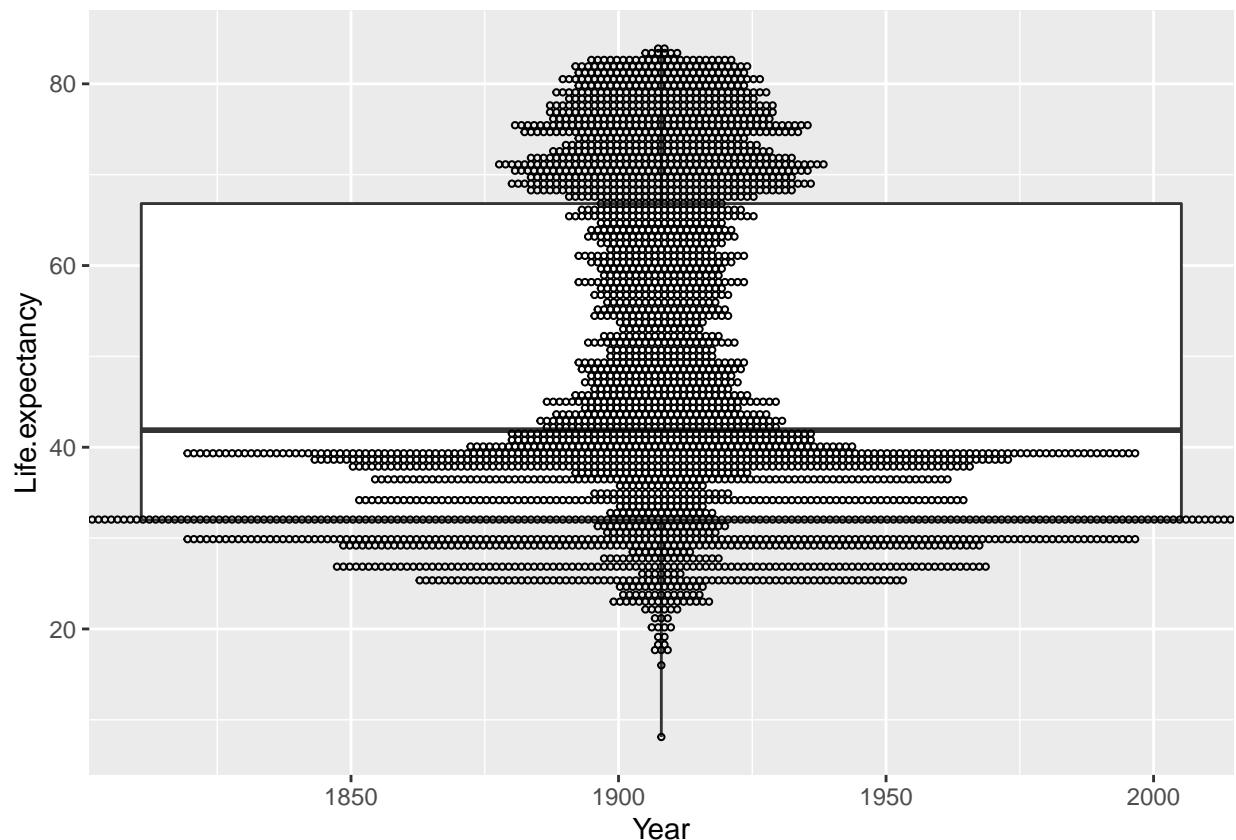


```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_dotplot(binaxis = "y", binwidth = .5, stackdir = "center")
```

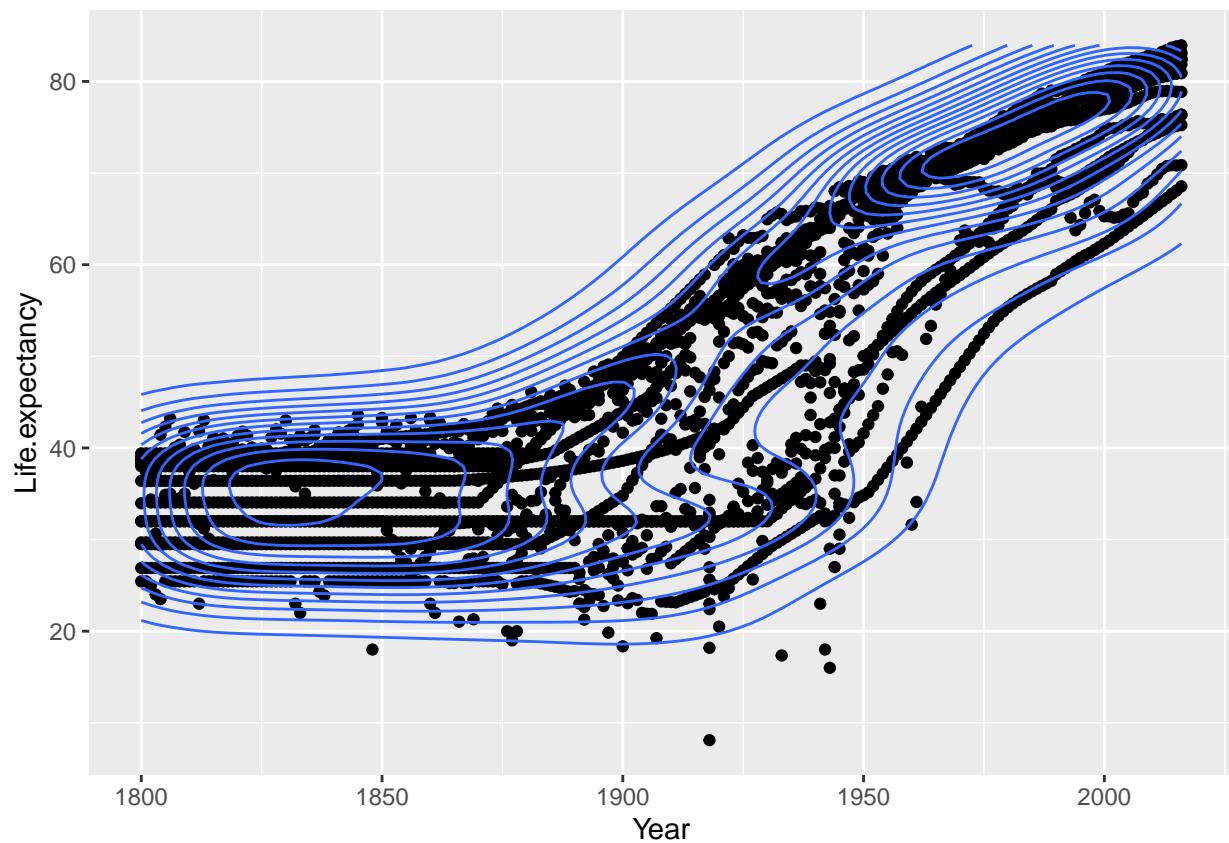


```
ggplot(df, aes(x = Year, y = Life.expectancy)) +  
  geom_boxplot(outlier.colour = NA, width = .6) +  
  geom_dotplot(binaxis = "y", binwidth = .7, stackdir = "center", fill = NA)
```

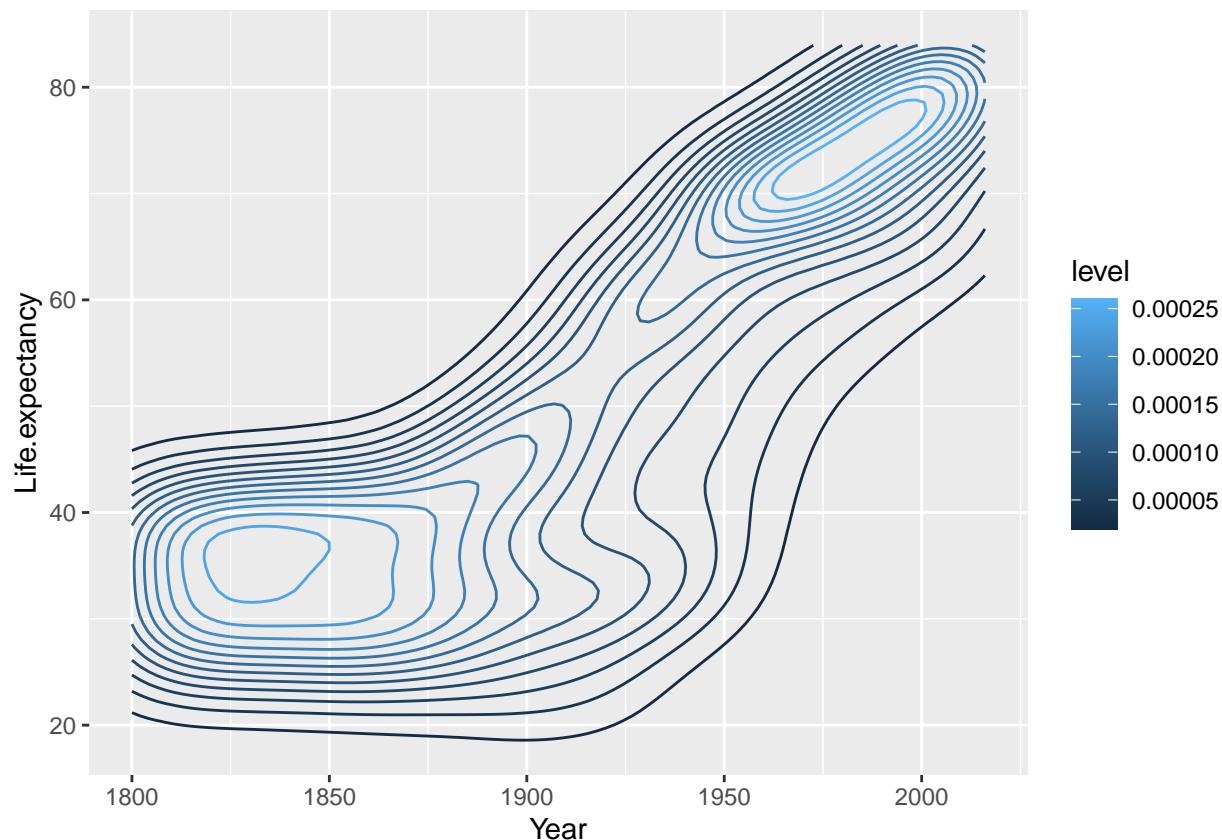
```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?
```



```
faith <- ggplot(df, aes(x = Year, y = Life.expectancy))  
faith +  
  geom_point() +  
  stat_density2d()
```



```
faith +
stat_density2d(aes(colour = ..level..))
```



```
faith +  
stat_density2d(aes(fill = ..density..), geom = "raster", contour = FALSE)
```

