

Lab 4 - Multinomial Regression - Questions

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2025-03-01

Lab Goal: Predict voting frequency using demographic variables Data source: FiveThirtyEight “Why Many Americans Don’t Vote” survey Method: Multinomial logistic regression

0.1 Data

The data for this assignment comes from an online Ipsos survey that was conducted for the FiveThirtyEight article “[Why Many Americans Don’t Vote](#)”. You can read more about the survey design and respondents in the README of the [GitHub repo](#) for the data.

Respondents were asked a variety of questions about their political beliefs, thoughts on multiple issues, and voting behavior. We will focus on using the demographic variables and someone’s party identification to understand whether a person is a probable voter.

The variables we’ll focus on were (definitions from the codebook in data set GitHub repo):

- **ppage**: Age of respondent
- **educ**: Highest educational attainment category.
- **race**: Race of respondent, census categories. Note: all categories except Hispanic were non-Hispanic.
- **gender**: Gender of respondent
- **income_cat**: Household income category of respondent
- **Q30**: Response to the question “Generally speaking, do you think of yourself as a...”
 - 1: Republican
 - 2: Democrat
 - 3: Independent
 - 4: Another party, please specify
 - 5: No preference

- -1: No response
- **voter_category**: past voting behavior:
 - **always**: respondent voted in all or all-but-one of the elections they were eligible in
 - **sporadic**: respondent voted in at least two, but fewer than all-but-one of the elections they were eligible in
 - **rarely/never**: respondent voted in 0 or 1 of the elections they were eligible in

You can read in the data directly from the GitHub repo:

```
library(nnet)
library(car)
library(tidyverse)
library(emmeans)
library(ggeffects)
library(knitr)
library(patchwork)
library(broom)
library(parameters)
library(easystats)
```

```
voter_data <- read.csv("https://raw.githubusercontent.com/fivethirtyeight/data/master/non-voter")
```

1 Lab

- The variable Q30 contains the respondent’s political party identification. Make a new variable that simplifies Q30 into four categories: “Democrat”, “Republican”, “Independent”, “Other” (“Other” also includes respondents who did not answer the question).

```
voter_data <- voter_data %>%
  mutate(pol_ident_new = case_when(
    Q30==1 ~ "Republican",
    Q30==2 ~ "Democrat",
    Q30==3 ~ "Independent",
    TRUE ~ "Other"
  ))

#voter_data$pol_ident_new
```

- The variable **voter_category** identifies the respondent’s past voter behavior. Relevel the variable to make rarely/never the baseline level, followed by sporadic, then always

```
#Enter your code
voter_data$voter_category
```

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[1133]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[1137]	"sporadic"	"sporadic"	"always"	"sporadic"
[1141]	"rarely/never"	"always"	"sporadic"	"always"
[1145]	"sporadic"	"rarely/never"	"always"	"sporadic"
[1149]	"rarely/never"	"sporadic"	"sporadic"	"always"
[1153]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1157]	"always"	"always"	"sporadic"	"always"
[1161]	"sporadic"	"rarely/never"	"sporadic"	"always"
[1165]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[1169]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[1173]	"sporadic"	"always"	"sporadic"	"rarely/never"
[1177]	"always"	"sporadic"	"sporadic"	"rarely/never"
[1181]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[1185]	"sporadic"	"rarely/never"	"rarely/never"	"rarely/never"

[1189]	"sporadic"	"sporadic"	"always"	"sporadic"
[1193]	"always"	"sporadic"	"sporadic"	"always"
[1197]	"always"	"sporadic"	"rarely/never"	"sporadic"
[1201]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
[1205]	"sporadic"	"always"	"rarely/never"	"always"
[1209]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
[1213]	"sporadic"	"always"	"rarely/never"	"always"
[1217]	"sporadic"	"always"	"sporadic"	"sporadic"
[1221]	"rarely/never"	"sporadic"	"always"	"sporadic"
[1225]	"sporadic"	"always"	"always"	"sporadic"
[1229]	"sporadic"	"always"	"sporadic"	"sporadic"
[1233]	"sporadic"	"always"	"sporadic"	"always"
[1237]	"sporadic"	"always"	"sporadic"	"rarely/never"
[1241]	"sporadic"	"always"	"sporadic"	"always"
[1245]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[1249]	"always"	"sporadic"	"always"	"sporadic"
[1253]	"sporadic"	"sporadic"	"always"	"always"
[1257]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1261]	"rarely/never"	"sporadic"	"always"	"always"
[1265]	"always"	"always"	"sporadic"	"sporadic"
[1269]	"always"	"always"	"rarely/never"	"always"
[1273]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[1277]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1281]	"sporadic"	"sporadic"	"sporadic"	"always"
[1285]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1289]	"sporadic"	"sporadic"	"always"	"always"
[1293]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1297]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
[1301]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[1305]	"sporadic"	"sporadic"	"always"	"sporadic"
[1309]	"rarely/never"	"always"	"always"	"sporadic"
[1313]	"sporadic"	"always"	"sporadic"	"sporadic"
[1317]	"rarely/never"	"sporadic"	"always"	"always"
[1321]	"always"	"sporadic"	"rarely/never"	"sporadic"
[1325]	"always"	"always"	"always"	"always"
[1329]	"always"	"sporadic"	"sporadic"	"sporadic"
[1333]	"rarely/never"	"rarely/never"	"rarely/never"	"always"
[1337]	"always"	"sporadic"	"sporadic"	"rarely/never"
[1341]	"sporadic"	"sporadic"	"always"	"sporadic"
[1345]	"always"	"rarely/never"	"always"	"sporadic"
[1349]	"always"	"sporadic"	"sporadic"	"sporadic"
[1353]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1357]	"always"	"sporadic"	"sporadic"	"rarely/never"

[1361]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[1365]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1369]	"always"	"rarely/never"	"sporadic"	"sporadic"
[1373]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[1377]	"always"	"always"	"rarely/never"	"sporadic"
[1381]	"always"	"always"	"sporadic"	"sporadic"
[1385]	"always"	"sporadic"	"sporadic"	"rarely/never"
[1389]	"always"	"sporadic"	"rarely/never"	"sporadic"
[1393]	"always"	"always"	"rarely/never"	"sporadic"
[1397]	"sporadic"	"rarely/never"	"always"	"sporadic"
[1401]	"sporadic"	"sporadic"	"rarely/never"	"always"
[1405]	"sporadic"	"always"	"sporadic"	"sporadic"
[1409]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1413]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[1417]	"always"	"sporadic"	"sporadic"	"sporadic"
[1421]	"sporadic"	"always"	"rarely/never"	"always"
[1425]	"sporadic"	"sporadic"	"sporadic"	"always"
[1429]	"always"	"sporadic"	"always"	"always"
[1433]	"sporadic"	"always"	"sporadic"	"rarely/never"
[1437]	"always"	"always"	"always"	"always"
[1441]	"rarely/never"	"always"	"rarely/never"	"sporadic"
[1445]	"always"	"sporadic"	"always"	"rarely/never"
[1449]	"always"	"sporadic"	"always"	"sporadic"
[1453]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[1457]	"always"	"always"	"sporadic"	"always"
[1461]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[1465]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1469]	"always"	"sporadic"	"always"	"sporadic"
[1473]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[1477]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[1481]	"rarely/never"	"sporadic"	"rarely/never"	"rarely/never"
[1485]	"sporadic"	"sporadic"	"sporadic"	"always"
[1489]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
[1493]	"sporadic"	"rarely/never"	"always"	"sporadic"
[1497]	"sporadic"	"sporadic"	"sporadic"	"always"
[1501]	"always"	"always"	"sporadic"	"always"
[1505]	"always"	"always"	"sporadic"	"sporadic"
[1509]	"rarely/never"	"sporadic"	"rarely/never"	"always"
[1513]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1517]	"sporadic"	"always"	"sporadic"	"rarely/never"
[1521]	"always"	"rarely/never"	"rarely/never"	"rarely/never"
[1525]	"always"	"always"	"rarely/never"	"sporadic"
[1529]	"sporadic"	"always"	"rarely/never"	"always"

[1533]	"sporadic"	"always"	"sporadic"	"always"
[1537]	"rarely/never"	"always"	"sporadic"	"always"
[1541]	"always"	"sporadic"	"sporadic"	"always"
[1545]	"always"	"sporadic"	"always"	"always"
[1549]	"always"	"always"	"sporadic"	"sporadic"
[1553]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[1557]	"sporadic"	"sporadic"	"always"	"sporadic"
[1561]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[1565]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[1569]	"sporadic"	"always"	"sporadic"	"always"
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[1577]	"always"	"rarely/never"	"rarely/never"	"always"
[1581]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[1585]	"always"	"always"	"always"	"rarely/never"
[1589]	"rarely/never"	"sporadic"	"rarely/never"	"always"
[1593]	"sporadic"	"always"	"sporadic"	"sporadic"
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[1601]	"sporadic"	"sporadic"	"always"	"sporadic"
[1605]	"always"	"sporadic"	"always"	"sporadic"
[1609]	"rarely/never"	"always"	"rarely/never"	"always"
[1613]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1617]	"always"	"sporadic"	"always"	"sporadic"
[1621]	"rarely/never"	"sporadic"	"rarely/never"	"always"
[1625]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
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[1633]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[1637]	"sporadic"	"sporadic"	"sporadic"	"always"
[1641]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1645]	"sporadic"	"always"	"always"	"sporadic"
[1649]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1653]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[1657]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
[1661]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1665]	"sporadic"	"always"	"always"	"sporadic"
[1669]	"always"	"rarely/never"	"always"	"always"
[1673]	"sporadic"	"always"	"always"	"always"
[1677]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1681]	"rarely/never"	"sporadic"	"sporadic"	"always"
[1685]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[1689]	"always"	"sporadic"	"sporadic"	"sporadic"
[1693]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
[1697]	"always"	"sporadic"	"sporadic"	"sporadic"
[1701]	"rarely/never"	"sporadic"	"sporadic"	"always"

[1705]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[1709]	"rarely/never"	"always"	"always"	"sporadic"
[1713]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1717]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1721]	"rarely/never"	"sporadic"	"rarely/never"	"always"
[1725]	"always"	"rarely/never"	"sporadic"	"sporadic"
[1729]	"rarely/never"	"sporadic"	"always"	"rarely/never"
[1733]	"rarely/never"	"sporadic"	"always"	"always"
[1737]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[1741]	"sporadic"	"sporadic"	"rarely/never"	"always"
[1745]	"always"	"always"	"sporadic"	"always"
[1749]	"always"	"always"	"sporadic"	"sporadic"
[1753]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[1757]	"rarely/never"	"rarely/never"	"sporadic"	"always"
[1761]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[1765]	"rarely/never"	"rarely/never"	"rarely/never"	"always"
[1769]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[1773]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[1777]	"sporadic"	"rarely/never"	"always"	"always"
[1781]	"always"	"rarely/never"	"always"	"rarely/never"
[1785]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[1789]	"rarely/never"	"always"	"sporadic"	"always"
[1793]	"sporadic"	"sporadic"	"sporadic"	"always"
[1797]	"always"	"always"	"sporadic"	"rarely/never"
[1801]	"rarely/never"	"always"	"always"	"sporadic"
[1805]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1809]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[1813]	"always"	"sporadic"	"sporadic"	"sporadic"
[1817]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1821]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1825]	"always"	"always"	"sporadic"	"sporadic"
[1829]	"sporadic"	"always"	"rarely/never"	"sporadic"
[1833]	"rarely/never"	"sporadic"	"always"	"always"
[1837]	"always"	"sporadic"	"always"	"rarely/never"
[1841]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1845]	"sporadic"	"always"	"sporadic"	"always"
[1849]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1853]	"always"	"always"	"sporadic"	"sporadic"
[1857]	"sporadic"	"sporadic"	"always"	"always"
[1861]	"always"	"sporadic"	"always"	"rarely/never"
[1865]	"sporadic"	"always"	"sporadic"	"sporadic"
[1869]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[1873]	"always"	"always"	"sporadic"	"sporadic"

[1877]	"always"	"always"	"always"	"always"
[1881]	"sporadic"	"sporadic"	"sporadic"	"always"
[1885]	"always"	"always"	"always"	"sporadic"
[1889]	"sporadic"	"rarely/never"	"sporadic"	"always"
[1893]	"always"	"sporadic"	"always"	"always"
[1897]	"always"	"always"	"always"	"rarely/never"
[1901]	"sporadic"	"rarely/never"	"always"	"rarely/never"
[1905]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[1909]	"sporadic"	"sporadic"	"rarely/never"	"always"
[1913]	"sporadic"	"always"	"sporadic"	"always"
[1917]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1921]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
[1925]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1929]	"always"	"sporadic"	"sporadic"	"always"
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[1937]	"sporadic"	"sporadic"	"rarely/never"	"always"
[1941]	"rarely/never"	"sporadic"	"always"	"always"
[1945]	"always"	"sporadic"	"sporadic"	"rarely/never"
[1949]	"sporadic"	"sporadic"	"sporadic"	"always"
[1953]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1957]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[1961]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[1965]	"rarely/never"	"always"	"sporadic"	"sporadic"
[1969]	"rarely/never"	"rarely/never"	"always"	"always"
[1973]	"rarely/never"	"always"	"always"	"sporadic"
[1977]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[1981]	"sporadic"	"always"	"always"	"sporadic"
[1985]	"always"	"sporadic"	"sporadic"	"sporadic"
[1989]	"sporadic"	"always"	"always"	"always"
[1993]	"sporadic"	"rarely/never"	"always"	"sporadic"
[1997]	"always"	"rarely/never"	"rarely/never"	"always"
[2001]	"sporadic"	"always"	"always"	"sporadic"
[2005]	"always"	"always"	"always"	"sporadic"
[2009]	"rarely/never"	"sporadic"	"always"	"always"
[2013]	"always"	"rarely/never"	"sporadic"	"sporadic"
[2017]	"rarely/never"	"sporadic"	"always"	"sporadic"
[2021]	"always"	"always"	"always"	"sporadic"
[2025]	"always"	"sporadic"	"always"	"always"
[2029]	"always"	"sporadic"	"sporadic"	"rarely/never"
[2033]	"always"	"sporadic"	"sporadic"	"sporadic"
[2037]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[2041]	"always"	"always"	"sporadic"	"sporadic"
[2045]	"sporadic"	"always"	"sporadic"	"always"

[2049]	"sporadic"	"sporadic"	"sporadic"	"always"
[2053]	"sporadic"	"rarely/never"	"always"	"always"
[2057]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[2061]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[2065]	"always"	"rarely/never"	"sporadic"	"rarely/never"
[2069]	"sporadic"	"always"	"sporadic"	"sporadic"
[2073]	"always"	"sporadic"	"sporadic"	"always"
[2077]	"sporadic"	"sporadic"	"always"	"always"
[2081]	"sporadic"	"always"	"sporadic"	"sporadic"
[2085]	"sporadic"	"always"	"sporadic"	"rarely/never"
[2089]	"sporadic"	"sporadic"	"always"	"rarely/never"
[2093]	"sporadic"	"always"	"sporadic"	"rarely/never"
[2097]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[2101]	"rarely/never"	"always"	"rarely/never"	"sporadic"
[2105]	"always"	"sporadic"	"sporadic"	"sporadic"
[2109]	"always"	"always"	"sporadic"	"rarely/never"
[2113]	"rarely/never"	"sporadic"	"rarely/never"	"rarely/never"
[2117]	"rarely/never"	"sporadic"	"always"	"sporadic"
[2121]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[2125]	"always"	"rarely/never"	"sporadic"	"sporadic"
[2129]	"sporadic"	"always"	"sporadic"	"sporadic"
[2133]	"sporadic"	"always"	"sporadic"	"always"
[2137]	"always"	"rarely/never"	"always"	"always"
[2141]	"sporadic"	"always"	"sporadic"	"rarely/never"
[2145]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[2149]	"always"	"always"	"always"	"sporadic"
[2153]	"always"	"sporadic"	"rarely/never"	"rarely/never"
[2157]	"always"	"rarely/never"	"rarely/never"	"always"
[2161]	"sporadic"	"always"	"always"	"always"
[2165]	"sporadic"	"sporadic"	"sporadic"	"always"
[2169]	"sporadic"	"sporadic"	"sporadic"	"always"
[2173]	"sporadic"	"rarely/never"	"always"	"always"
[2177]	"always"	"always"	"always"	"rarely/never"
[2181]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[2185]	"sporadic"	"sporadic"	"rarely/never"	"always"
[2189]	"sporadic"	"sporadic"	"always"	"sporadic"
[2193]	"rarely/never"	"always"	"rarely/never"	"sporadic"
[2197]	"sporadic"	"always"	"sporadic"	"always"
[2201]	"rarely/never"	"always"	"sporadic"	"sporadic"
[2205]	"rarely/never"	"rarely/never"	"always"	"always"
[2209]	"always"	"sporadic"	"rarely/never"	"always"
[2213]	"always"	"sporadic"	"sporadic"	"sporadic"
[2217]	"sporadic"	"always"	"always"	"always"

[2221]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[2225]	"rarely/never"	"always"	"always"	"always"
[2229]	"always"	"rarely/never"	"always"	"sporadic"
[2233]	"rarely/never"	"sporadic"	"always"	"always"
[2237]	"always"	"always"	"sporadic"	"always"
[2241]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[2245]	"rarely/never"	"sporadic"	"always"	"sporadic"
[2249]	"always"	"always"	"rarely/never"	"sporadic"
[2253]	"rarely/never"	"always"	"sporadic"	"sporadic"
[2257]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[2261]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[2265]	"sporadic"	"always"	"rarely/never"	"always"
[2269]	"sporadic"	"sporadic"	"rarely/never"	"always"
[2273]	"sporadic"	"always"	"sporadic"	"rarely/never"
[2277]	"always"	"sporadic"	"always"	"sporadic"
[2281]	"rarely/never"	"always"	"sporadic"	"always"
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[2289]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[2293]	"sporadic"	"always"	"always"	"always"
[2297]	"sporadic"	"sporadic"	"rarely/never"	"always"
[2301]	"sporadic"	"always"	"sporadic"	"sporadic"
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[2309]	"always"	"sporadic"	"rarely/never"	"sporadic"
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[2317]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[2321]	"sporadic"	"sporadic"	"always"	"rarely/never"
[2325]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[2329]	"always"	"sporadic"	"rarely/never"	"sporadic"
[2333]	"rarely/never"	"rarely/never"	"always"	"always"
[2337]	"always"	"always"	"always"	"rarely/never"
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[2345]	"sporadic"	"sporadic"	"always"	"always"
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[2353]	"sporadic"	"rarely/never"	"rarely/never"	"always"
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[2369]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
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[2377]	"always"	"sporadic"	"sporadic"	"sporadic"
[2381]	"rarely/never"	"always"	"always"	"sporadic"
[2385]	"sporadic"	"rarely/never"	"always"	"always"
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[2393]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[2397]	"sporadic"	"rarely/never"	"rarely/never"	"rarely/never"
[2401]	"rarely/never"	"always"	"always"	"always"
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[2413]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[2417]	"rarely/never"	"always"	"always"	"always"
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[2469]	"sporadic"	"sporadic"	"always"	"always"
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[2477]	"always"	"always"	"sporadic"	"sporadic"
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[2485]	"always"	"sporadic"	"always"	"sporadic"
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[2497]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
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[2509]	"sporadic"	"sporadic"	"always"	"rarely/never"
[2513]	"sporadic"	"rarely/never"	"always"	"rarely/never"
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[2589]	"always"	"sporadic"	"sporadic"	"sporadic"
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[2601]	"rarely/never"	"always"	"sporadic"	"sporadic"
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[2737]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[2741]	"rarely/never"	"sporadic"	"always"	"rarely/never"
[2745]	"rarely/never"	"always"	"sporadic"	"sporadic"
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[2893]	"always"	"sporadic"	"always"	"sporadic"
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[2901]	"sporadic"	"sporadic"	"always"	"sporadic"
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[2921]	"rarely/never"	"sporadic"	"rarely/never"	"always"
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[2937]	"always"	"rarely/never"	"always"	"rarely/never"
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[2957]	"sporadic"	"rarely/never"	"sporadic"	"always"
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[3029]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
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[3041]	"rarely/never"	"always"	"rarely/never"	"rarely/never"
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[3069]	"always"	"always"	"rarely/never"	"always"
[3073]	"sporadic"	"always"	"sporadic"	"sporadic"
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[3141]	"rarely/never"	"always"	"always"	"always"
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[3225]	"rarely/never"	"always"	"sporadic"	"rarely/never"
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[3237]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
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[3245]	"sporadic"	"always"	"sporadic"	"sporadic"
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[3281]	"sporadic"	"always"	"sporadic"	"always"
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[3353]	"sporadic"	"sporadic"	"always"	"sporadic"
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[3361]	"always"	"rarely/never"	"sporadic"	"sporadic"
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[3389]	"always"	"sporadic"	"sporadic"	"sporadic"
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[3405]	"rarely/never"	"always"	"rarely/never"	"sporadic"
[3409]	"sporadic"	"sporadic"	"always"	"always"
[3413]	"always"	"always"	"always"	"rarely/never"
[3417]	"sporadic"	"sporadic"	"rarely/never"	"always"
[3421]	"sporadic"	"sporadic"	"always"	"sporadic"

[3425]	"sporadic"	"always"	"sporadic"	"always"
[3429]	"always"	"sporadic"	"sporadic"	"always"
[3433]	"rarely/never"	"sporadic"	"always"	"sporadic"
[3437]	"sporadic"	"always"	"always"	"sporadic"
[3441]	"sporadic"	"sporadic"	"sporadic"	"always"
[3445]	"always"	"sporadic"	"always"	"sporadic"
[3449]	"always"	"always"	"sporadic"	"always"
[3453]	"always"	"sporadic"	"sporadic"	"rarely/never"
[3457]	"rarely/never"	"sporadic"	"sporadic"	"always"
[3461]	"sporadic"	"always"	"always"	"sporadic"
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[3469]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[3473]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[3477]	"always"	"always"	"always"	"sporadic"
[3481]	"sporadic"	"always"	"sporadic"	"always"
[3485]	"always"	"sporadic"	"rarely/never"	"sporadic"
[3489]	"always"	"always"	"sporadic"	"rarely/never"
[3493]	"always"	"always"	"always"	"rarely/never"
[3497]	"sporadic"	"sporadic"	"sporadic"	"always"
[3501]	"sporadic"	"rarely/never"	"sporadic"	"always"
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[3509]	"always"	"rarely/never"	"sporadic"	"sporadic"
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[3517]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
[3521]	"sporadic"	"always"	"always"	"rarely/never"
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[3529]	"always"	"sporadic"	"rarely/never"	"always"
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[3545]	"sporadic"	"rarely/never"	"always"	"rarely/never"
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[3553]	"rarely/never"	"sporadic"	"always"	"rarely/never"
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[3561]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[3565]	"rarely/never"	"sporadic"	"always"	"sporadic"
[3569]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[3573]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[3577]	"always"	"sporadic"	"rarely/never"	"sporadic"
[3581]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[3585]	"always"	"always"	"rarely/never"	"sporadic"
[3589]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
[3593]	"always"	"sporadic"	"always"	"sporadic"

[3597]	"sporadic"	"rarely/never"	"sporadic"	"always"
[3601]	"always"	"rarely/never"	"always"	"always"
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[3609]	"sporadic"	"always"	"sporadic"	"sporadic"
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[3625]	"always"	"sporadic"	"rarely/never"	"rarely/never"
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[3653]	"sporadic"	"always"	"sporadic"	"sporadic"
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[3669]	"always"	"sporadic"	"sporadic"	"sporadic"
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[3681]	"always"	"rarely/never"	"always"	"rarely/never"
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[3689]	"always"	"always"	"rarely/never"	"always"
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[3697]	"always"	"always"	"sporadic"	"always"
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[3705]	"always"	"sporadic"	"sporadic"	"always"
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[3713]	"rarely/never"	"sporadic"	"rarely/never"	"rarely/never"
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[3721]	"sporadic"	"sporadic"	"always"	"sporadic"
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[3733]	"sporadic"	"sporadic"	"always"	"rarely/never"
[3737]	"always"	"always"	"sporadic"	"sporadic"
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[3745]	"sporadic"	"always"	"always"	"always"
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[3753]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[3757]	"always"	"sporadic"	"rarely/never"	"always"
[3761]	"sporadic"	"rarely/never"	"sporadic"	"always"
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[3769]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
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[3777]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[3781]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[3785]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[3789]	"rarely/never"	"sporadic"	"always"	"rarely/never"
[3793]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
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[3813]	"rarely/never"	"rarely/never"	"sporadic"	"always"
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[3825]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
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[3921]	"sporadic"	"always"	"rarely/never"	"sporadic"
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[3929]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[3933]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
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[3941]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
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[3961]	"always"	"always"	"always"	"always"
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[4005]	"rarely/never"	"sporadic"	"sporadic"	"always"
[4009]	"always"	"sporadic"	"always"	"sporadic"
[4013]	"always"	"sporadic"	"sporadic"	"sporadic"
[4017]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
[4021]	"sporadic"	"rarely/never"	"rarely/never"	"always"
[4025]	"always"	"sporadic"	"rarely/never"	"sporadic"
[4029]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
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[4037]	"sporadic"	"sporadic"	"always"	"sporadic"
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[4069]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
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[4097]	"sporadic"	"always"	"sporadic"	"rarely/never"
[4101]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
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[4121]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[4125]	"sporadic"	"always"	"rarely/never"	"always"
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[4137]	"sporadic"	"rarely/never"	"sporadic"	"always"
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[4149]	"always"	"sporadic"	"always"	"rarely/never"
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[4157]	"sporadic"	"sporadic"	"sporadic"	"always"
[4161]	"rarely/never"	"rarely/never"	"always"	"sporadic"
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[4173]	"sporadic"	"sporadic"	"always"	"rarely/never"
[4177]	"sporadic"	"sporadic"	"always"	"sporadic"
[4181]	"sporadic"	"sporadic"	"always"	"sporadic"
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[4193]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
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[4209]	"sporadic"	"sporadic"	"sporadic"	"always"
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[4225]	"sporadic"	"always"	"always"	"always"
[4229]	"always"	"sporadic"	"sporadic"	"sporadic"
[4233]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
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[4241]	"rarely/never"	"always"	"rarely/never"	"always"
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[4253]	"rarely/never"	"always"	"rarely/never"	"always"
[4257]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
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[4265]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
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[4277]	"always"	"rarely/never"	"always"	"sporadic"
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[4393]	"always"	"always"	"always"	"always"
[4397]	"always"	"rarely/never"	"always"	"always"
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[4425]	"always"	"always"	"always"	"rarely/never"
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[4505]	"sporadic"	"sporadic"	"always"	"rarely/never"
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[4525]	"always"	"always"	"rarely/never"	"always"
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[4533]	"always"	"sporadic"	"rarely/never"	"sporadic"
[4537]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[4541]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[4545]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[4549]	"rarely/never"	"rarely/never"	"rarely/never"	"sporadic"
[4553]	"always"	"always"	"rarely/never"	"rarely/never"
[4557]	"rarely/never"	"rarely/never"	"rarely/never"	"sporadic"
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[4565]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[4569]	"sporadic"	"rarely/never"	"sporadic"	"always"
[4573]	"sporadic"	"rarely/never"	"always"	"rarely/never"
[4577]	"rarely/never"	"rarely/never"	"sporadic"	"always"
[4581]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[4585]	"sporadic"	"always"	"always"	"rarely/never"
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[4593]	"sporadic"	"always"	"sporadic"	"sporadic"
[4597]	"sporadic"	"always"	"sporadic"	"always"
[4601]	"sporadic"	"rarely/never"	"always"	"sporadic"
[4605]	"always"	"rarely/never"	"rarely/never"	"rarely/never"
[4609]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[4613]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[4617]	"rarely/never"	"rarely/never"	"always"	"always"
[4621]	"rarely/never"	"sporadic"	"always"	"rarely/never"
[4625]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"

[4629]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[4633]	"rarely/never"	"rarely/never"	"rarely/never"	"rarely/never"
[4637]	"always"	"always"	"rarely/never"	"sporadic"
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[4649]	"rarely/never"	"rarely/never"	"sporadic"	"always"
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[4661]	"sporadic"	"rarely/never"	"always"	"rarely/never"
[4665]	"always"	"always"	"sporadic"	"sporadic"
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[4673]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
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[4681]	"always"	"always"	"rarely/never"	"sporadic"
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[4689]	"always"	"rarely/never"	"sporadic"	"rarely/never"
[4693]	"always"	"always"	"sporadic"	"always"
[4697]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[4701]	"always"	"always"	"rarely/never"	"always"
[4705]	"rarely/never"	"rarely/never"	"rarely/never"	"sporadic"
[4709]	"rarely/never"	"always"	"always"	"rarely/never"
[4713]	"rarely/never"	"always"	"rarely/never"	"always"
[4717]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[4721]	"always"	"always"	"sporadic"	"always"
[4725]	"rarely/never"	"rarely/never"	"always"	"always"
[4729]	"sporadic"	"rarely/never"	"always"	"rarely/never"
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[4741]	"always"	"rarely/never"	"always"	"rarely/never"
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[4749]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[4753]	"rarely/never"	"rarely/never"	"sporadic"	"always"
[4757]	"rarely/never"	"rarely/never"	"always"	"always"
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[4765]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
[4769]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
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[4777]	"rarely/never"	"always"	"sporadic"	"sporadic"
[4781]	"sporadic"	"sporadic"	"always"	"always"
[4785]	"always"	"always"	"sporadic"	"sporadic"
[4789]	"always"	"sporadic"	"sporadic"	"always"
[4793]	"rarely/never"	"rarely/never"	"rarely/never"	"always"
[4797]	"sporadic"	"sporadic"	"sporadic"	"always"

[4801]	"sporadic"	"rarely/never"	"sporadic"	"always"
[4805]	"always"	"sporadic"	"sporadic"	"rarely/never"
[4809]	"sporadic"	"always"	"rarely/never"	"sporadic"
[4813]	"always"	"rarely/never"	"always"	"rarely/never"
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[4821]	"sporadic"	"rarely/never"	"always"	"rarely/never"
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[4829]	"sporadic"	"sporadic"	"always"	"sporadic"
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[4841]	"sporadic"	"sporadic"	"always"	"sporadic"
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[4849]	"sporadic"	"rarely/never"	"sporadic"	"always"
[4853]	"rarely/never"	"rarely/never"	"always"	"rarely/never"
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[4865]	"always"	"sporadic"	"sporadic"	"sporadic"
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[4885]	"sporadic"	"rarely/never"	"sporadic"	"always"
[4889]	"rarely/never"	"always"	"always"	"rarely/never"
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[4897]	"rarely/never"	"rarely/never"	"rarely/never"	"always"
[4901]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[4905]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
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[4917]	"sporadic"	"sporadic"	"always"	"sporadic"
[4921]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
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[4929]	"rarely/never"	"sporadic"	"always"	"sporadic"
[4933]	"sporadic"	"always"	"sporadic"	"sporadic"
[4937]	"always"	"sporadic"	"sporadic"	"always"
[4941]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[4945]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[4949]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[4953]	"sporadic"	"sporadic"	"sporadic"	"always"
[4957]	"sporadic"	"sporadic"	"rarely/never"	"always"
[4961]	"sporadic"	"rarely/never"	"sporadic"	"always"
[4965]	"rarely/never"	"always"	"rarely/never"	"sporadic"
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[4973]	"sporadic"	"always"	"sporadic"	"rarely/never"
[4977]	"sporadic"	"always"	"always"	"always"
[4981]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[4985]	"rarely/never"	"always"	"rarely/never"	"sporadic"
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[4993]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[4997]	"sporadic"	"always"	"rarely/never"	"sporadic"
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[5005]	"always"	"sporadic"	"sporadic"	"sporadic"
[5009]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[5013]	"sporadic"	"always"	"always"	"sporadic"
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[5021]	"sporadic"	"sporadic"	"always"	"sporadic"
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[5037]	"sporadic"	"rarely/never"	"sporadic"	"always"
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[5089]	"always"	"rarely/never"	"always"	"sporadic"
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[5097]	"rarely/never"	"sporadic"	"always"	"sporadic"
[5101]	"always"	"rarely/never"	"rarely/never"	"sporadic"
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[5113]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
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[5121]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
[5125]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[5129]	"rarely/never"	"rarely/never"	"always"	"always"
[5133]	"sporadic"	"sporadic"	"always"	"rarely/never"
[5137]	"always"	"sporadic"	"always"	"sporadic"
[5141]	"rarely/never"	"sporadic"	"rarely/never"	"rarely/never"

[5145]	"rarely/never"	"always"	"sporadic"	"rarely/never"
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[5153]	"sporadic"	"sporadic"	"always"	"rarely/never"
[5157]	"always"	"sporadic"	"sporadic"	"always"
[5161]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[5165]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[5169]	"sporadic"	"sporadic"	"always"	"sporadic"
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[5189]	"sporadic"	"always"	"always"	"rarely/never"
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[5197]	"rarely/never"	"always"	"sporadic"	"sporadic"
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[5205]	"always"	"rarely/never"	"rarely/never"	"sporadic"
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[5221]	"rarely/never"	"always"	"rarely/never"	"rarely/never"
[5225]	"sporadic"	"always"	"always"	"sporadic"
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[5265]	"rarely/never"	"always"	"always"	"rarely/never"
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[5281]	"sporadic"	"rarely/never"	"always"	"rarely/never"
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[5301]	"sporadic"	"sporadic"	"sporadic"	"always"
[5305]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[5309]	"rarely/never"	"sporadic"	"sporadic"	"rarely/never"
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[5317]	"always"	"sporadic"	"rarely/never"	"sporadic"
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[5325]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
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[5337]	"rarely/never"	"rarely/never"	"rarely/never"	"always"
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[5361]	"sporadic"	"sporadic"	"sporadic"	"always"
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[5409]	"sporadic"	"rarely/never"	"sporadic"	"always"
[5413]	"sporadic"	"always"	"sporadic"	"sporadic"
[5417]	"always"	"rarely/never"	"sporadic"	"rarely/never"
[5421]	"sporadic"	"always"	"always"	"sporadic"
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[5449]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
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[5457]	"rarely/never"	"always"	"rarely/never"	"sporadic"
[5461]	"always"	"sporadic"	"always"	"sporadic"
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[5469]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
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[5485]	"sporadic"	"rarely/never"	"always"	"rarely/never"

[5489]	"rarely/never"	"sporadic"	"rarely/never"	"rarely/never"
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[5497]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
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[5513]	"always"	"rarely/never"	"rarely/never"	"always"
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[5521]	"sporadic"	"always"	"sporadic"	"rarely/never"
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[5533]	"always"	"sporadic"	"sporadic"	"rarely/never"
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[5557]	"sporadic"	"always"	"sporadic"	"always"
[5561]	"rarely/never"	"always"	"sporadic"	"rarely/never"
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[5585]	"always"	"rarely/never"	"rarely/never"	"always"
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[5597]	"sporadic"	"always"	"sporadic"	"rarely/never"
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[5605]	"sporadic"	"always"	"rarely/never"	"sporadic"
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[5613]	"sporadic"	"always"	"sporadic"	"sporadic"
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[5629]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[5633]	"rarely/never"	"rarely/never"	"sporadic"	"rarely/never"
[5637]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[5641]	"rarely/never"	"always"	"always"	"sporadic"
[5645]	"rarely/never"	"always"	"rarely/never"	"rarely/never"
[5649]	"rarely/never"	"always"	"sporadic"	"sporadic"
[5653]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[5657]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"

[5661]	"rarely/never"	"sporadic"	"sporadic"	"sporadic"
[5665]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[5669]	"sporadic"	"rarely/never"	"sporadic"	"always"
[5673]	"sporadic"	"always"	"rarely/never"	"rarely/never"
[5677]	"rarely/never"	"always"	"rarely/never"	"always"
[5681]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[5685]	"rarely/never"	"sporadic"	"rarely/never"	"always"
[5689]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[5693]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[5697]	"sporadic"	"sporadic"	"always"	"rarely/never"
[5701]	"sporadic"	"always"	"always"	"sporadic"
[5705]	"sporadic"	"always"	"always"	"rarely/never"
[5709]	"sporadic"	"rarely/never"	"rarely/never"	"sporadic"
[5713]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[5717]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[5721]	"rarely/never"	"sporadic"	"always"	"sporadic"
[5725]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[5729]	"sporadic"	"rarely/never"	"sporadic"	"rarely/never"
[5733]	"rarely/never"	"rarely/never"	"sporadic"	"sporadic"
[5737]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[5741]	"always"	"rarely/never"	"sporadic"	"always"
[5745]	"sporadic"	"rarely/never"	"rarely/never"	"always"
[5749]	"sporadic"	"rarely/never"	"sporadic"	"always"
[5753]	"sporadic"	"sporadic"	"sporadic"	"always"
[5757]	"always"	"rarely/never"	"rarely/never"	"sporadic"
[5761]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[5765]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[5769]	"sporadic"	"rarely/never"	"sporadic"	"always"
[5773]	"sporadic"	"always"	"sporadic"	"sporadic"
[5777]	"rarely/never"	"sporadic"	"rarely/never"	"sporadic"
[5781]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[5785]	"rarely/never"	"rarely/never"	"always"	"sporadic"
[5789]	"sporadic"	"sporadic"	"rarely/never"	"rarely/never"
[5793]	"sporadic"	"always"	"rarely/never"	"always"
[5797]	"always"	"sporadic"	"always"	"sporadic"
[5801]	"rarely/never"	"always"	"sporadic"	"rarely/never"
[5805]	"sporadic"	"sporadic"	"rarely/never"	"sporadic"
[5809]	"sporadic"	"sporadic"	"always"	"rarely/never"
[5813]	"sporadic"	"sporadic"	"sporadic"	"sporadic"
[5817]	"rarely/never"	"rarely/never"	"sporadic"	"always"
[5821]	"sporadic"	"sporadic"	"sporadic"	"rarely/never"
[5825]	"sporadic"	"rarely/never"	"sporadic"	"sporadic"
[5829]	"sporadic"	"rarely/never"	"rarely/never"	"always"

```
[5833] "rarely/never" "sporadic"      "always"      "always"
```

```
voter_data <- voter_data %>%  
  mutate(voter_category = fct_relevel(voter_category, "rarely/never", "sporadic", "always"))
```

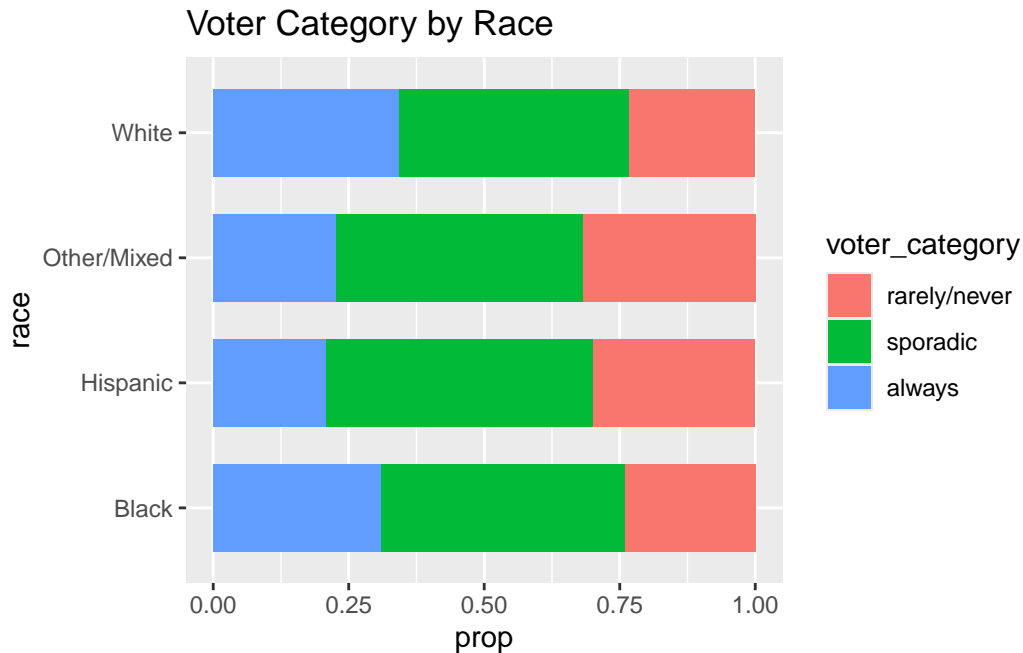
- Center the age variable to make the intercept more interpretable. That is, so that it reflects the log-odds for an average-aged person rather than a 0-year old person

```
# enter code
```

```
voter_data$center_age <- voter_data$ppage - mean(voter_data$ppage)
```

- In the [FiveThirtyEight article](https://www.mikelee.co/posts/2020-02-08-recreate-fivethirtyeight-chicklet-stacked-bar-chart-in-ggplot2), the authors include visualizations of the relationship between the voter category and demographic variables such as race, age, education, etc. Select two demographic variables. For each variable, try to replicate the visualizations and interpret the plot to describe its relationship with voter category. Have fun with it: <https://www.mikelee.co/posts/2020-02-08-recreate-fivethirtyeight-chicklet-stacked-bar-chart-in-ggplot2>.

```
# library  
library(ggplot2)  
library(viridis)  
library(cowplot)  
  #library(ggchicklet)  
  library(ggtext)  
  library(dplyr)  
  library(forcats)  
  library(grid)  
  
# Enter code  
race_vote = voter_data %>%  
  count(race, voter_category) %>%  
  group_by(race) %>%  
  mutate(prop = n / sum(n)) %>%  
  ggplot(aes(x = race, y = prop)) +  
  geom_col(aes(fill = voter_category), width = 0.7) + coord_flip() +  
  labs(title = "Voter Category by Race")  
  
race_vote
```



It seems like Hispanic folks are least likely to “always” vote.

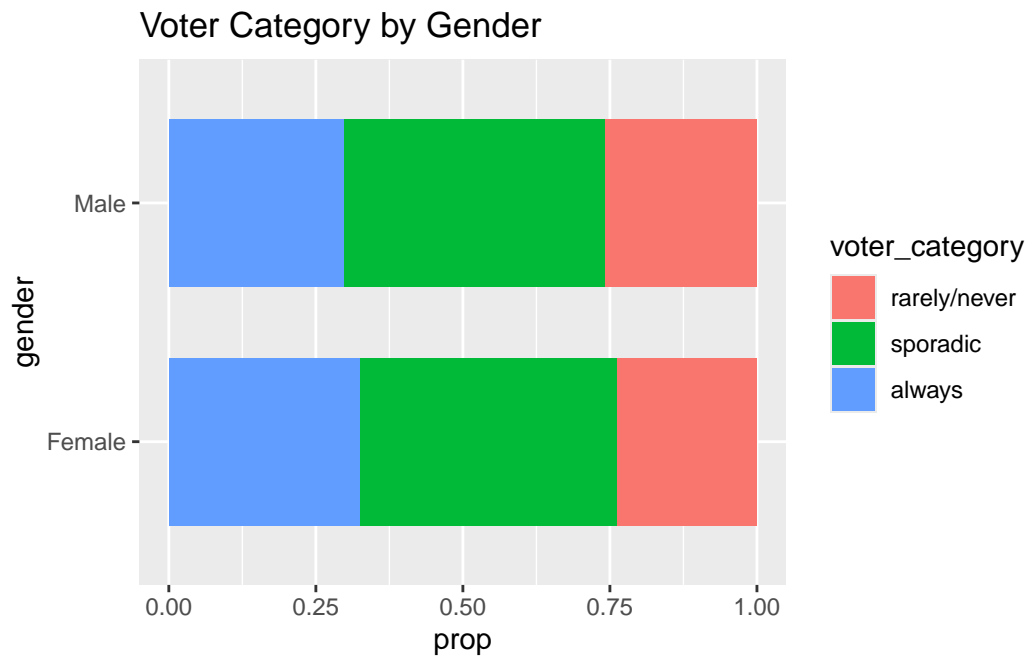
“Other/Mixed” folks are most likely to rarely/never vote (although they could have just not answered the race question)

White folks are mostly likely to “always” vote, closely followed by Black folk

Enter code

```
gender_vote = voter_data %>%
  count(gender, voter_category) %>%
  group_by(gender) %>%
  mutate(prop = n / sum(n)) %>%
  ggplot(aes(x = gender, y = prop)) +
  geom_col(aes(fill = voter_category), width = 0.7) + coord_flip() +
  labs(title = "Voter Category by Gender")
```

gender_vote

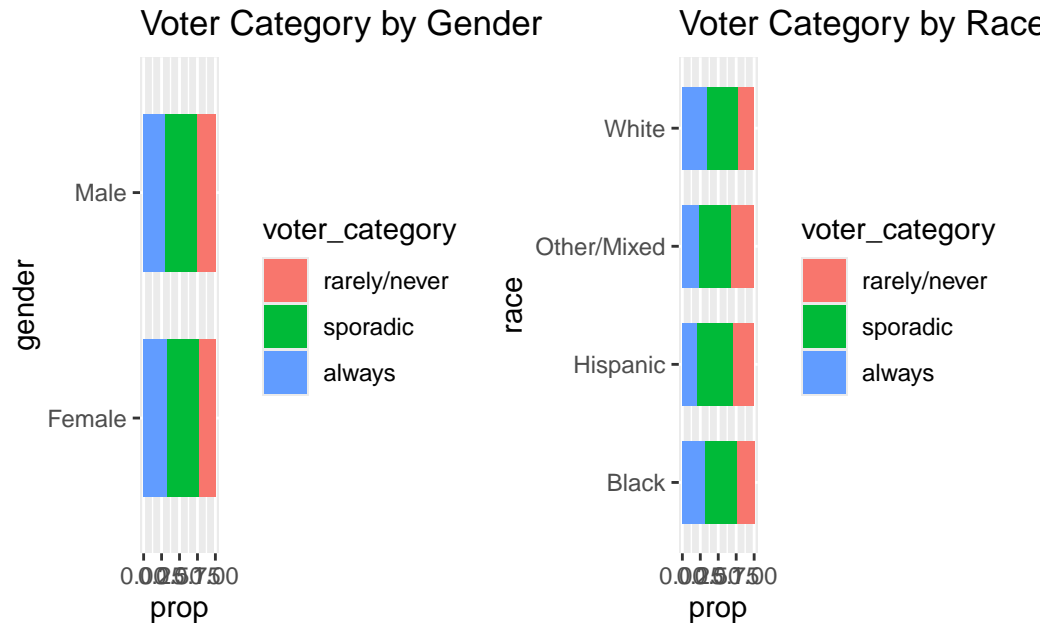


Women are most likely to always vote. Nearly ~50% of both men and women only sporadically vote.

The plots can be combined into a single plot using the patchwork package.

```
library(patchwork)

gender_vote + race_vote + plot_layout(ncol = 2)
```



- Fit a model using mean-centered age, race, gender, income, and education to predict voter category. Show the code used to fit the model, but do **not** display the model output.

```
library(nnet)

#Enter code
model <- multinom(voter_category ~ center_age + race + gender + income_cat + educ, data = vo

# weights: 36 (22 variable)
initial value 6411.501317
iter 10 value 5869.948482
iter 20 value 5728.474131
final value 5693.312867
converged
```

- *Should party identification be added to the model?*
- #Hint: Use an anova test to make the determination

```
#Enter code

model <- multinom(voter_category ~ center_age + race + gender + income_cat + educ, data = vo
```



```
# weights: 36 (22 variable)
initial value 6411.501317
iter 10 value 5869.948482
iter 20 value 5728.474131
final value 5693.312867
converged
```

```
model_party <- multinom(voter_category ~ center_age + race + gender + income_cat + educ + pol
```

```
# weights: 45 (28 variable)
initial value 6411.501317
iter 10 value 5818.012349
iter 20 value 5709.034111
iter 30 value 5621.228937
final value 5616.390878
converged
```

```
# Compare the two models using ANOVA
comparing <- anova(model, model_party)
comparing %>%
  kable()
```

Model	Resid. df	Resid. Dev	Test	Df	LR stat.	Pr(Chi)
center_age + race + gender + income_cat + educ	11650	11386.63		NA	NA	NA
center_age + race + gender + income_cat + educ + pol_ident_new	11644	11232.78	1 vs 2	6	153.844	0

#Enter answer based on your code: _____

Model party provides the best fit

Use the model you select for the remainder of the assignment.

1.1 LRT

```
car::Anova(model_party) %>%
  kable()
```

	LR Chisq	Df	Pr(>Chisq)
center_age	638.297213	2	0.000000
race	52.651508	6	0.000000
gender	6.027914	2	0.049097
income_cat	67.721466	6	0.000000
educ	154.136763	4	0.000000
pol_ident_new	153.843978	6	0.000000

- Run the full model and report overall significance of each of the terms.

Each of the terms are $p < .001$ (very, very close to 0)

```
model_party %>%
  tidy()
```

```
# A tibble: 28 x 6
  y.level term estimate std.error statistic p.value
  <chr>   <chr>      <dbl>    <dbl>    <dbl>    <dbl>
1 sporadic (Intercept) 1.73      0.136     12.7 4.33e-37
2 sporadic center_age 0.0457    0.00232    19.7 5.31e-86
3 sporadic raceHispanic 0.0402    0.128      0.314 7.53e- 1
4 sporadic raceOther/Mixed -0.332    0.159     -2.09 3.66e- 2
5 sporadic raceWhite -0.0775    0.108     -0.719 4.72e- 1
6 sporadic genderMale -0.0901    0.0722     -1.25 2.12e- 1
7 sporadic income_cat$40-75k -0.0738    0.111     -0.662 5.08e- 1
8 sporadic income_cat$75-125k 0.0125    0.107      0.117 9.07e- 1
9 sporadic income_catLess than $40k -0.588    0.114     -5.17 2.37e- 7
10 sporadic educHigh school or less -0.853    0.0974     -8.76 1.94e-18
# i 18 more rows
```

1.2 Marginal Effects Political Group - Emmeans

```
#Get estimated marginal means from the model

#using
multinomial_analysis <- emmeans(model_party, ~ pol_ident_new|voter_category)

coefs = contrast(regrid(multinomial_analysis, "log"), "trt.vs.ctrl1", by="pol_ident_new")
# you can add a parameter to the above command, ref = newbaseline, if you want to change bas
```

```
update(coefs, by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast	pol_ident_new	estimate	SE	df	t.ratio	p.value
sporadic - (rarely/never)	Democrat	0.961	0.070	28	13.722	0.000
always - (rarely/never)	Democrat	0.480	0.074	28	6.498	0.000
sporadic - (rarely/never)	Independent	0.591	0.077	28	7.643	0.000
always - (rarely/never)	Independent	-0.049	0.084	28	-0.590	0.900
sporadic - (rarely/never)	Other	0.078	0.087	28	0.902	0.747
always - (rarely/never)	Other	-0.835	0.110	28	-7.577	0.000
sporadic - (rarely/never)	Republican	0.883	0.084	28	10.469	0.000
always - (rarely/never)	Republican	0.327	0.089	28	3.672	0.004

1.3 Marginal Effects of Education - Emmeans

```
#Enter code
#using
multinomial_analysis <- emmeans(model_party, ~ educ|voter_category)

coefs = contrast(regrid(multinomial_analysis, "log"), "trt.vs.ctrl1", by="educ")
# you can add a parameter to the above command, ref = newbaseline, if you want to change baseline

update(coefs, by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast	educ	estimate	SE	df	t.ratio	p.value
sporadic - (rarely/never)	College	0.986	0.076	28	12.904	0.000
always - (rarely/never)	College	0.477	0.080	28	5.960	0.000
sporadic - (rarely/never)	High school or less	0.187	0.069	28	2.705	0.031
always - (rarely/never)	High school or less	-0.711	0.080	28	-8.883	0.000
sporadic - (rarely/never)	Some college	0.707	0.074	28	9.512	0.000
always - (rarely/never)	Some college	0.167	0.079	28	2.114	0.112

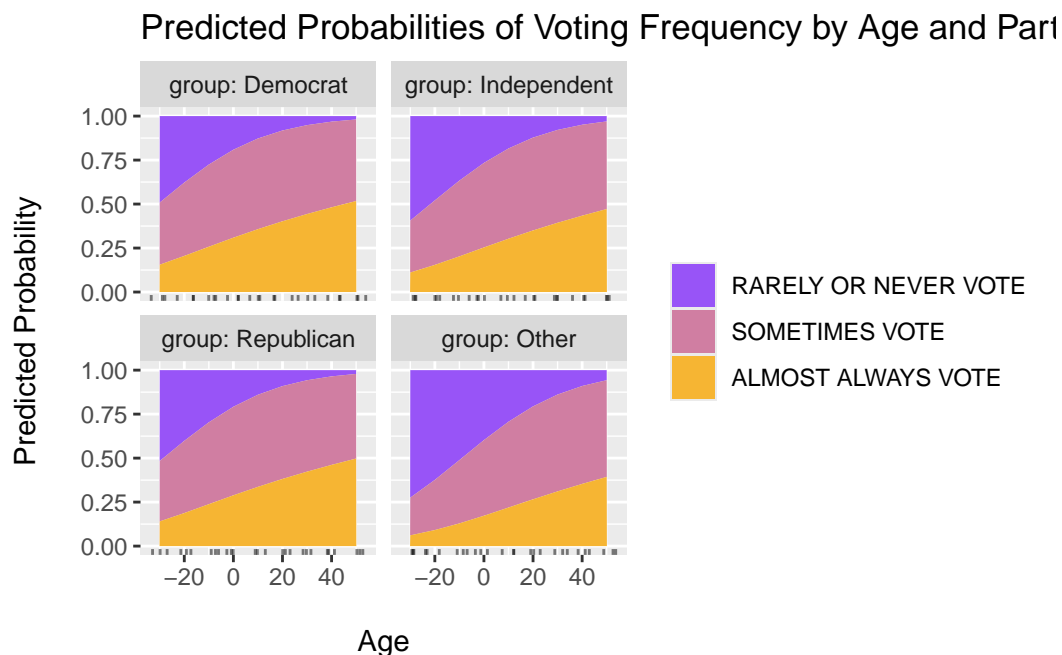
- Next, plot the predicted probabilities of voter category as a function of Age and Party ID

```

predictions <- ggemmeans(model_party, terms = c("center_age", "pol_ident_new"))

# Create the plot with facets for each party ID category.
ggplot(predictions, aes(x = x, y = predicted, fill = response.level)) +
  geom_area() +
  geom_rug(sides = "b", position = "jitter", alpha = 0.5) +
  labs(
    x = "\nAge",
    y = "Predicted Probability\n",
    title = "Predicted Probabilities of Voting Frequency by Age and Party ID"
  ) +
  facet_wrap(~ group, labeller = label_both) + # Facet by Party ID
  scale_fill_manual(
    name = NULL,
    values = c("always" = "#F6B533", "sporadic" = "#D07EA2", "rarely/never" = "#9854F7"),
    labels = c("RARELY OR NEVER VOTE", "SOMETIMES VOTE", "ALMOST ALWAYS VOTE"),
    breaks = c("rarely/never", "sporadic", "always")
  )

```



Republicans are least likely to rarely/never vote.

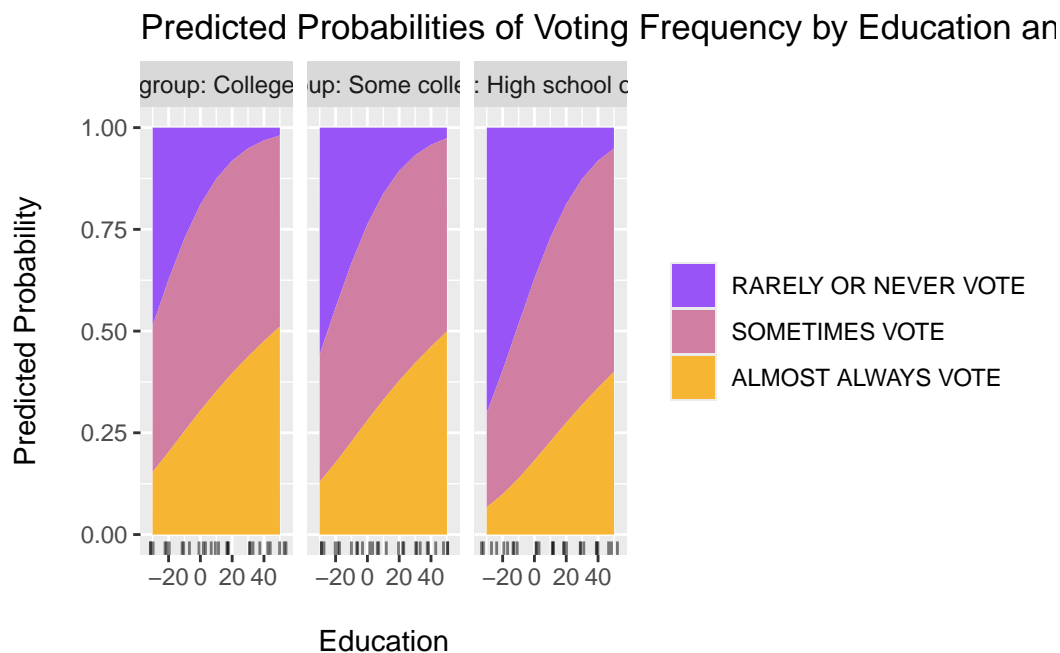
Plot predicted probabilities as a function of education and voting frequency.

```

predictions <- ggemmeans(model_party, terms = c("center_age", "educ"))

# Create the plot with facets for each party ID category.
ggplot(predictions, aes(x = x, y = predicted, fill = response.level)) +
  geom_area() +
  geom_rug(sides = "b", position = "jitter", alpha = 0.5) +
  labs(
    x = "\nEducation",
    y = "Predicted Probability\n",
    title = "Predicted Probabilities of Voting Frequency by Education and Party ID"
  ) +
  facet_wrap(~ group, labeller = label_both) + # Facet by Party ID
  scale_fill_manual(
    name = NULL,
    values = c("always" = "#F6B533", "sporadic" = "#D07EA2", "rarely/never" = "#9854F7"),
    labels = c("RARELY OR NEVER VOTE", "SOMETIMES VOTE", "ALMOST ALWAYS VOTE"),
    breaks = c("rarely/never", "sporadic", "always")
  )

```



Those with only a high school education or less are less likely to consistently engage with voting behaviors, as they are most likely to “rarely or never vote,” and least likely to “almost always vote”

Differences between political groups and voting behavior - Emmeans

```
multi_an <- emmeans(model_party, ~ pol_ident_new|voter_category)

coefs = contrast(regrid(multi_an, "log"), "trt.vs.ctrl1", by="pol_ident_new")

update(coefs, by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast	pol_ident_new	estimate	SE	df	t.ratio	p.value
sporadic - (rarely/never)	Democrat	0.961	0.070	28	13.722	0.000
always - (rarely/never)	Democrat	0.480	0.074	28	6.498	0.000
sporadic - (rarely/never)	Independent	0.591	0.077	28	7.643	0.000
always - (rarely/never)	Independent	-0.049	0.084	28	-0.590	0.900
sporadic - (rarely/never)	Other	0.078	0.087	28	0.902	0.747
always - (rarely/never)	Other	-0.835	0.110	28	-7.577	0.000
sporadic - (rarely/never)	Republican	0.883	0.084	28	10.469	0.000
always - (rarely/never)	Republican	0.327	0.089	28	3.672	0.004

```
# get difference between yes-no and fair-excellent
contrast(coefs, "revpairwise", by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast1	contrast	esti- mate	SE	df	t.ratio	p.value
Independent - Democrat	sporadic - (rarely/never)	-0.370	0.094	28	-3.933	0.003
Other - Democrat	sporadic - (rarely/never)	-0.883	0.103	28	-8.578	0.000
Other - Independent	sporadic - (rarely/never)	-0.513	0.107	28	-4.807	0.000
Republican - Democrat	sporadic - (rarely/never)	-0.078	0.099	28	-0.787	0.860
Republican - Independent	sporadic - (rarely/never)	0.292	0.099	28	2.965	0.029
Republican - Other	sporadic - (rarely/never)	0.805	0.109	28	7.404	0.000

contrast1	contrast	estimate	SE	df	t.ratio	p.value
Independent - Democrat	always - (rarely/never)	-0.529	0.101	28	-5.255	0.000
Other - Democrat	always - (rarely/never)	-1.315	0.125	28	-10.508	0.000
Other - Independent	always - (rarely/never)	-0.786	0.129	28	-6.072	0.000
Republican - Democrat	always - (rarely/never)	-0.153	0.104	28	-1.470	0.468
Republican - Independent	always - (rarely/never)	0.376	0.104	28	3.605	0.006
Republican - Other	always - (rarely/never)	1.162	0.130	28	8.969	0.000

Differences between education level and voting behavior - Emmeans

Last part of the assignment: Interpret the results from running the following code for your model

```
multi_an <- emmeans(model_party, ~ educ|voter_category)

coefs = contrast(regrid(multi_an, "log"), "trt.vs.ctrl1", by="educ")

update(coefs, by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast	educ	estimate	SE	df	t.ratio	p.value
sporadic - (rarely/never)	College	0.986	0.076	28	12.904	0.000
always - (rarely/never)	College	0.477	0.080	28	5.960	0.000
sporadic - (rarely/never)	High school or less	0.187	0.069	28	2.705	0.031
always - (rarely/never)	High school or less	-0.711	0.080	28	-8.883	0.000
sporadic - (rarely/never)	Some college	0.707	0.074	28	9.512	0.000
always - (rarely/never)	Some college	0.167	0.079	28	2.114	0.112

```
# get difference between yes-no and fair-excellent
contrast(coefs, "revpairwise", by = "contrast") %>%
  kable(format = "markdown", digits = 3)
```

contrast1	contrast	esti- mate	SE	df	t.ratio	p.value
High school or less - College	sporadic - (rarely/never)	-0.799	0.095	28	-8.416	0.000
Some college - College	sporadic - (rarely/never)	-0.278	0.092	28	-3.030	0.014
Some college - High school or less	sporadic - (rarely/never)	0.520	0.088	28	5.920	0.000
High school or less - College	always - (rarely/never)	-1.188	0.104	28	-	0.000
					11.394	
Some college - College	always - (rarely/never)	-0.310	0.097	28	-3.207	0.009
Some college - High school or less	always - (rarely/never)	0.878	0.098	28	8.995	0.000

Enter your interpretation here:

Generally, the more education one has the more likely one is to vote and to do so consistently