Recoding data

Data Science in a Box

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Case study: Religion and income

Income distribution by religious group

% of adults who have a household income of...

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Religious tradition	Less than $30,000	$30,000-$49,999	$50,000-$99,999	$100,000 or more	Sample Size
Buddhist	36%	18%	32%	13%	233
Catholic	36%	19%	26%	19%	6,137
Evangelical Protestant	35%	22%	28%	14%	7,462
Hindu	17%	13%	34%	36%	172
Historically Black Protestant	53%	22%	17%	8%	1,704
Jehovah's Witness	48%	25%	22%	4%	208
Jewish	16%	15%	24%	44%	708
Mainline Protestant	29%	20%	28%	23%	5,208
Mormon	27%	20%	33%	20%	594
Muslim	34%	17%	29%	20%	205
Orthodox Christian	18%	17%	36%	29%	155
Unaffiliated (religious "nones")	33%	20%	26%	21%	6,790

Sample sizes and margins of error vary from subgroup to subgroup, from year to year and from state to state. You can see the sample size for the estimates in this chart on rollover or in the last column of the table. And visit this table to see approximate margins of error for a group of a given size. Readers should always bear in mind the approximate margin of error for the group they are examining when making comparisons with other groups or assessing the significance of trends over time. For full question wording, see the survey questionnaire.

Source: pewforum.org/religious-landscape-study/income-distribution, Retrieved 14 April, 2020

Read data

```
library(readxl)
rel_inc <- read_excel("data/relig-income.xlsx")
```

```
## # A tibble: 12 x 6
##   `Religious tradition`   Less ~1 $30,0~2 $50,0~3 $100,~4 Sampl~5
##   <chr>                     <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 Buddhist                   0.36    0.18    0.32    0.13     233
## 2 Catholic                   0.36    0.19    0.26    0.19    6137
## 3 Evangelical Protestant     0.35    0.22    0.28    0.14    7462
## 4 Hindu                      0.17    0.13    0.34    0.36     172
## 5 Historically Black Pro~    0.53    0.22    0.17    0.08    1704
## 6 Jehovah's Witness          0.48    0.25    0.22    0.04     208
## # ... with 6 more rows, and abbreviated variable names
## #   1: `Less than $30,000`, 2: `$30,000-$49,999`,
## #   3: `$50,000-$99,999`, 4: `$100,000 or more`,
## #   5: `Sample Size`
```

Rename columns

```
rel_inc %>%
  rename(
    religion = `Religious tradition`,
    n = `Sample Size`
  )
```

```
## # A tibble: 12 x 6
##   religion                Less ~1 $30,0~2 $50,0~3 $100,~4     n
##   <chr>                     <dbl>   <dbl>   <dbl>   <dbl> <dbl>
## 1 Buddhist                   0.36    0.18    0.32    0.13   233
## 2 Catholic                   0.36    0.19    0.26    0.19  6137
## 3 Evangelical Protestant     0.35    0.22    0.28    0.14  7462
## 4 Hindu                      0.17    0.13    0.34    0.36   172
## 5 Historically Black Prote~  0.53    0.22    0.17    0.08  1704
## 6 Jehovah's Witness          0.48    0.25    0.22    0.04   208
## # ... with 6 more rows, and abbreviated variable names
## #   1: `Less than $30,000`, 2: `$30,000-$49,999`,
## #   3: `$50,000-$99,999`, 4: `$100,000 or more`
```

If we want a new variable called `income` with levels such as "Less than $30,000", "$30,000-$49,999", ... etc. which function should we use?

```
## # A tibble: 48 x 4
##    religion                    n income           proportion
##    <chr>                   <dbl> <chr>                 <dbl>
##  1 Buddhist                  233 Less than $30,000      0.36
##  2 Buddhist                  233 $30,000-$49,999        0.18
##  3 Buddhist                  233 $50,000-$99,999        0.32
##  4 Buddhist                  233 $100,000 or more       0.13
##  5 Catholic                 6137 Less than $30,000      0.36
##  6 Catholic                 6137 $30,000-$49,999        0.19
##  7 Catholic                 6137 $50,000-$99,999        0.26
##  8 Catholic                 6137 $100,000 or more       0.19
##  9 Evangelical Protestant   7462 Less than $30,000      0.35
## 10 Evangelical Protestant   7462 $30,000-$49,999        0.22
## 11 Evangelical Protestant   7462 $50,000-$99,999        0.28
## 12 Evangelical Protestant   7462 $100,000 or more       0.14
## 13 Hindu                     172 Less than $30,000      0.17
## 14 Hindu                     172 $30,000-$49,999        0.13
## 15 Hindu                     172 $50,000-$99,999        0.34
## # ... with 33 more rows
```

Pivot longer

```
rel_inc %>%
  rename(
    religion = `Religious tradition`,
    n = `Sample Size`
  ) %>%
  pivot_longer(
    cols = -c(religion, n),   # all but religion and n
    names_to = "income",
    values_to = "proportion"
  )
```

```
## # A tibble: 48 x 4
##   religion     n income            proportion
##   <chr>    <dbl> <chr>                  <dbl>
## 1 Buddhist   233 Less than $30,000       0.36
## 2 Buddhist   233 $30,000-$49,999         0.18
## 3 Buddhist   233 $50,000-$99,999         0.32
## 4 Buddhist   233 $100,000 or more        0.13
## 5 Catholic  6137 Less than $30,000       0.36
## 6 Catholic  6137 $30,000-$49,999         0.19
## # ... with 42 more rows
```

Calculate frequencies

```
rel_inc %>%
  rename(
    religion = `Religious tradition`,
    n = `Sample Size`
  ) %>%
  pivot_longer(
    cols = -c(religion, n),
    names_to = "income",
    values_to = "proportion"
  ) %>%
  mutate(frequency = round(proportion * n))
```

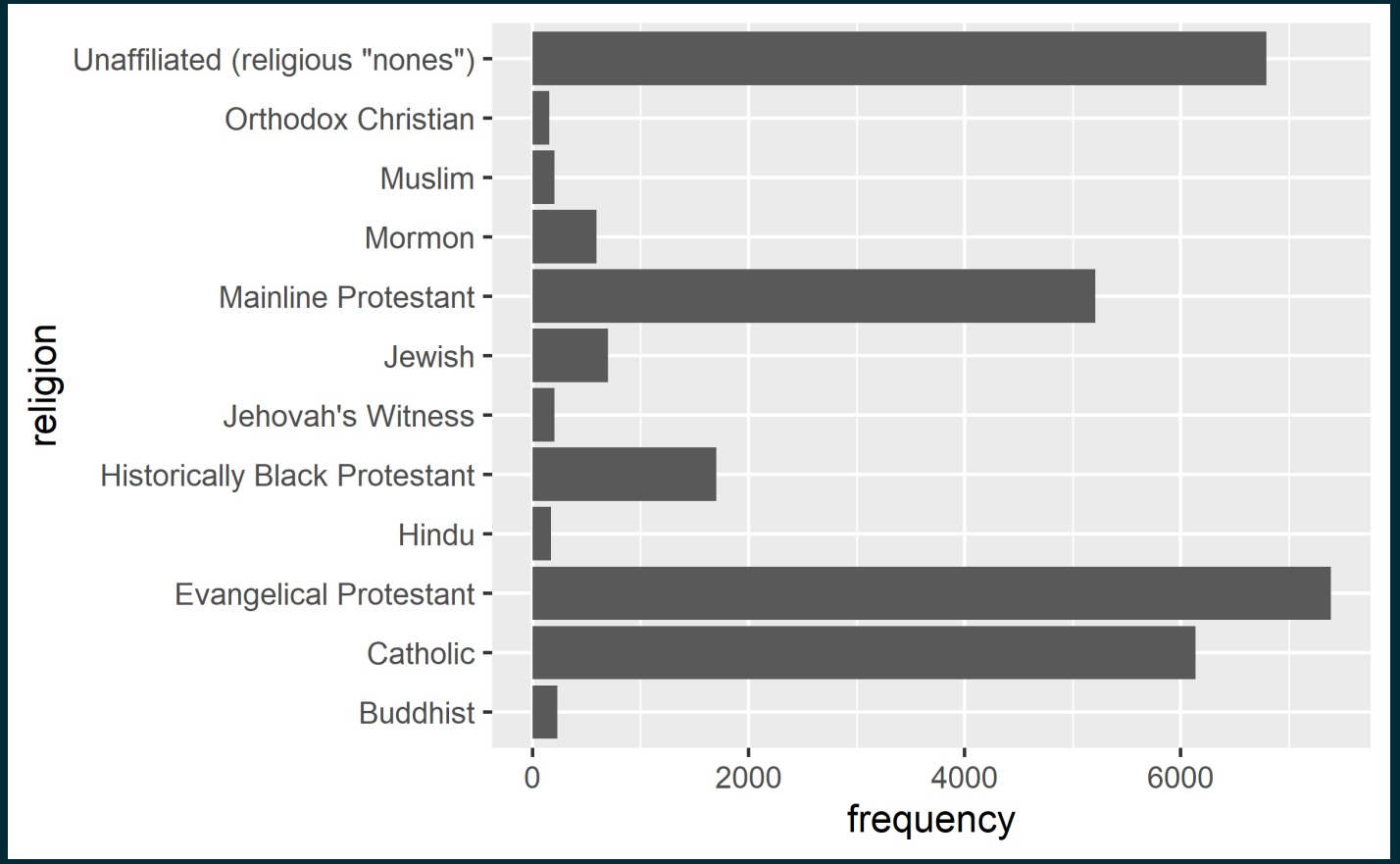
```
## # A tibble: 48 x 5
##   religion     n income            proportion frequency
##   <chr>    <dbl> <chr>                  <dbl>     <dbl>
## 1 Buddhist   233 Less than $30,000       0.36        84
## 2 Buddhist   233 $30,000-$49,999         0.18        42
## 3 Buddhist   233 $50,000-$99,999         0.32        75
## 4 Buddhist   233 $100,000 or more        0.13        30
## 5 Catholic  6137 Less than $30,000       0.36      2209
## 6 Catholic  6137 $30,000-$49,999         0.19      1166
## # ... with 42 more rows
```

Save data

```
rel_inc_long <- rel_inc %>%
  rename(
    religion = `Religious tradition`,
    n = `Sample Size`
  ) %>%
  pivot_longer(
    cols = -c(religion, n),
    names_to = "income",
    values_to = "proportion"
  ) %>%
  mutate(frequency = round(proportion * n))
```

Barplot

```
ggplot(rel_inc_long, aes(y = religion, x = frequency)) +
  geom_col()
```



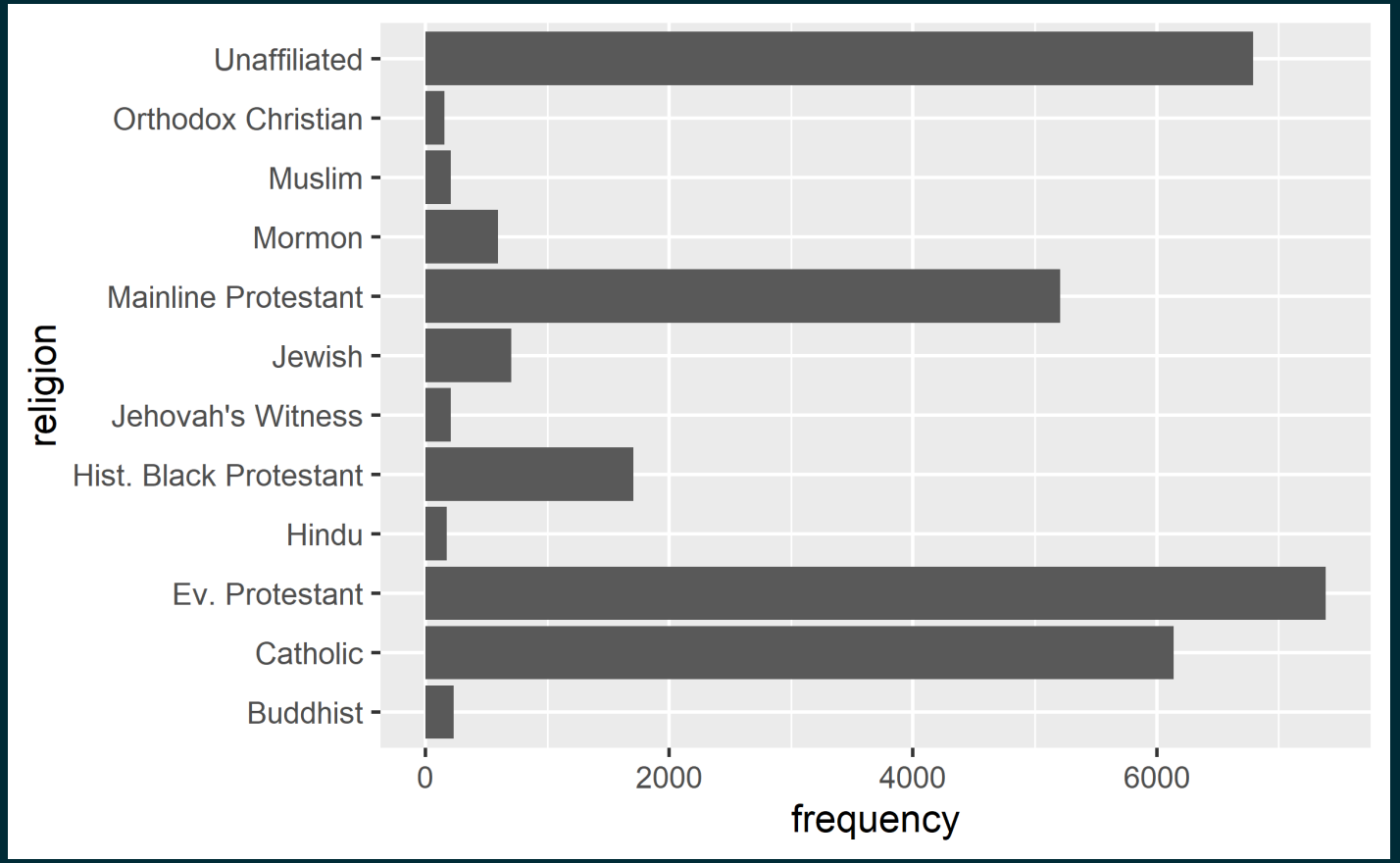
Recode religion

Recode | Plot

```
rel_inc_long <- rel_inc_long %>%
  mutate(religion = case_when(
    religion == "Evangelical Protestant"           ~ "Ev. Protestant",
    religion == "Historically Black Protestant"    ~ "Hist. Black Protestant",
    religion == 'Unaffiliated (religious "nones")' ~ "Unaffiliated",
    TRUE                                           ~ religion
  ))
```

Recode religion

Recode | Plot



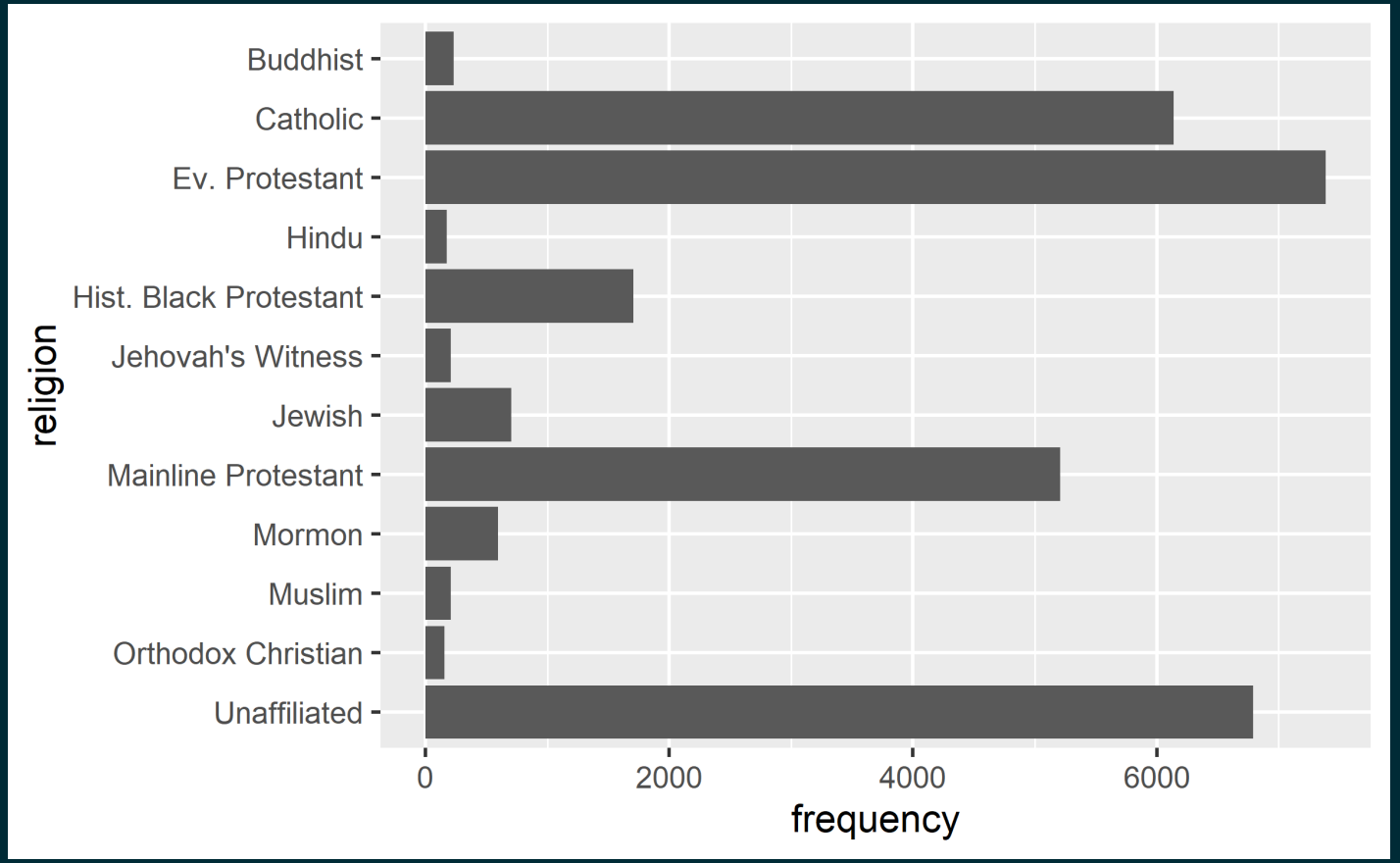
Reverse religion order

Recode | Plot

```
rel_inc_long <- rel_inc_long %>%
  mutate(religion = fct_rev(religion))
```

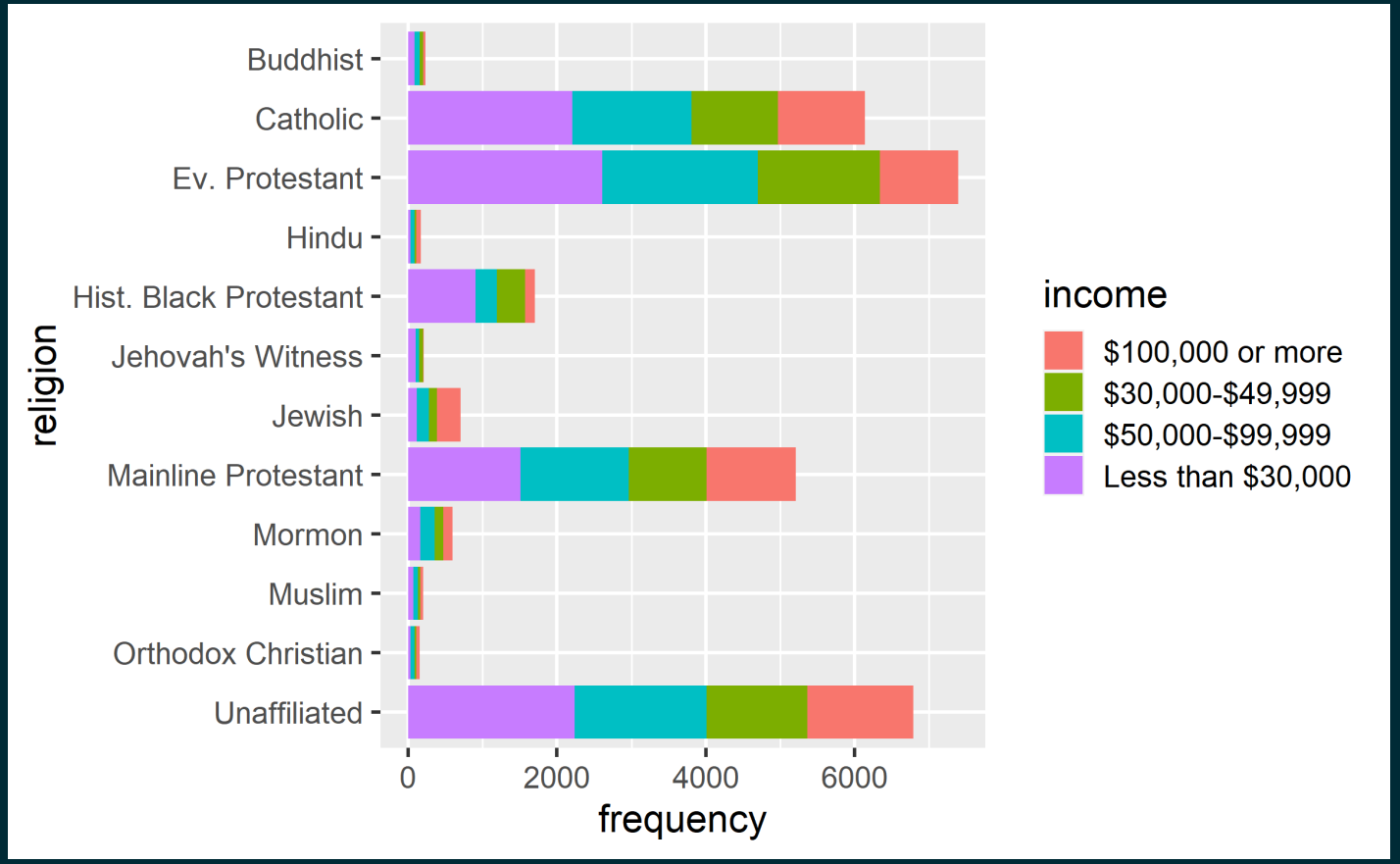
Reverse religion order

Recode | Plot



Add income

Plot Code



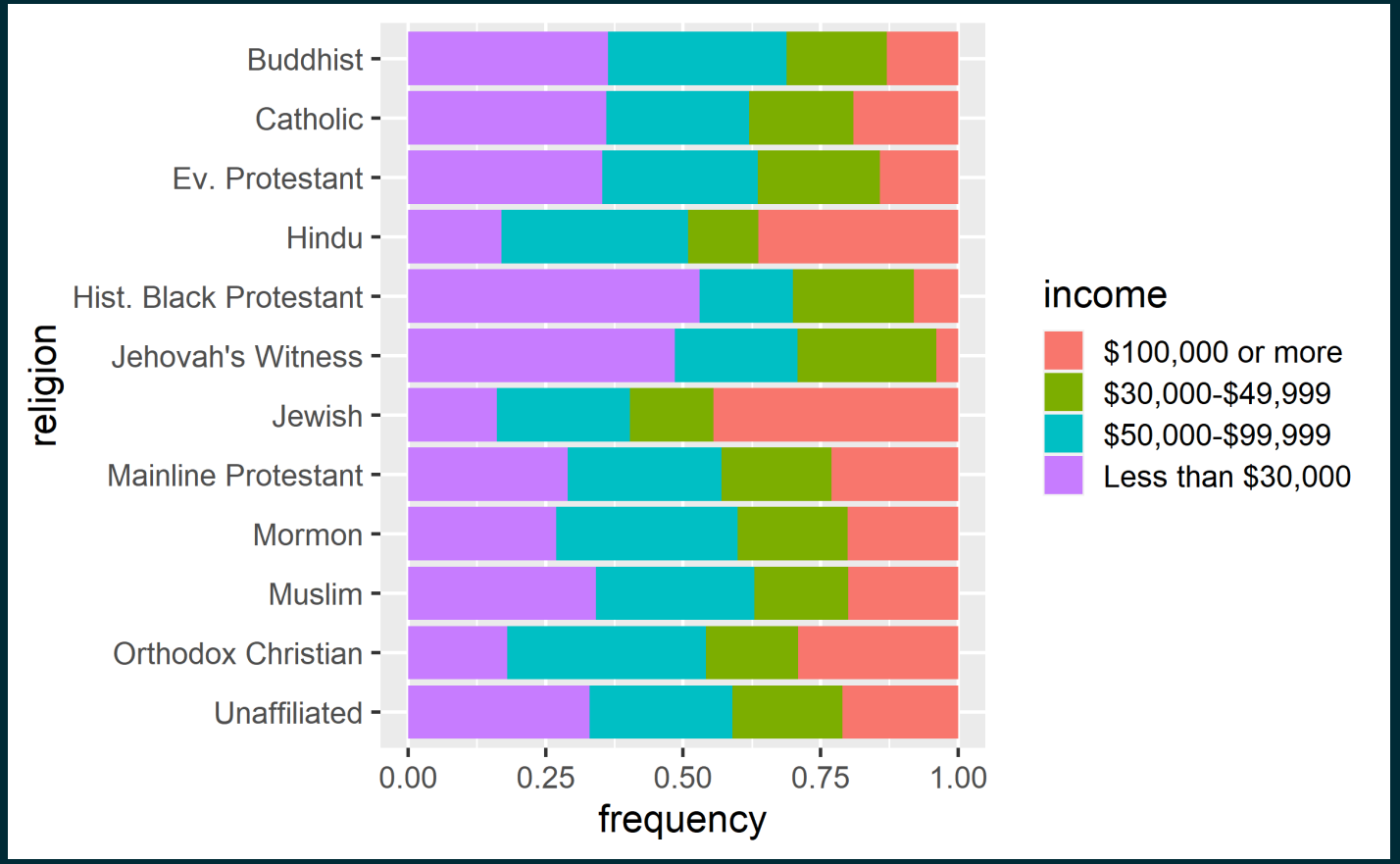
Add income

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col()
```

Fill bars

Plot Code



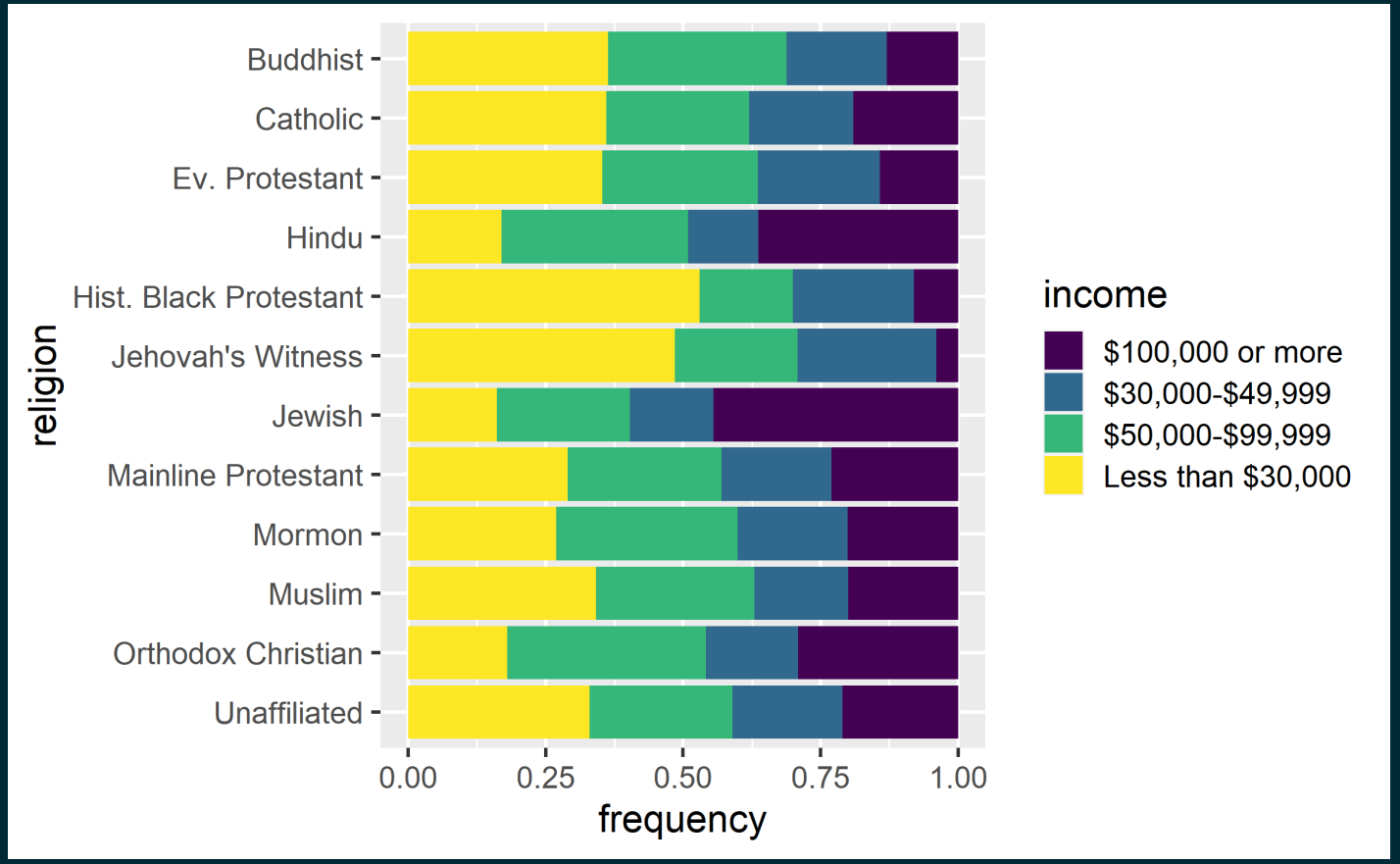
Fill bars

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill")
```

Change colors

Plot Code



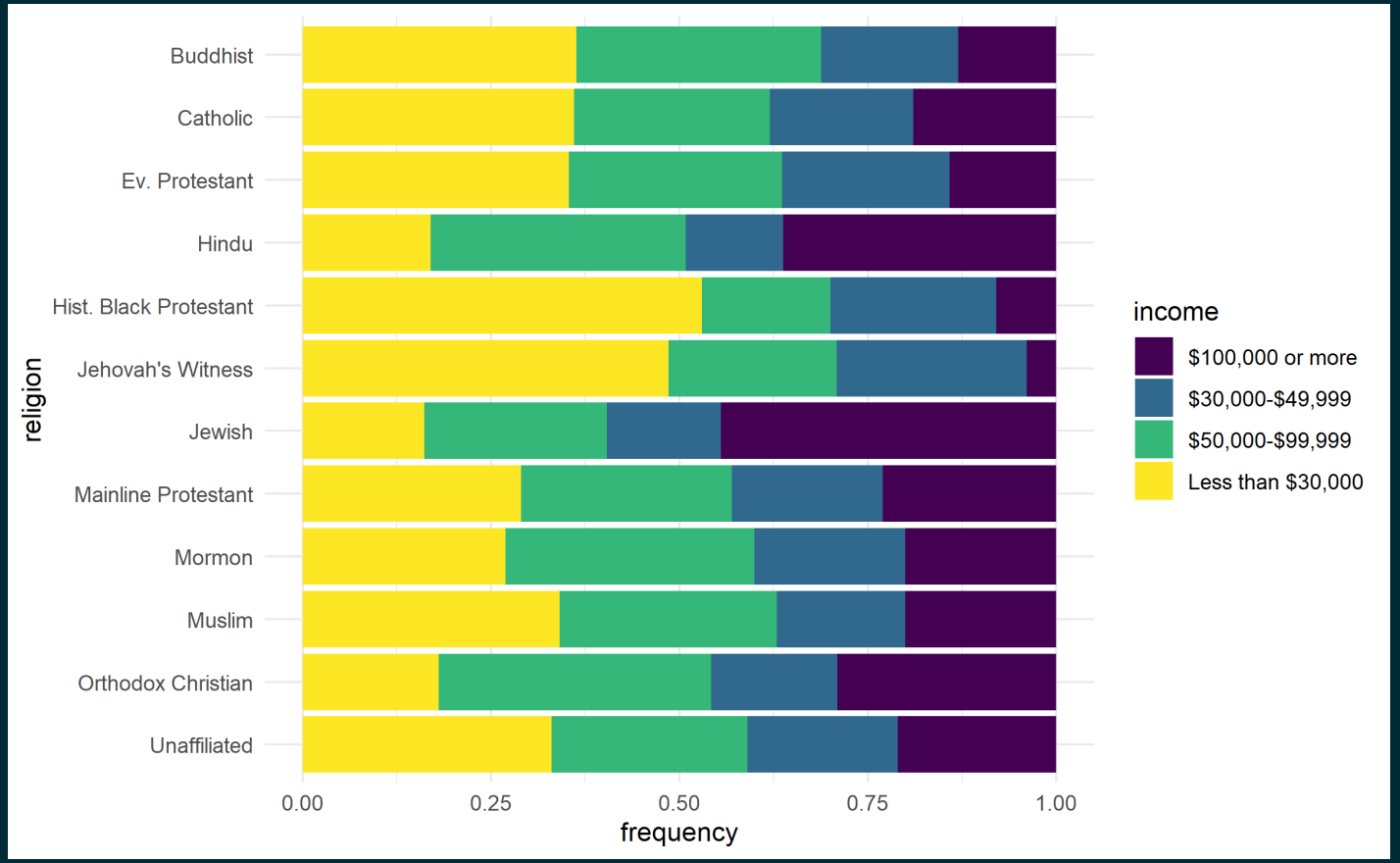
Change colors

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill") +
  scale_fill_viridis_d()
```

Change theme

Plot Code



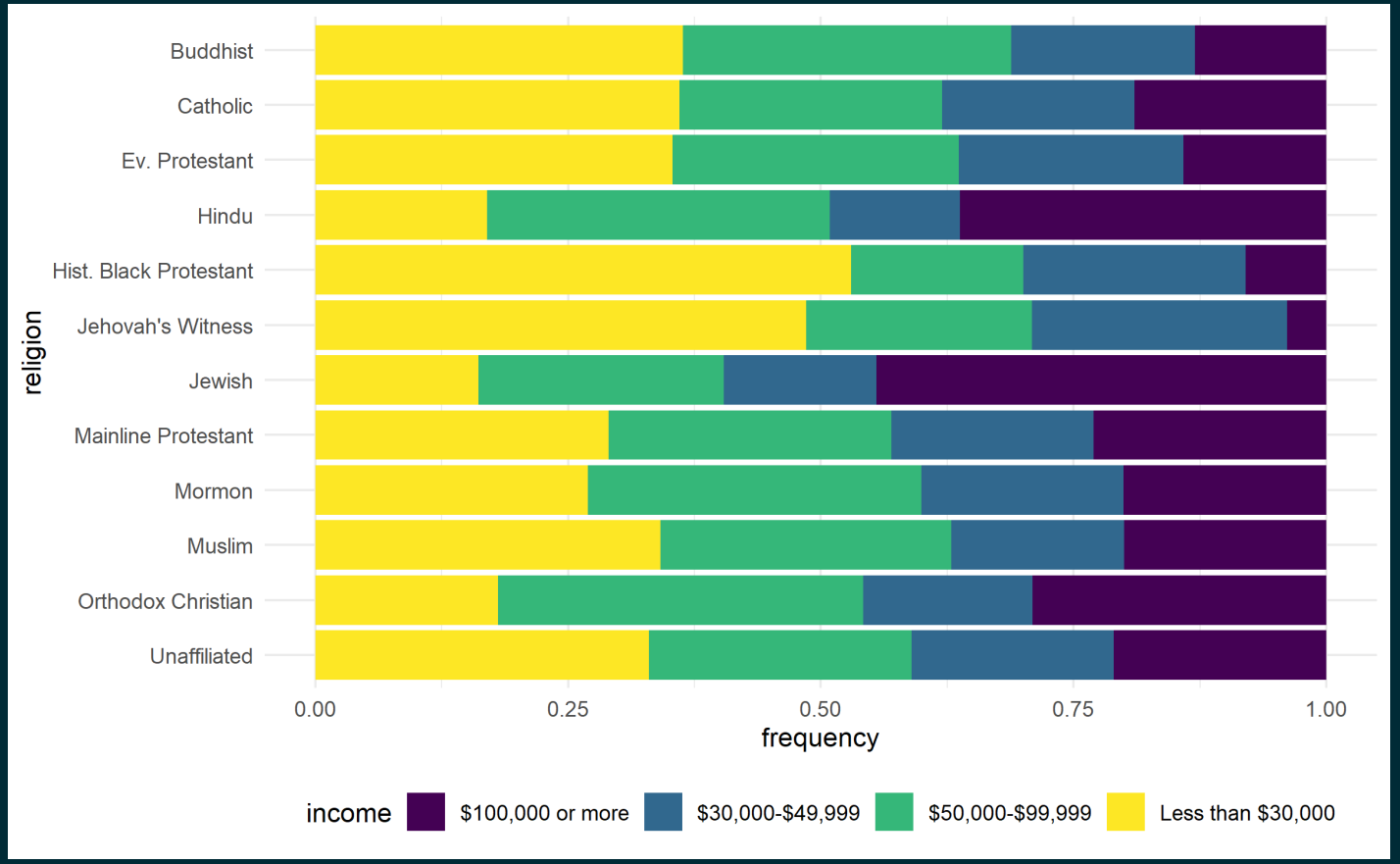
Change theme

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill") +
  scale_fill_viridis_d() +
  theme_minimal()
```

Move legend to the bottom

Plot Code



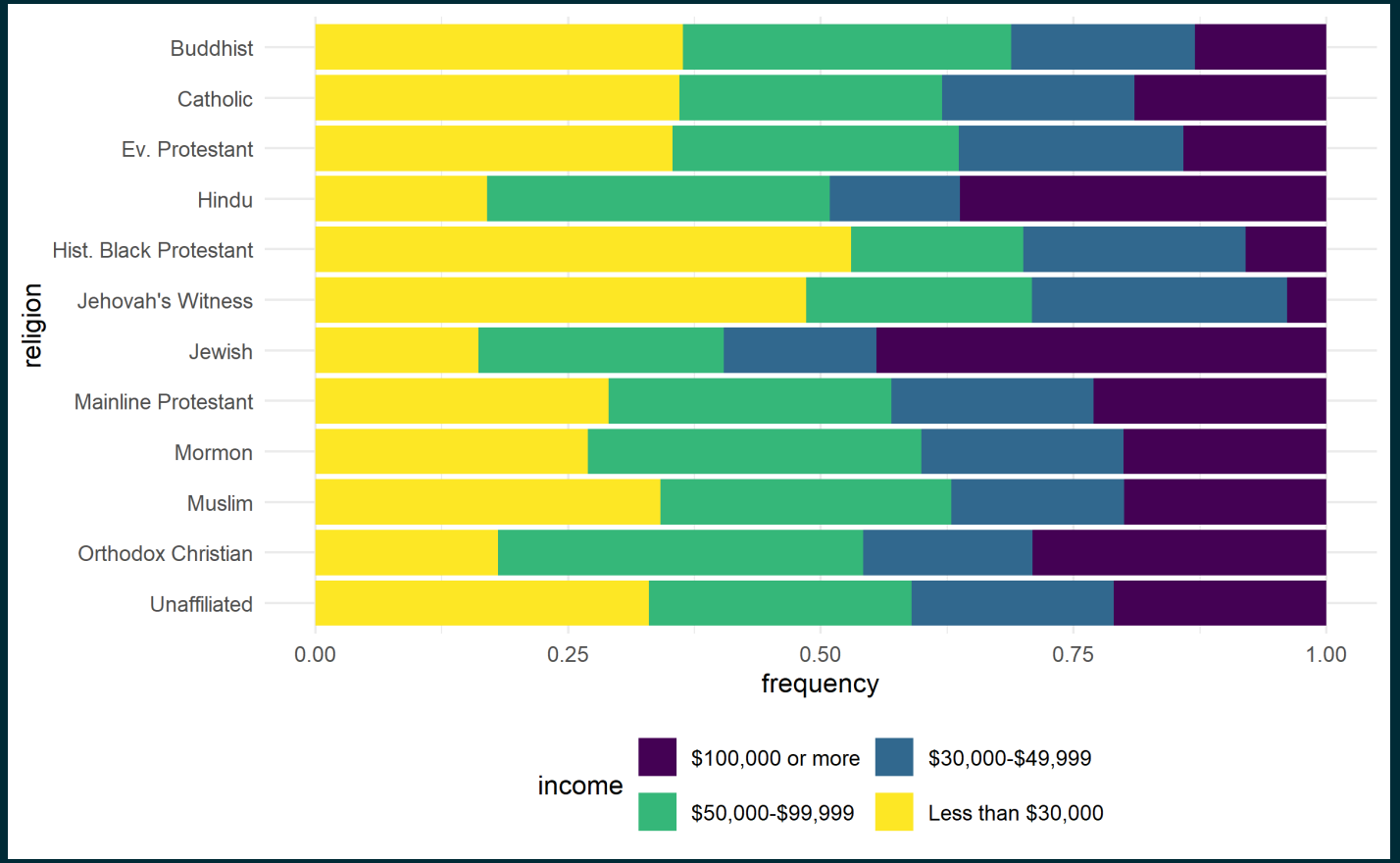
Move legend to the bottom

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill") +
  scale_fill_viridis_d() +
  theme_minimal() +
  theme(legend.position = "bottom")
```

Legend adjustments

Plot Code



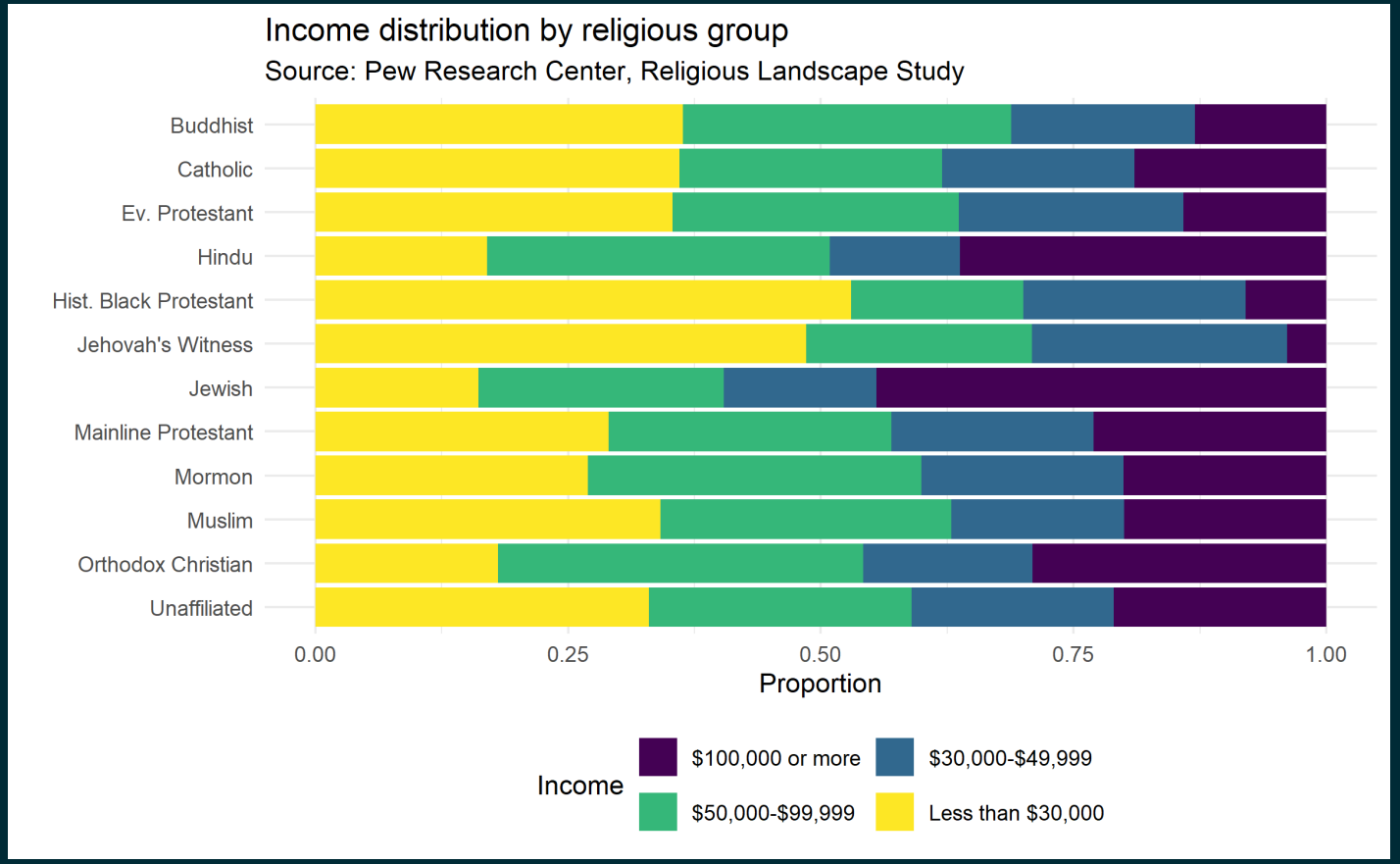
Legend adjustments

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill") +
  scale_fill_viridis_d() +
  theme_minimal() +
  theme(legend.position = "bottom") +
  guides(fill = guide_legend(nrow = 2, byrow = TRUE))
```

Fix labels

Plot Code



Fix labels

Plot | Code

```
ggplot(rel_inc_long, aes(y = religion, x = frequency, fill = income)) +
  geom_col(position = "fill") +
  scale_fill_viridis_d() +
  theme_minimal() +
  theme(legend.position = "bottom") +
  guides(fill = guide_legend(nrow = 2, byrow = TRUE)) +
  labs(
    x = "Proportion", y = "",
    title = "Income distribution by religious group",
    subtitle = "Source: Pew Research Center, Religious Landscape Study",
    fill = "Income"
    )
```