Analyzing Modern Slavery

Yatziri I. Carmona Ochoa

Packages

```
#Load packages
library(tidyverse)
library(readxl)
library(dplyr)
library(ggplot2)
library(tidyr)
library(scales)
```

Dataset

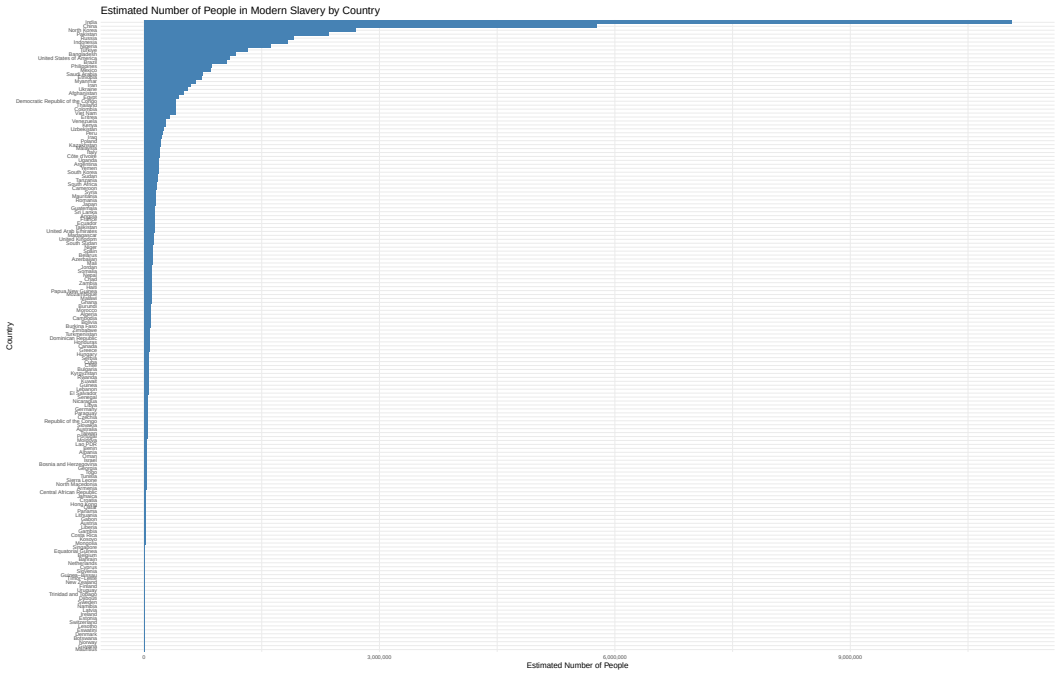
```
# Because there's multiple sheets and crowded rows, we need to specify where
# need to begin
df <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",
  skip = 2
)
```

Investigating Trends for Estimated Number of People in Modern Slavery

For Every Country

```
#Select columns for country and estimates
slavery_plot_data <- df |>
  select(Country, `Estimated number of people in modern slavery`) |>
  rename(Estimated = `Estimated number of people in modern slavery`) |>
  drop_na() |>
  arrange(desc(Estimated))
```

```
#Create comparison plot
ggplot(slavery_plot_data, aes(x = reorder(Country, Estimated), y = Estimated)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  scale_y_continuous(labels = scales::comma) +
  labs(
    title = "Estimated Number of People in Modern Slavery by Country",
    x = "Country",
    y = "Estimated Number of People"
  ) +
  theme_minimal(base_size = 3)
```



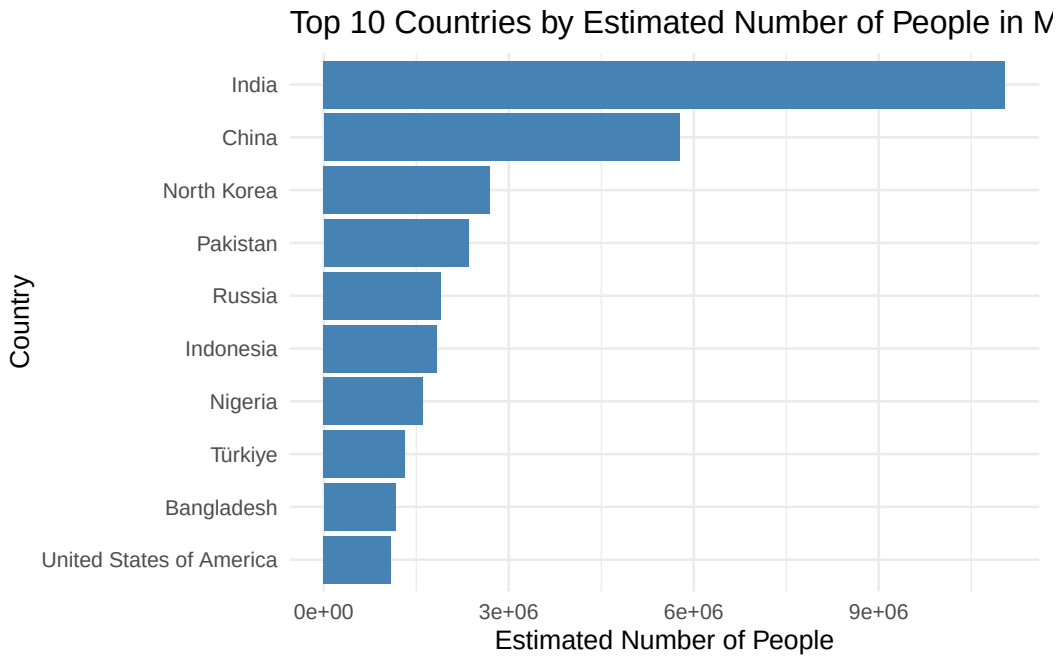
Top 10 Countries with the Greatest Number of Estimated People in Modern Slavery

```
#Checking for the top 10 countries with the greatest estimated number of people in modern sla

top10 <- df |>
  select(Country, `Estimated number of people in modern slavery`) |>
  rename(Estimated = `Estimated number of people in modern slavery`) |>
  arrange(desc(Estimated)) |>
  slice(1:10)

top10
```

```
# A tibble: 10 x 2
   Country                 Estimated
   <chr>                       <dbl>
 1 India                    11050000
 2 China                     5771000
 3 North Korea               2696000
 4 Pakistan                  2349000
 5 Russia                    1899000
```

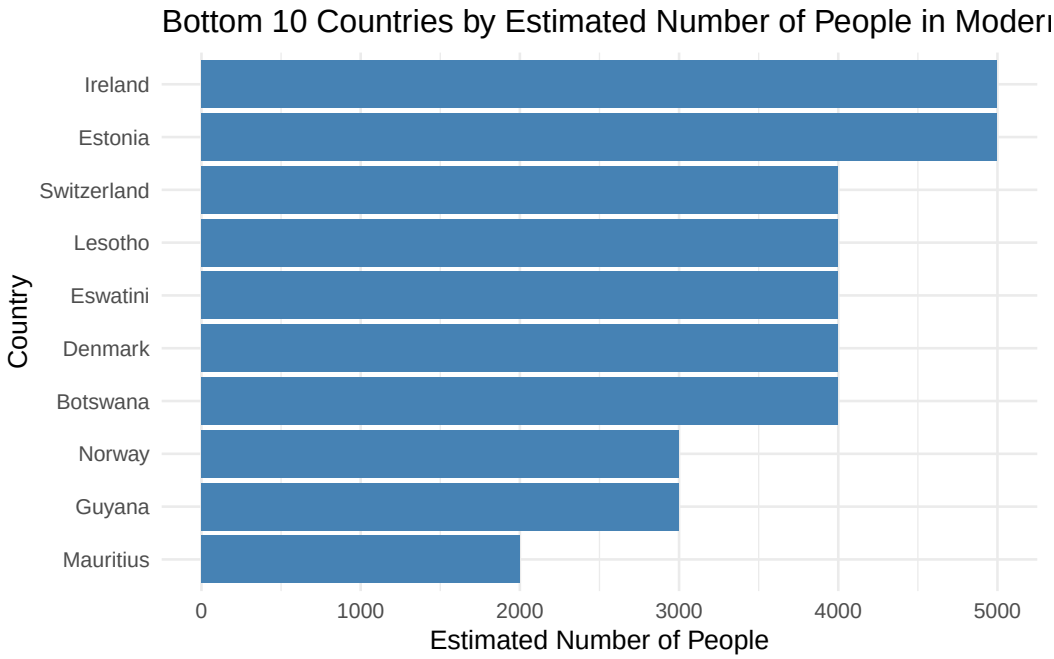
```
 6 Indonesia                  1833000
 7 Nigeria                    1611000
 8 Türkiye                    1320000
 9 Bangladesh                 1162000
10 United States of America   1091000
```

```r
top10 <- slavery_plot_data |>
  arrange(desc(Estimated)) |>
  slice(1:10)


ggplot(top10, aes(x = reorder(Country, Estimated), y = Estimated)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  scale_y_continuous() +
  labs(
    title = "Top 10 Countries by Estimated Number of People in Modern Slavery",
    x = "Country",
    y = "Estimated Number of People"
  ) +
  theme_minimal(base_size = 10)
```



Bottom 10 Countries with the Lowest Number of Estimated People in Modern Slavery

```
#Create comparison plot
slavery_plot_data <- df |>
  select(Country, `Estimated number of people in modern slavery`) |>
  rename(Estimated = `Estimated number of people in modern slavery`) |>
  drop_na() |>
  arrange((Estimated))

bottom10 <- slavery_plot_data |>
  arrange(Estimated) |>
  slice(1:10)


ggplot(bottom10, aes(x = reorder(Country, Estimated), y = Estimated)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  scale_y_continuous() +
  labs(
    title = "Bottom 10 Countries by Estimated Number of People in Modern Slavery",
    x = "Country",
    y = "Estimated Number of People"
  ) +
  theme_minimal(base_size = 10)
```




```
#Checking for the bottom 10 countries with the greatest estimated number of people in modern

df <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",  # or whichever sheet you want
  skip = 2
)

bottom10 <- df |>
  select(Country, `Estimated number of people in modern slavery`) |>
  rename(Estimated = `Estimated number of people in modern slavery`) |>
  arrange((Estimated)) |>
  slice(1:10)

bottom10
```

```
# A tibble: 10 x 2
   Country     Estimated
   <chr>           <dbl>
 1 Mauritius        2000
 2 Guyana           3000
 3 Norway           3000
 4 Botswana         4000
```

```
 5 Denmark           4000
 6 Eswatini          4000
 7 Lesotho           4000
 8 Switzerland       4000
 9 Estonia           5000
10 Ireland           5000
```

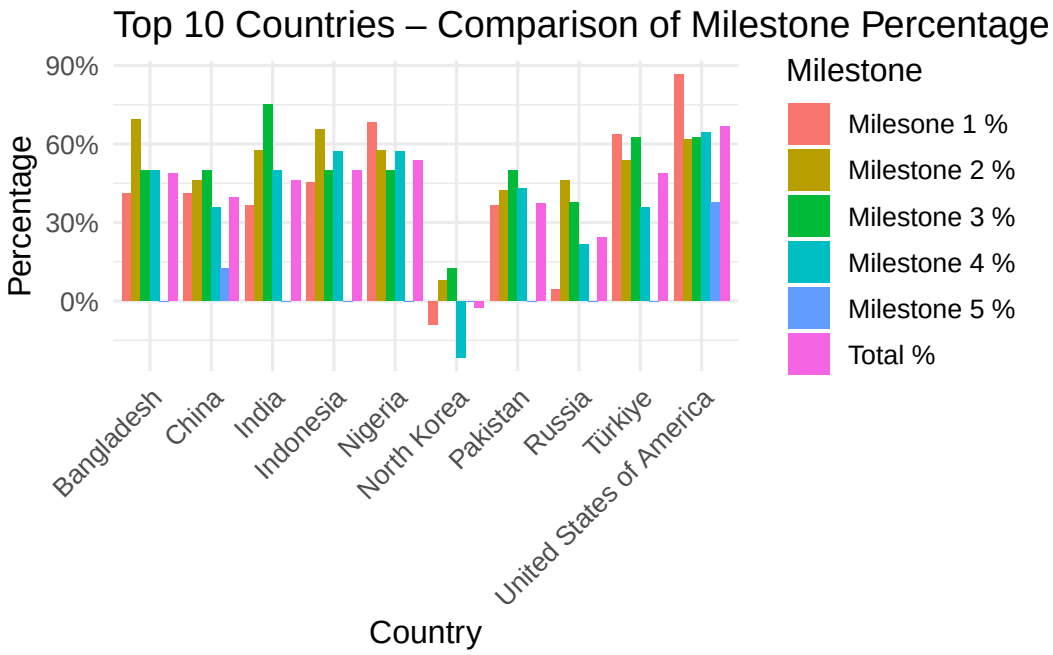
Investigating Government Response

Milestone Percentages Comparison for Top 10 Modern Slavery Countries

```
milestone_cols <- c(
  "Milestone 1 %",
  "Milestone 2 %",
  "Milestone 3 %",
  "Milestone 4 %",
  "Milestone 5 %",
  "Total %"
)
```

```
df_summary <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",
  skip = 2
)

df_summary <- df_summary |>
  mutate(Estimated = as.numeric(gsub(",", "", `Estimated number of people in modern slavery`)

top10 <- df_summary |>
  arrange(desc(Estimated)) |>
  slice(1:10) |>
  select(Country)

df_indicators <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "Govt response - Indicators",
  skip = 2
)
```

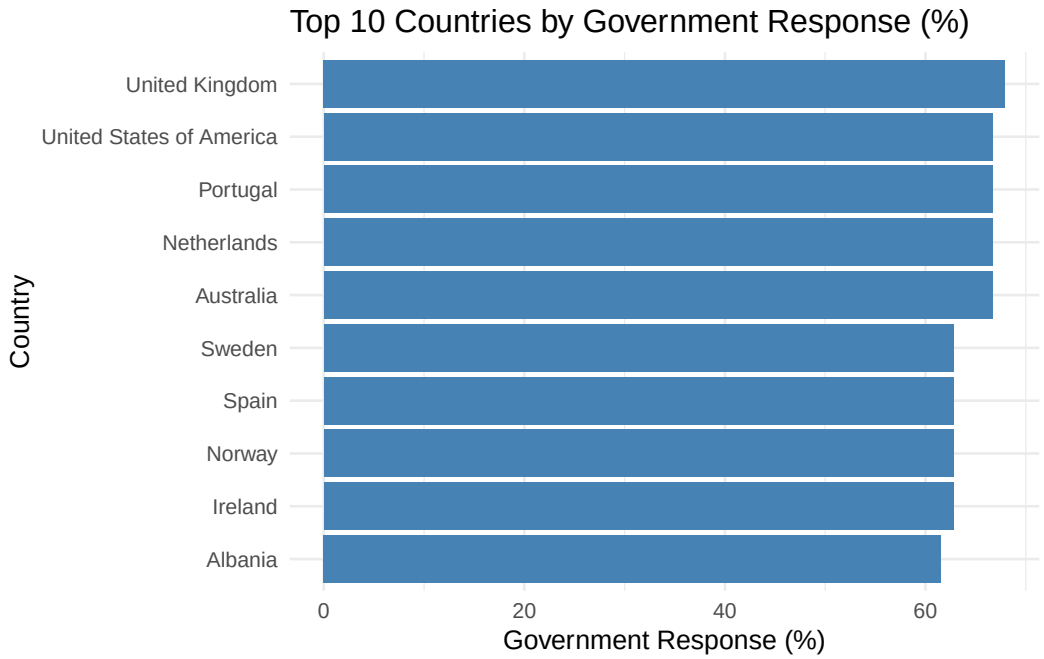
```r
df10 <- df_indicators |>
  filter(Country %in% top10$Country)

milestone_cols <- c(
  "Milesone 1 %",
  "Milestone 2 %",
  "Milestone 3 %",
  "Milestone 4 %",
  "Milestone 5 %",
  "Total %"
)

plot_data <- df10 |>
  select(Country, all_of(milestone_cols)) |>
  pivot_longer(cols = milestone_cols,
               names_to = "Milestone",
               values_to = "Percentage")

ggplot(plot_data,
       aes(x = Country, y = Percentage, fill = Milestone)) +
  geom_col(position = "dodge") +
  scale_y_continuous(labels = percent_format(scale = 1)) +
  labs(
    title = "Top 10 Countries - Comparison of Milestone Percentages",
    x = "Country",
    y = "Percentage",
    fill = "Milestone"
  ) +
  theme_minimal(base_size = 12) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




```
df_summary <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",
  skip = 2
)

df_summary <- df_summary |>
  mutate(`Government response total (%)` =
           as.numeric(gsub(",", "", `Government response total (%)`)))

slavery_plot_data <- df_summary |>
  select(Country, `Government response total (%)`) |>
  drop_na(`Government response total (%)`)

top10 <- slavery_plot_data |>
  arrange(desc(`Government response total (%)`)) |>
  slice(1:10)

bottom10 <- slavery_plot_data |>
  arrange(`Government response total (%)`) |>
  slice(1:10)
```

Top 10 Countries with the Best Government Response %

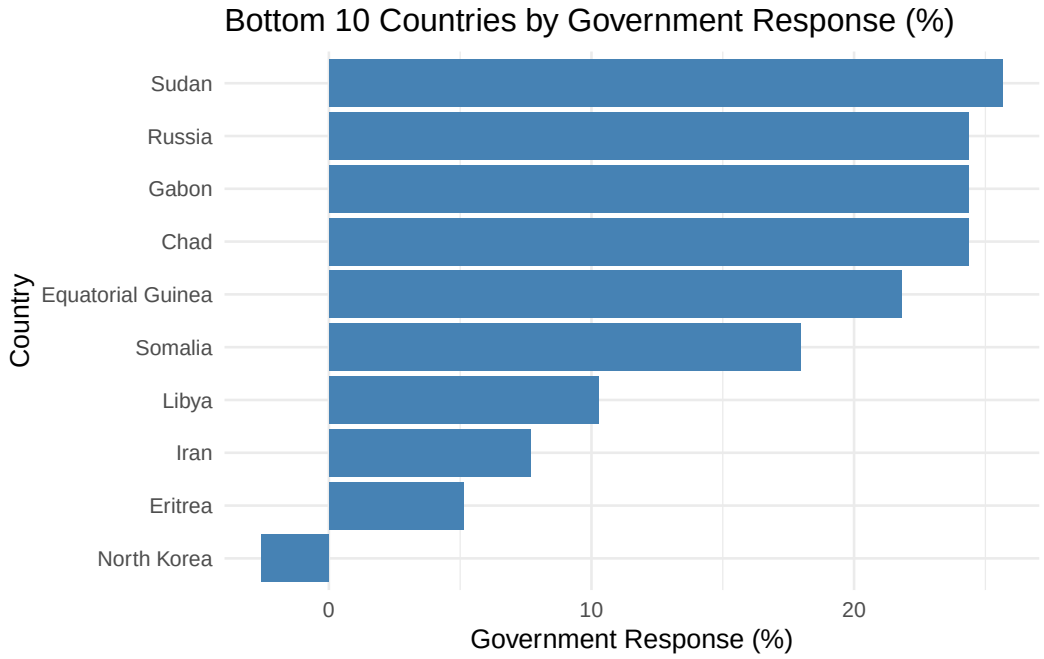
```
ggplot(top10, aes(
  x = reorder(Country, `Government response total (%)`),
  y = `Government response total (%)`
)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  labs(
    title = "Top 10 Countries by Government Response (%)",
    x = "Country",
    y = "Government Response (%)"
  ) +
  theme_minimal(base_size = 10)
```



Bottom 10 Countries with the Worst Government Response %

```
ggplot(bottom10, aes(
  x = reorder(Country, `Government response total (%)`),
  y = `Government response total (%)`
```

```
)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  labs(
    title = "Bottom 10 Countries by Government Response (%)",
    x = "Country",
    y = "Government Response (%)"
  ) +
  theme_minimal(base_size = 10)
```




```
df_summary <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",
  skip = 2
)

df_summary <- df_summary |>
  mutate(
    `Estimated number of people in modern slavery` =
      as.numeric(gsub(",", "", `Estimated number of people in modern slavery`)),

    `Government response total (%)` =
```

```
      as.numeric(gsub(",", "", `Government response total (%)`))
  )
top10_estimated <- df_summary |>
  arrange(desc(`Estimated number of people in modern slavery`)) |>
  slice(1:10) |>
  select(Country, `Estimated number of people in modern slavery`, `Government response total

ggplot(top10_estimated,
       aes(x = reorder(Country, `Government response total (%)`),
           y = `Government response total (%)`)) +
  geom_col(fill = "steelblue") +
  coord_flip() +
  labs (
    title = "Government Response (%) for Bottom 10 Countries by Estimated People in Modern Sl
    x = "Country",
    y = "Government Response (%)"
  ) +
  theme_minimal(base_size = 8)
```