

# Analyzing Modern Slavery

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## Packages

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

## Dataset

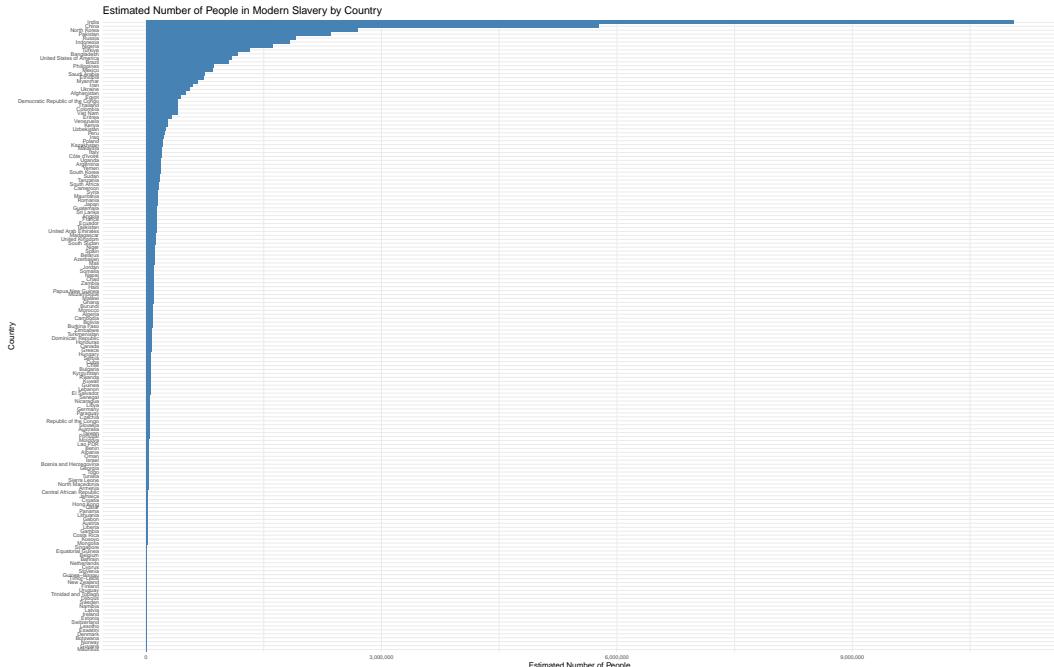
```
# Because there's multiple sheets and crowded rows, we need to specify where
# need to begin
df <- read_excel(
  "2023-Global-Slavery-Index-Data 2.xlsx",
  sheet = "GSI 2023 summary data",
  skip = 2
)
```

# 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 slavery
```

```
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)
```

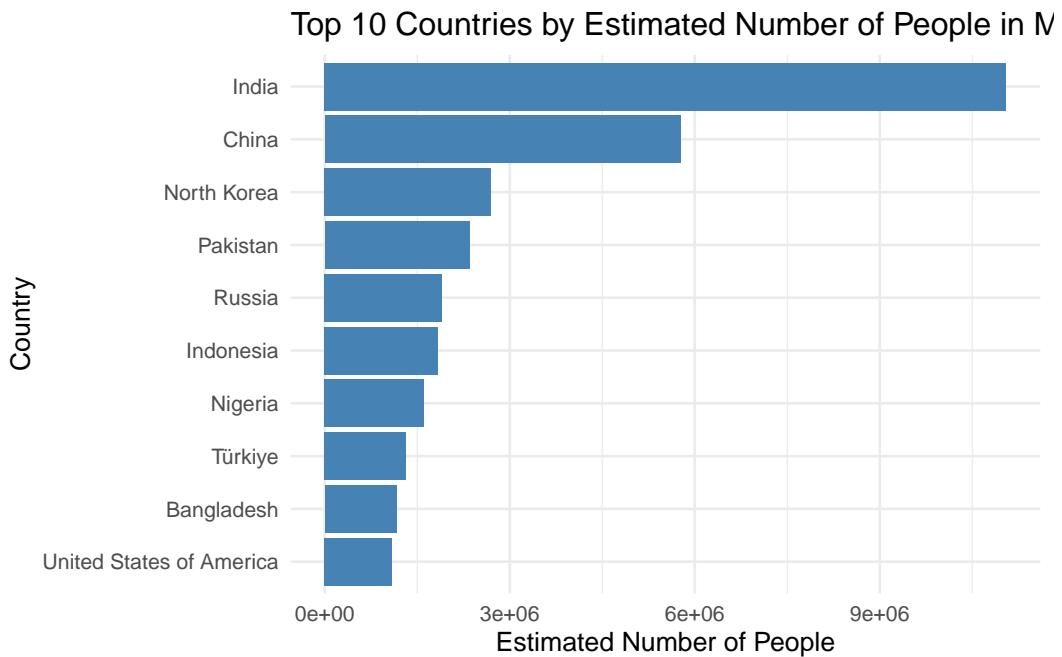
```
top10
```

```
# 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

```
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)
```



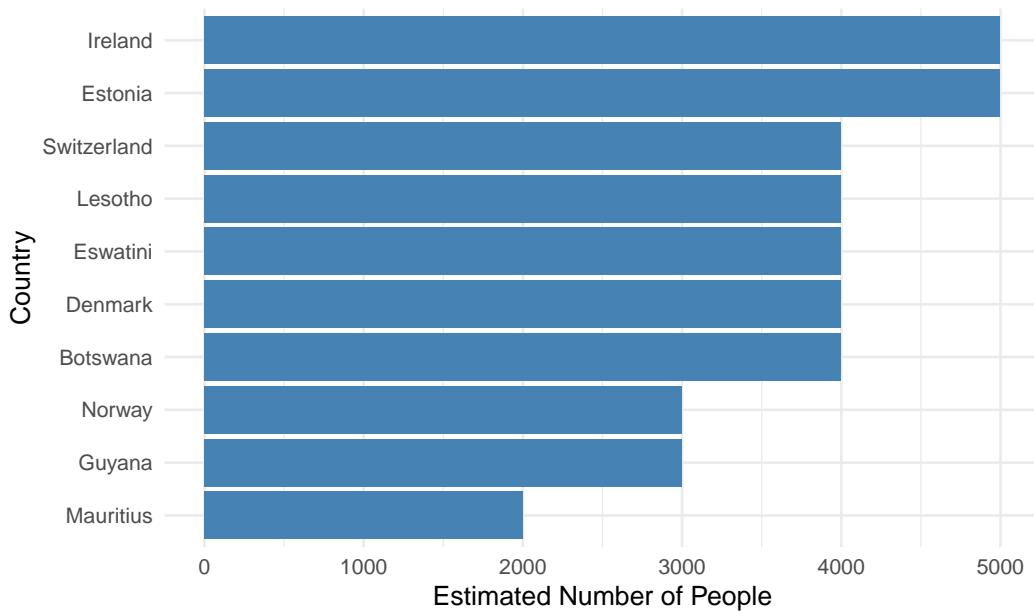
## Bottom 10 Countries with the Lowest Number of Estimated People in Modern Slavery

```
#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)
```

Bottom 10 Countries by Estimated Number of People in Modern Slavery



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

```
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
)

```

```

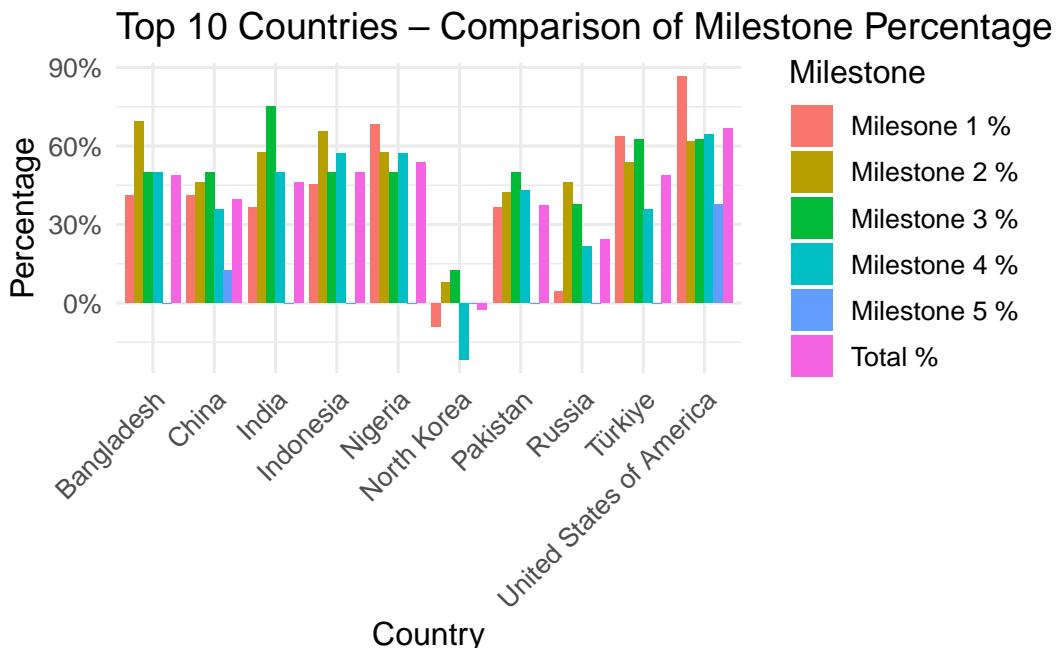
df10 <- df_indicators |>
  filter(Country %in% top10$Country)

milestone_cols <- c(
  "Milestone 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 (%)`)))

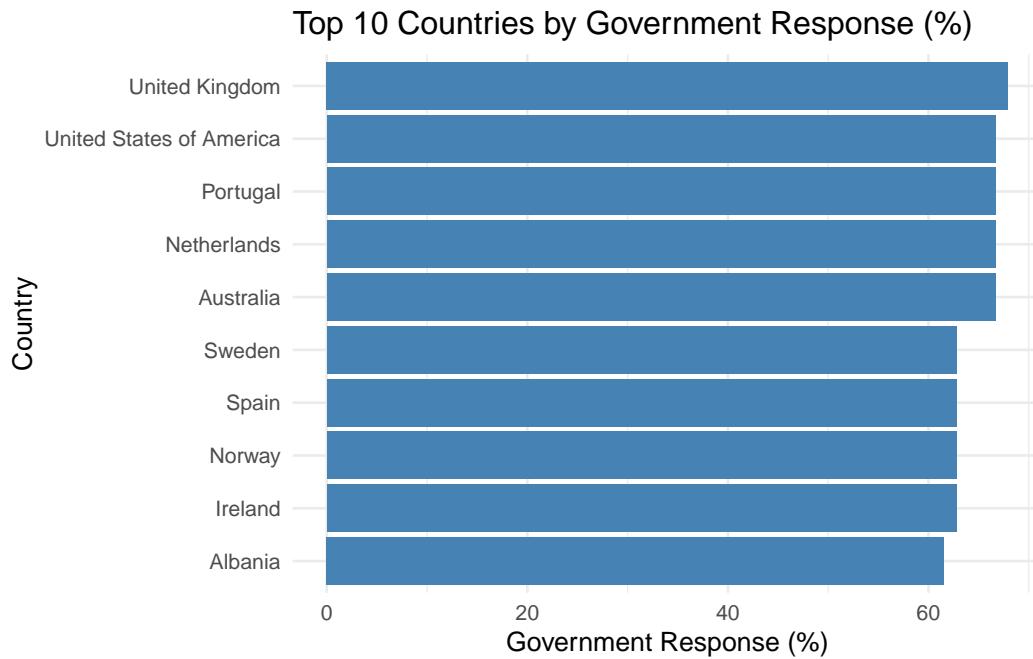
slavery_plot_data <- df_summary |>
  select(Country, `Government response total (%)`) |>
  drop_na(`Government response total (%)`)

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)
```



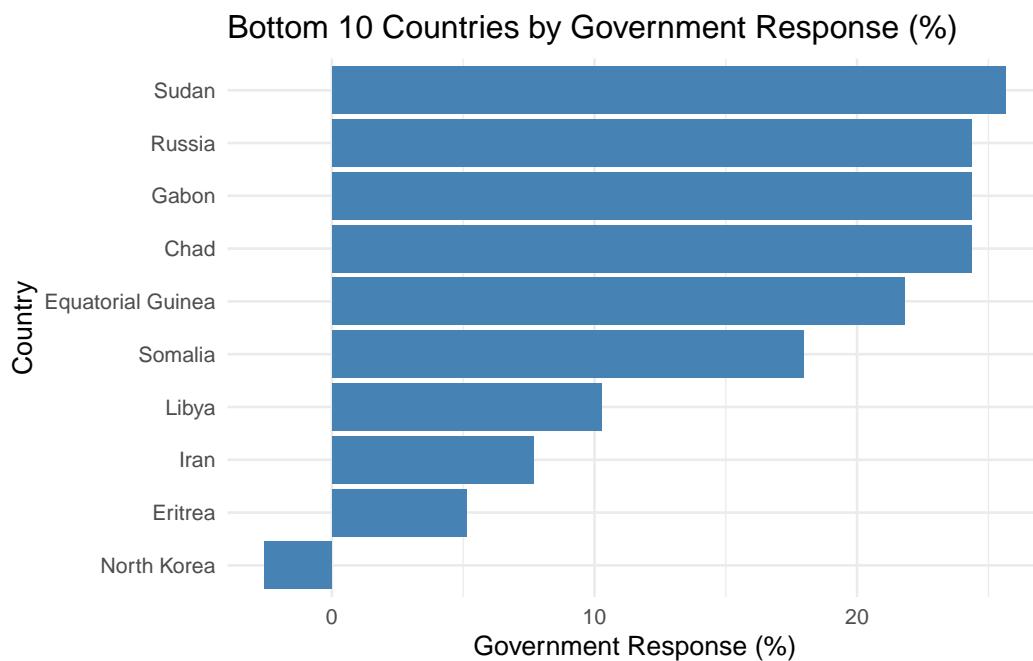
## Bottom 10 Countries with the Worst Government Response %

```
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 Top 10 Countries by Estimated People in Modern Slavery",
    x = "Country",
    y = "Government Response (%)"
  ) +
  theme_minimal(base_size = 8)

```

