08_Maternal Mortality_eda

Group K

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```
#load dataset
dataset <- read_csv("../raw_data/maternal-mortality_national_zaf.csv", show_col_types = FALSE)
head(dataset)
```

```
## # A tibble: 6 x 29
##   ISO3   DataId Indicator Value Precision DHS_CountryCode CountryName SurveyYear
##   <chr>  <chr>  <chr>     <chr> <chr>     <chr>           <chr>       <chr>
## 1 #coun~ #meta~ #indicat~ #ind~ #indicat~ <NA>            #country+n~ #date+year
## 2 ZAF    91409  Female d~ 5.5   1         ZA              South Afri~ 1998
## 3 ZAF    91377  Number o~ 19    0         ZA              South Afri~ 1998
## 4 ZAF    768646 Years of~ 1227~ 0         ZA              South Afri~ 1998
## 5 ZAF    768647 Years of~ 1237~ 0         ZA              South Afri~ 1998
## 6 ZAF    535566 Pregnanc~ 0.15  2         ZA              South Afri~ 1998
## # i 21 more variables: SurveyId <chr>, IndicatorId <chr>, IndicatorOrder <dbl>,
## #   IndicatorType <chr>, CharacteristicId <dbl>, CharacteristicOrder <dbl>,
## #   CharacteristicCategory <chr>, CharacteristicLabel <chr>,
## #   ByVariableId <chr>, ByVariableLabel <chr>, IsTotal <dbl>,
## #   IsPreferred <dbl>, SDRID <chr>, RegionId <lgl>, SurveyYearLabel <dbl>,
## #   SurveyType <chr>, DenominatorWeighted <dbl>, DenominatorUnweighted <dbl>,
## #   CILow <dbl>, CIHigh <dbl>, LevelRank <lgl>
```

#2. Data Overview

##Glimpse and summary statistics

```
## Rows: 22
## Columns: 29
## $ ISO3                  <chr> "#country+code", "ZAF", "ZAF", "ZAF", "ZAF", "Z~
## $ DataId                <chr> "#meta+id", "91409", "91377", "768646", "768647~
## $ Indicator             <chr> "#indicator+name", "Female deaths that are preg~
## $ Value                 <chr> "#indicator+value+num", "5.5", "19", "122701", ~
## $ Precision             <chr> "#indicator+precision", "1", "0", "0", "0", "2"~
## $ DHS_CountryCode       <chr> NA, "ZA", "ZA", "ZA", "ZA", "ZA", "ZA", "ZA", "~
## $ CountryName           <chr> "#country+name", "South Africa", "South Africa"~
## $ SurveyYear            <chr> "#date+year", "1998", "1998", "1998", "1998", "~
## $ SurveyId              <chr> "#survey+id", "ZA1998DHS", "ZA1998DHS", "ZA1998~
## $ IndicatorId           <chr> "#indicator+code", "MM_MMRT_W_FDP", "MM_MMRT_W_~
## $ IndicatorOrder        <dbl> NA, 77003010, 77003020, 77003030, 77003040, 770~
## $ IndicatorType         <chr> NA, "I", "N", "D", "U", "I", "I", "I", "C", "C"~
## $ CharacteristicId      <dbl> NA, 10000, 10000, 10000, 10000, 10000, 1000, 10~
## $ CharacteristicOrder   <dbl> NA, 10000, 10000, 10000, 10000, 10000, 0, 0, 0,~
## $ CharacteristicCategory <chr> NA, "Total 15-49", "Total 15-49", "Total 15-49"~
```

```
## $ CharacteristicLabel    <chr> NA, "Total 15-49", "Total 15-49", "Total 15-49"~
## $ ByVariableId           <chr> "#indicator+label+code", "0", "0", "0", "0", "0~
## $ ByVariableLabel        <chr> "#indicator+label", NA, NA, NA, NA, NA, NA, NA,~
## $ IsTotal                <dbl> NA, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1~
## $ IsPreferred            <dbl> NA, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1~
## $ SDRID                  <chr> NA, "MMMMRTWFDP", "MMMMRTWPDT", "MMMMRTWEXP", "~
## $ RegionId               <lgl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA,~
## $ SurveyYearLabel        <dbl> NA, 1998, 1998, 1998, 1998, 1998, 1998, 1998, 1~
## $ SurveyType             <chr> NA, "DHS", "DHS", "DHS", "DHS", "DHS", "DHS", "~
## $ DenominatorWeighted    <dbl> NA, NA, NA, NA, NA, 122701, NA, NA, NA, NA, NA,~
## $ DenominatorUnweighted  <dbl> NA, NA, NA, 123738, 123738, 123738, NA, NA, NA,~
## $ CILow                  <dbl> NA, NA, NA, NA, NA, NA, NA, 77, NA, NA, NA, NA,~
## $ CIHigh                 <dbl> NA, NA, NA, NA, NA, NA, NA, 223, NA, NA, NA, NA~
## $ LevelRank              <lgl> NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA, NA,~
```

```
##      ISO3               DataId           Indicator            Value
##  Length:22          Length:22          Length:22          Length:22
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##   Precision         DHS_CountryCode    CountryName         SurveyYear
##  Length:22          Length:22          Length:22          Length:22
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##
##    SurveyId          IndicatorId        IndicatorOrder     IndicatorType
##  Length:22          Length:22          Min.   :77003010   Length:22
##  Class :character   Class :character   1st Qu.:77003030   Class :character
##  Mode  :character   Mode  :character   Median :77033010   Mode  :character
##                                        Mean   :77018746
##                                        3rd Qu.:77033030
##                                        Max.   :77033060
##                                        NA's   :1
##  CharacteristicId CharacteristicOrder CharacteristicCategory
##  Min.   : 1000    Min.   :    0       Length:22
##  1st Qu.: 1000    1st Qu.:    0       Class :character
##  Median : 1000    Median :    0       Mode  :character
##  Mean   : 5286    Mean   : 4762
##  3rd Qu.:10000    3rd Qu.:10000
##  Max.   :10000    Max.   :10000
##  NA's   :1        NA's   :1
##  CharacteristicLabel ByVariableId       ByVariableLabel       IsTotal
##  Length:22           Length:22          Length:22          Min.   :1
##  Class :character    Class :character   Class :character   1st Qu.:1
##  Mode  :character    Mode  :character   Mode  :character   Median :1
##                                                            Mean   :1
##                                                            3rd Qu.:1
##                                                            Max.   :1
```

```
##                                                                 NA's   :1
##   IsPreferred    SDRID           RegionId       SurveyYearLabel
##  Min.   :1    Length:22          Mode:logical   Min.   :1998
##  1st Qu.:1    Class :character   NA's:22        1st Qu.:1998
##  Median :1    Mode  :character                  Median :2016
##  Mean   :1                                      Mean   :2007
##  3rd Qu.:1                                      3rd Qu.:2016
##  Max.   :1                                      Max.   :2016
##  NA's   :1                                      NA's   :1
##   SurveyType        DenominatorWeighted DenominatorUnweighted     CILow
##  Length:22          Min.   : 62768      Min.   : 63523        Min.   : 77.0
##  Class :character   1st Qu.: 77751      1st Qu.: 63523        1st Qu.:155.5
##  Mode  :character   Median : 92735      Median : 93631        Median :234.0
##                     Mean   : 92735      Mean   : 93631        Mean   :193.7
##                     3rd Qu.:107718      3rd Qu.:123738        3rd Qu.:252.0
##                     Max.   :122701      Max.   :123738        Max.   :270.0
##                     NA's   :20          NA's   :16            NA's   :19
##      CIHigh      LevelRank
##  Min.   :223.0   Mode:logical
##  1st Qu.:469.0   NA's:22
##  Median :715.0
##  Mean   :580.0
##  3rd Qu.:758.5
##  Max.   :802.0
##  NA's   :19
```

#3. Data Quality

##Missing values per column

```
missing_values <- colSums(is.na(dataset))
missing_values
```

```
##                   ISO3                 DataId              Indicator
##                      0                      0                      0
##                  Value              Precision        DHS_CountryCode
##                      0                      0                      1
##            CountryName             SurveyYear               SurveyId
##                      0                      0                      0
##            IndicatorId        IndicatorOrder          IndicatorType
##                      0                      1                      1
##       CharacteristicId    CharacteristicOrder CharacteristicCategory
##                      1                      1                      1
##    CharacteristicLabel          ByVariableId        ByVariableLabel
##                      1                      0                     21
##                IsTotal           IsPreferred                  SDRID
##                      1                      1                      1
##               RegionId        SurveyYearLabel             SurveyType
##                     22                      1                      1
##    DenominatorWeighted  DenominatorUnweighted                  CILow
##                     20                     16                     19
##                 CIHigh             LevelRank
##                     19                     22
```

##Dupilcates

```
duplicates <- sum(duplicated(dataset))
duplicates
```

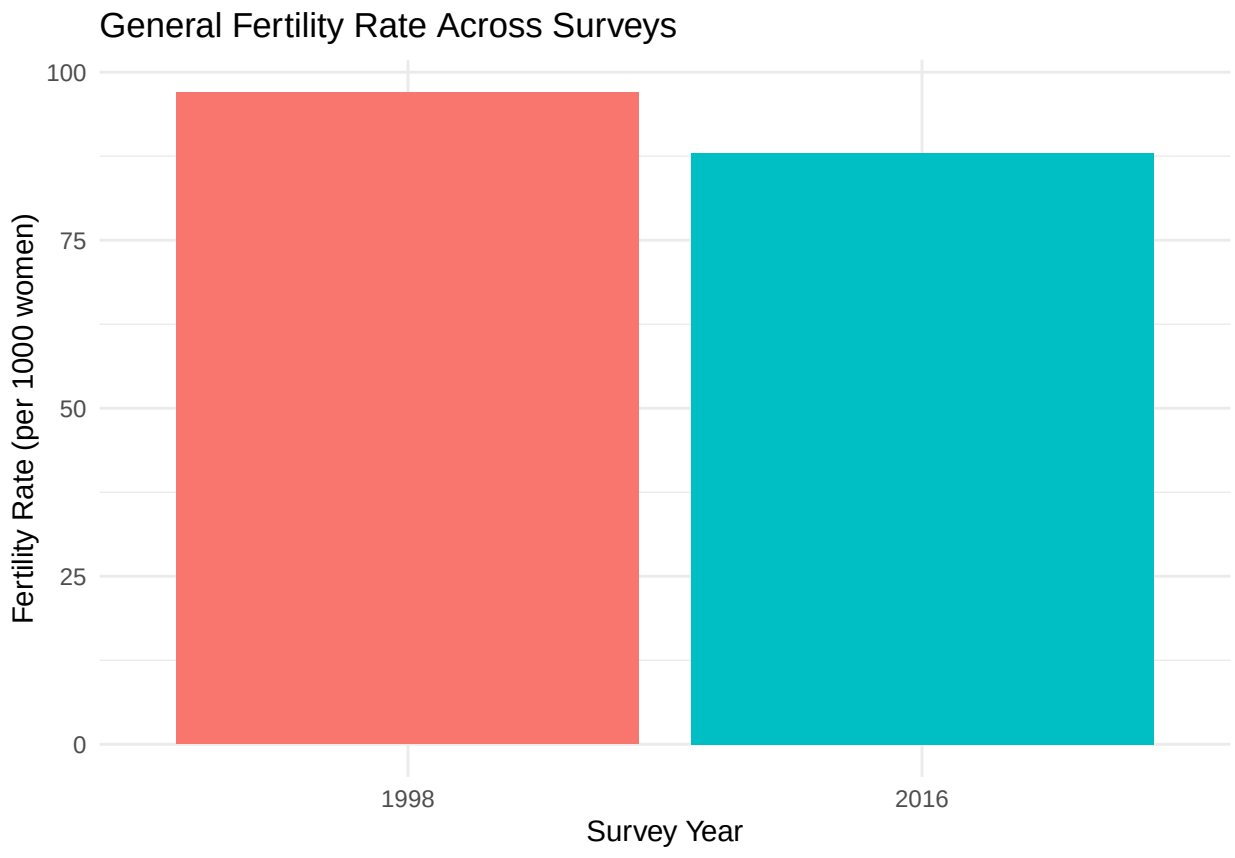
```
## [1] 0
```

#4. Visualizations

Bar plot showing the distribution of fertility-related indicators

```
fertility_data <- dataset %>%
  filter(Indicator == "General fertility rate") %>%
  mutate(Value = as.numeric(Value),
         SurveyYear = as.factor(SurveyYear))

ggplot(fertility_data, aes(x = SurveyYear, y = Value, fill = SurveyYear)) +
  geom_bar(stat = "identity") +
  labs(title = "General Fertility Rate Across Surveys",
       x = "Survey Year",
       y = "Fertility Rate (per 1000 women)") +
  theme_minimal() +
  theme(legend.position = "none")
```

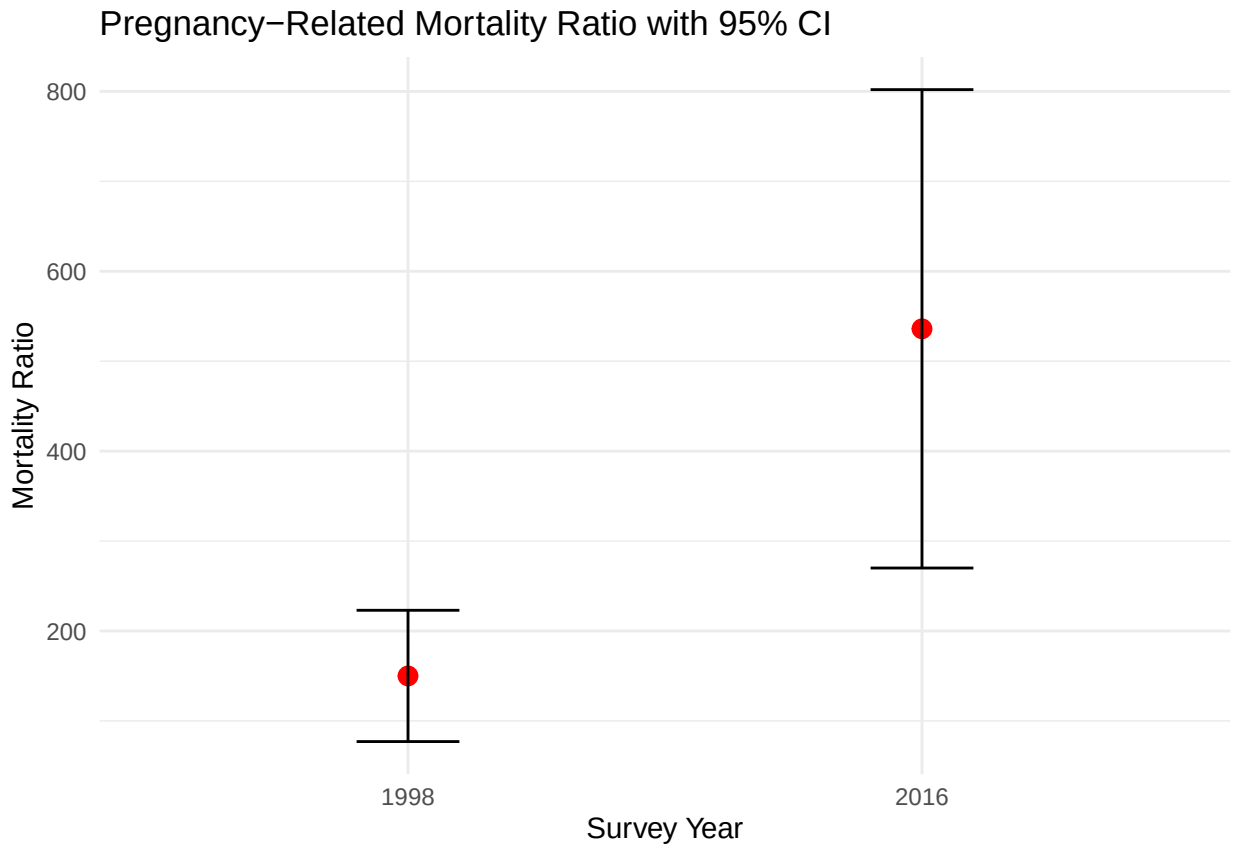


```
ggsave("../outputs/visuals/fertility_rate_barplot.png", width = 6, height = 4)
```

Point plot with error bars to visualize the Pregnancy-related mortality ratio along with its lower and upper bounds.

```
prmr_data <- dataset %>%
  filter(Indicator == "Pregnancy-related mortality ratio") %>%
  mutate(Value = as.numeric(Value),
         CILow = as.numeric(CILow),
         CIHigh = as.numeric(CIHigh),
         SurveyYear = as.factor(SurveyYear))

ggplot(prmr_data, aes(x = SurveyYear, y = Value)) +
  geom_point(size = 3, color = "red") +
  geom_errorbar(aes(ymin = CILow, ymax = CIHigh), width = 0.2) +
  labs(title = "Pregnancy-Related Mortality Ratio with 95% CI",
       x = "Survey Year",
       y = "Mortality Ratio") +
  theme_minimal()
```




```
ggsave("../outputs/visuals/prmr_pointplot.png", width = 6, height = 4)
```

#Summary Tables

```r
# 1. Remove first row if it's metadata/header
dataset_clean <- dataset[-1, ]

# 2. Convert relevant numeric columns to numeric
numeric_cols <- c("Value", "DenominatorWeighted", "DenominatorUnweighted", "CILow", "CIHigh")

dataset_clean <- dataset_clean %>%
  mutate(across(all_of(numeric_cols), ~ as.numeric(.)))

# 3. Create a tidy summary table
summary_table <- dataset_clean %>%
  summarise(across(all_of(numeric_cols),
                   list(mean = ~mean(., na.rm = TRUE),
                        sd   = ~sd(., na.rm = TRUE),
                        min  = ~min(., na.rm = TRUE),
                        max  = ~max(., na.rm = TRUE)))) %>%
  pivot_longer(
    cols = everything(),
    names_to = c("Variable", "Statistic"),
    names_sep = "_",
    values_to = "Value"
  ) %>%
  arrange(Variable)

write_csv(summary_table, "../outputs/summary tables/summary_dataset_tidy.csv")

summary_table
```

```
## # A tibble: 20 x 3
##    Variable              Statistic      Value
##    <chr>                 <chr>          <dbl>
##  1 CIHigh                mean         580
##  2 CIHigh                sd           312.
##  3 CIHigh                min          223
##  4 CIHigh                max          802
##  5 CILow                 mean         194.
##  6 CILow                 sd           103.
##  7 CILow                 min           77
##  8 CILow                 max          270
##  9 DenominatorUnweighted mean       93630.
## 10 DenominatorUnweighted sd         32981.
## 11 DenominatorUnweighted min        63523
## 12 DenominatorUnweighted max       123738
## 13 DenominatorWeighted   mean       92734.
## 14 DenominatorWeighted   sd         42379.
## 15 DenominatorWeighted   min        62768
## 16 DenominatorWeighted   max       122701
## 17 Value                 mean       17882.
## 18 Value                 sd         39767.
## 19 Value                 min            0.005
## 20 Value                 max       123738
```

#Data dictionary

```r
# Create a dictionary manually
data_dictionary <- tibble(
  Column = c("ISO3", "DataId", "Indicator", "Value", "Precision", "DHS_CountryCode",
             "CountryName", "SurveyYear", "SurveyId", "IndicatorId", "IndicatorOrder",
             "IndicatorType", "CharacteristicId", "CharacteristicOrder",
             "CharacteristicCategory", "CharacteristicLabel", "ByVariableId",
             "ByVariableLabel", "IsTotal", "IsPreferred", "SDRID", "RegionId",
             "SurveyYearLabel", "SurveyType", "DenominatorWeighted",
             "DenominatorUnweighted", "CILow", "CIHigh", "LevelRank"),
  DataType = c("character","character","character","character","character","character",
               "character","character","character","character","numeric",
               "character","numeric","numeric","character","character","character",
               "character","numeric","numeric","character","logical","numeric",
               "character","numeric","numeric","numeric","numeric","logical"),
  Description = c(
    "ISO3 country code",
    "Unique ID for the dataset row",
    "Name of the health indicator",
    "Numeric value of the indicator (currently character)",
    "Number of decimal places or precision",
    "Country code from DHS dataset",
    "Full country name",
    "Year survey was conducted",
    "Unique ID for the survey",
    "DHS indicator code",
    "Order of indicator in dataset",
    "Type of indicator (I,N,D,U,C)",
    "ID for the population characteristic",
    "Order of the characteristic",
    "Category of the population (e.g., Total 15-49)",
    "Label describing the population characteristic",
    "ID for any breakdown variable",
    "Label for breakdown variable",
    "1 if row represents a total, 0 otherwise",
    "1 if this is the preferred row for this indicator, 0 otherwise",
    "DHS short code for the indicator",
    "Region identifier (mostly NA)",
    "Year label for survey (redundant with SurveyYear)",
    "Type of survey (e.g., DHS)",
    "Weighted denominator used to calculate indicator",
    "Unweighted denominator used to calculate indicator",
    "Lower bound of the confidence interval",
    "Upper bound of the confidence interval",
    "Level rank (mostly NA; optional hierarchy indicator)"
  )
)

kable(data_dictionary, caption = "Data Dictionary for the DHS Maternal Mortality Dataset")
```

Table 1: Data Dictionary for the DHS Maternal Mortality Dataset

Column	DataType	Description
ISO3	character	ISO3 country code
DataId	character	Unique ID for the dataset row
Indicator	character	Name of the health indicator
Value	character	Numeric value of the indicator (currently character)
Precision	character	Number of decimal places or precision
DHS_CountryCode	character	Country code from DHS dataset
CountryName	character	Full country name
SurveyYear	character	Year survey was conducted
SurveyId	character	Unique ID for the survey
IndicatorId	character	DHS indicator code
IndicatorOrder	numeric	Order of indicator in dataset
IndicatorType	character	Type of indicator (I,N,D,U,C)
CharacteristicId	numeric	ID for the population characteristic
CharacteristicOrder	numeric	Order of the characteristic
CharacteristicCategory	character	Category of the population (e.g., Total 15-49)
CharacteristicLabel	character	Label describing the population characteristic
ByVariableId	character	ID for any breakdown variable
ByVariableLabel	character	Label for breakdown variable
IsTotal	numeric	1 if row represents a total, 0 otherwise
IsPreferred	numeric	1 if this is the preferred row for this indicator, 0 otherwise
SDRID	character	DHS short code for the indicator
RegionId	logical	Region identifier (mostly NA)
SurveyYearLabel	numeric	Year label for survey (redundant with SurveyYear)
SurveyType	character	Type of survey (e.g., DHS)
DenominatorWeighted	numeric	Weighted denominator used to calculate indicator
DenominatorUnweighted	numeric	Unweighted denominator used to calculate indicator
CILow	numeric	Lower bound of the confidence interval
CIHigh	numeric	Upper bound of the confidence interval
LevelRank	logical	Level rank (mostly NA; optional hierarchy indicator)

```
write_csv(data_dictionary, "../outputs/dictionary/maternal_mortality_dictionary.csv")
```