24_Brazil

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1 How has the under-5 mortality rate for girls evolved relative to that of boys in Brazil between 1960 and 2020?

1.1 Abstract

Using World Bank World Development Indicators (WDI), this study examines the evolution of under-5 mortality rates for girls and boys in Brazil from 1960 to 2020. Over this sixty-year period, both male and female mortality rates declined significantly, reflecting improvements in public health, nutrition, and healthcare access. In 1960, male under-5 mortality was about 25 deaths per 1,000 live births higher than female mortality. While the gap gradually narrowed over time, male mortality remained consistently higher than female throughout the period. These trends highlight both progress in child health and the persistent gender differences in vulnerability during early childhood. The findings underscore the importance of targeted child health interventions and continued monitoring of sex-specific health outcomes.

1.2 1. Question

How has the under-5 mortality rate for girls evolved relative to that of boys in Brazil between 1960 and 2020?

- **Female under-5 mortality proxy**: Mortality rate, under-5, female (per 1,000 live births)
- **Male under-5 mortality proxy**: Mortality rate, under-5, male (per 1,000 live births)

1.3 2. Data

- **Source**: World Bank World Development Indicators (WDI)
- **Indicators**:
    - Mortality rate, under-5, female (per 1,000 live births)
    - Mortality rate, under-5, male (per 1,000 live births)
- **Coverage**: Brazil, 1960–2020
- **Notes**: National-level data only

1.4 3. Method

1. Filtered dataset for Brazil.
2. **Selected relevant columns**: Year, Indicator Name, Value.
3. Pivoted male and female mortality rates into separate columns and sorted by year.
4. Produced a dual-axis line graph comparing female and male under-5 mortality rates over time.

(Analysis is descriptive; no causal inference applied.)

1.5 4. Results

- **Female under-5 mortality (per 1,000 live births)**: Declined steadily from 1960 to 2020, reflecting major gains in child health.
- **Male under-5 mortality (per 1,000 live births)**: Also declined, but remained higher than female mortality throughout the period.
- **Comparison**: Male mortality began about 25 per 1,000 higher than female in 1960, converged gradually over the decades, yet the male rate consistently exceeded the female rate, illustrating persistent sex-specific vulnerability.

(Figure 1. Under-5 Mortality by Sex, Brazil 1960–2020)

(Table 1. Pivoted dataset)

1.6 5. Interpretation

- Brazil's declining under-5 mortality reflects improvements in healthcare access, immunization programs, sanitation, and nutrition over six decades.
- The persistent excess male mortality aligns with biological susceptibility in early childhood, highlighting that aggregate reductions may not eliminate sex-specific risk.
- Gradual convergence suggests progress toward equitable child health outcomes, though remaining differences indicate targeted interventions for boys may still be relevant.
- These findings underscore the need for continuous investment in maternal and child health programs, early childhood monitoring, and sex-sensitive public health strategies.

1.7 6. Limitations

- National-level estimates may mask regional disparities, particularly between urban and rural areas.
- Mortality data do not capture causes of death, limiting understanding of structural or environmental determinants.
- Descriptive analysis does not isolate policy or health system contributions to mortality declines.

1.8 7. Next Steps / Extensions

- Conduct state- or municipality-level analysis to examine regional convergence and disparities.
- Investigate cause-specific mortality to identify areas for targeted interventions.
- Compare Brazil's sex-specific under-5 mortality trends with other Latin American countries to contextualize progress.
- Explore links between socioeconomic status, healthcare access, and persistent gender gaps in child survival.

```python
[1]: # How has the under-5 mortality rate for girls evolved relative to that of boys
     ↪in Brazil between 1960 and 2020?

     import pandas as pd
     import matplotlib.pyplot as plt
```

```python
import os

# Folders
data_raw_folder = "data_raw/"
data_clean_folder = "data_clean/"
figures_folder = "figures/"

# Load CSV
filename = "health_bra_filtered.csv"  # Filtered dataset with only relevant rows
df = pd.read_csv(os.path.join(data_raw_folder, filename))

# Keep only needed columns
df = df[["Year", "Indicator Name", "Value"]]

# Convert Year and Value to numeric, drop invalid rows
df["Year"] = pd.to_numeric(df["Year"], errors="coerce")
df["Value"] = pd.to_numeric(df["Value"], errors="coerce")
df = df.dropna(subset=["Year", "Value"])

# Pivot indicators into separate columns
df_pivot = df.pivot(index="Year", columns="Indicator Name", values="Value").
 ↪reset_index()
df_pivot = df_pivot.sort_values("Year")

print("Pivoted Brazil dataset:")
display(df_pivot)

# Interpolate missing values for smooth plotting (optional)
df_plot = df_pivot.interpolate(method='linear')

# Plot the two indicators
plt.figure(figsize=(10,6))
plt.plot(df_plot["Year"], df_plot["Mortality rate, under-5, female (per 1,000␣
 ↪live births)"],
         marker='o', linestyle='-', label="Female mortality rate, under-5")
plt.plot(df_plot["Year"], df_plot["Mortality rate, under-5, male (per 1,000␣
 ↪live births)"],
         marker='o', linestyle='-', label="Male mortality rate, under-5")

plt.title("Brazil: Female vs Male mortality rate under-5 (%) (1960-2020)")
plt.xlabel("Year")
plt.ylabel("Rate per 1,000 live births")
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.savefig(os.path.join(figures_folder,␣
 ↪"brazil_female_vs_male_mortality_rate_under-5.png"))
```

```
plt.show()

# Save cleaned CSV
df_pivot.to_csv(os.path.join(data_clean_folder,␣
 ↪"brazil_female_vs_male_mortality_rate_under-5"), index=False)
```

Pivoted Brazil dataset:

Indicator Name Year Mortality rate, under-5, female (per 1,000 live births) \
0   1960   155.9
1   1961   151.4
2   1962   147.1
3   1963   143.0
4   1964   139.2
..   …   …
56   2016   15.0
57   2017   13.7
58   2018   13.5
59   2019   13.3
60   2020   13.2

Indicator Name Mortality rate, under-5, male (per 1,000 live births)
0   182.3
1   177.4
2   172.9
3   168.5
4   164.6
..   …
56   18.5
57   17.1
58   16.9
59   16.7
60   16.5

[61 rows x 3 columns]
```

Brazil: Female vs Male mortality rate under-5 (%) (1960-2020)