

A decorative wreath of various botanical illustrations surrounds a central white oval. The plants include green ferns, red maple-like leaves, yellow flowers, purple flowers, and large green leaves.

Student ID: F315284

Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

23COP511 - Big Data Analytics and Visualisation

Objective

These research questions aim to delve deeper into the factors influencing maternal mortality and explore potential interventions or areas of focus to reduce maternal deaths globally.

Trend Analysis

1. What is the trend in maternal mortality ratio over the past decade, and are there any significant changes or patterns?
2. How does the maternal mortality ratio vary across different regions or countries, and what factors might contribute to these variations?

Risk Factors

3. What are the primary risk factors associated with maternal mortality, such as access to skilled birth attendants, caesarean section rate, and antenatal care coverage?

Healthcare Infrastructure

4. How does the density of healthcare professionals (doctors, nurses, midwives) relate to maternal mortality ratio?

Adolescent Birth Rate

5. Is there a relationship between adolescent birth rate and maternal mortality ratio, and does this vary by region or country?

Socioeconomic Factors

6. What is the impact of household health expenditure on maternal mortality ratio?
7. How does general government expenditure on domestic health impact maternal mortality ratio?

Anaemia and Maternal Mortality

8. How does the prevalence of anaemia among pregnant women correlate with maternal mortality ratio?



Justification of Data Compilation

1. **Maternal Mortality Ratio:** This data serves as the core indicator for assessing maternal health outcomes and trends over time, aligning with the study's objective of analyzing trends in maternal mortality (Research Questions 1 and 2).

2. **Adolescent Birth Rate:** Adolescent pregnancies are associated with higher risks of maternal mortality, making this data relevant for exploring risk factors impacting maternal mortality ratio (Research Question 5).

3. **Density of Healthcare Professionals:** The availability of healthcare professionals is crucial for providing maternal healthcare services. This data helps examine the relationship between healthcare infrastructure and maternal mortality (Research Questions 3 and 4).

4. **Household Health Expenditure:** Household expenditure on health can indicate access to maternal healthcare services and potential socioeconomic factors influencing maternal mortality. This aligns with the study's objective of exploring socioeconomic factors (Research Question 6).

5. **Government Expenditure on Domestic Health:** Government investment in healthcare infrastructure and services can impact maternal health outcomes. This data is relevant for assessing the relationship between government expenditure and maternal mortality (Research Question 7).

6. **Prevalence of Anaemia among Pregnant Women:** Anaemia is a common condition affecting maternal health outcomes. This data is crucial for examining the relationship between anaemia and maternal mortality and identifying potential interventions (Research Question 8).

7. **Percentage of Births by Caesarean Section:** Mode of delivery can impact maternal health outcomes. This data helps explore the relationship between caesarean section rates and maternal mortality (Research Question 3).

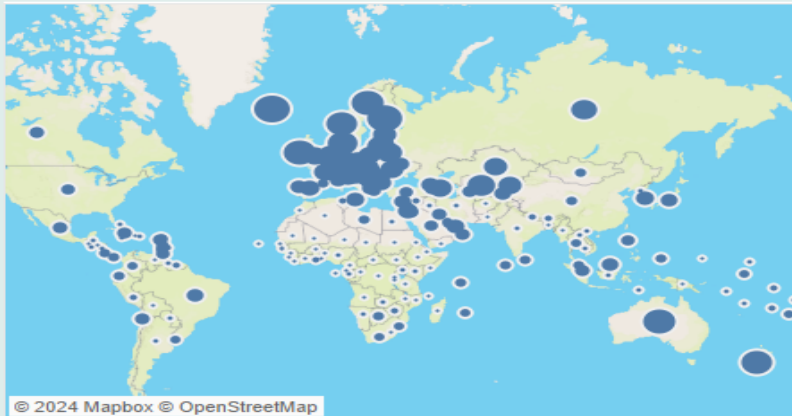
8. **Antenatal Care Coverage:** Antenatal care is vital for monitoring maternal health during pregnancy and reducing the risk of complications. This data helps assess the relationship between antenatal care coverage and maternal mortality (Research Questions 8)

9. **Births Attended by Health Professional:** The proportion of births attended by skilled health personnel is a critical indicator of access to quality maternal healthcare services. This data is essential for examining the impact of healthcare infrastructure on maternal mortality (Research Question 3).

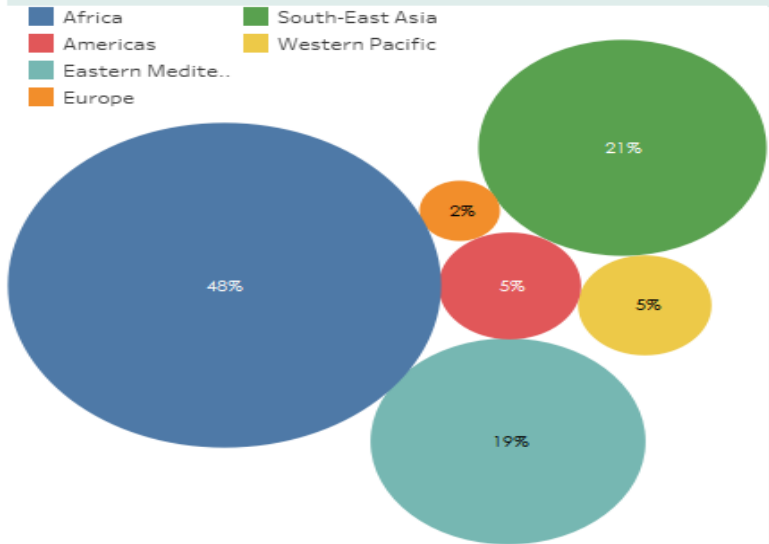


Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Density of nurses and midwives



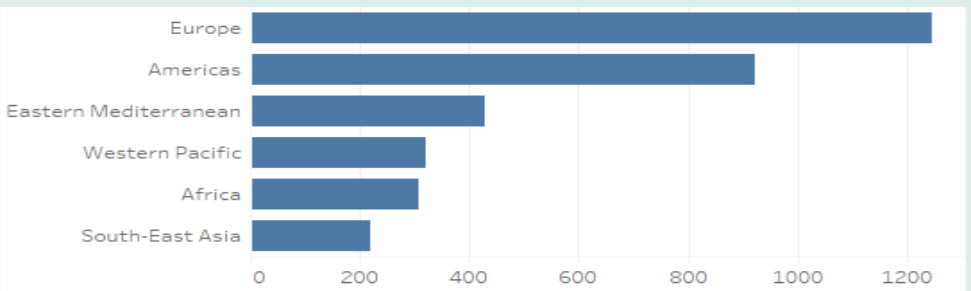
Distribution of Maternal mortality rate across regions (1985-2020)



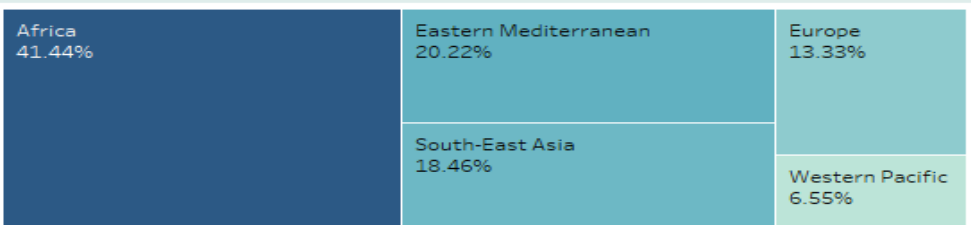
Regional Distribution of pregnant women with anaemia

Pregnant women with anaemia (aged 15-49)		% of Total Number
South-East Asia	232,034	35.66%
Africa	196,960	30.27%
Eastern Mediterranean	80,873	12.43%
Western Pacific	75,714	11.64%
Americas	39,128	6.01%
Europe	25,987	3.99%

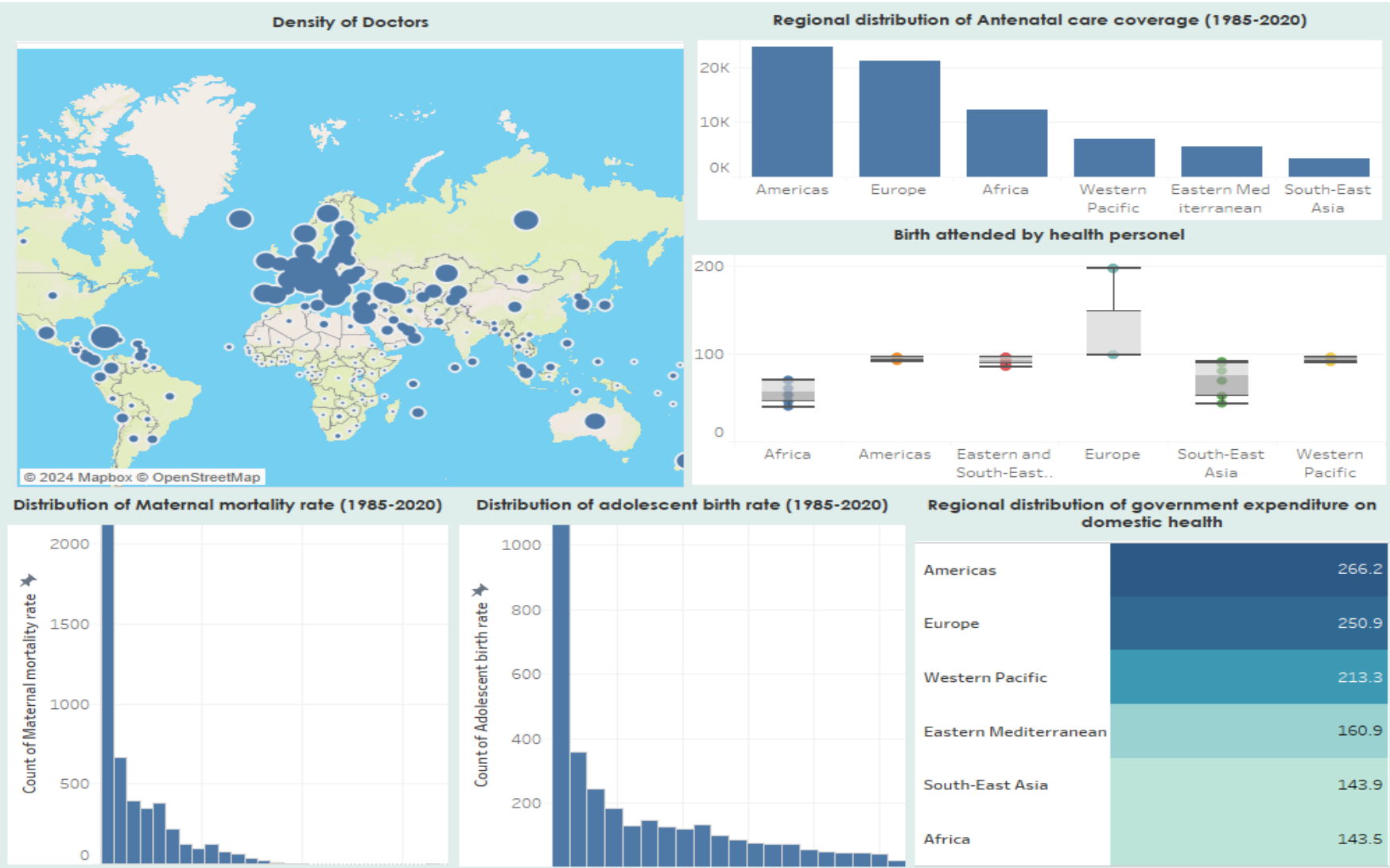
Regional distribution of birth by caesarean section (%)



Adolescent birth rate distribution by Region (2000-2020)



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223.5

World Maternal mortality rate (2020)

531.5

Africa Maternal mortality rate (2020)

68.04

Americas Maternal mortality rate as of 2020

179.2

Eastern Mediterranean Maternal mortality rate (2020)

13.18

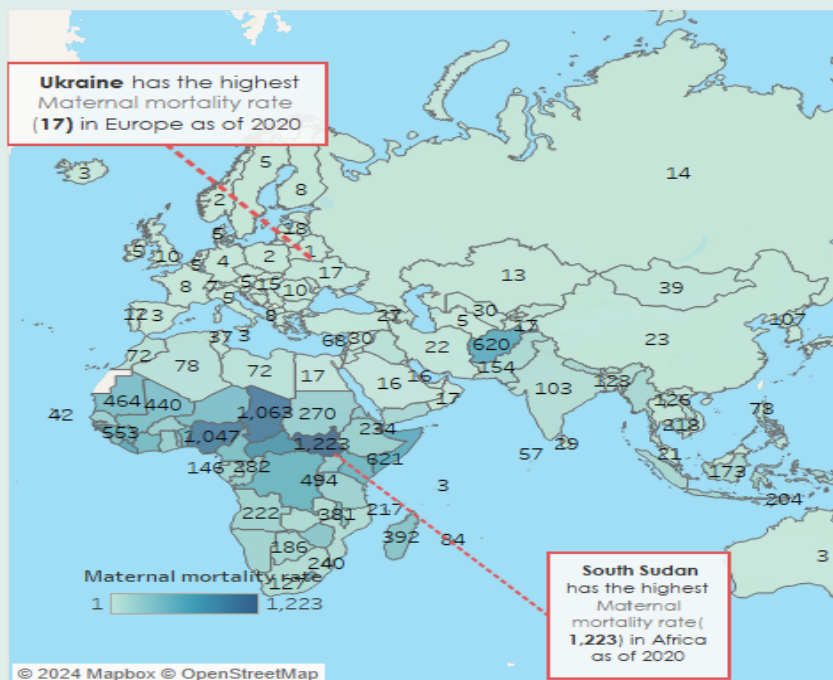
Europe Maternal mortality rate (2020)

116.8

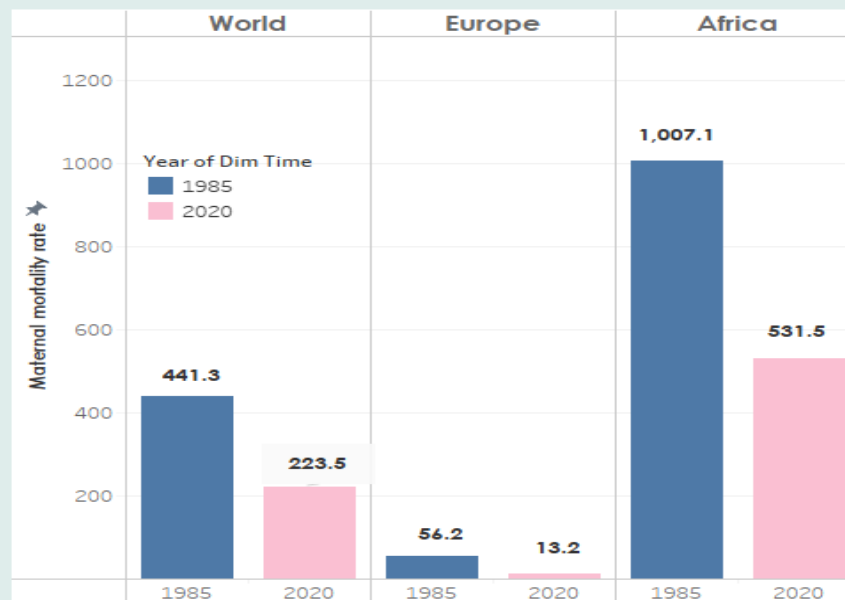
South-East Asia Maternal mortality rate (2020)

44.25

Western Pacific Maternal mortality rate (2020)

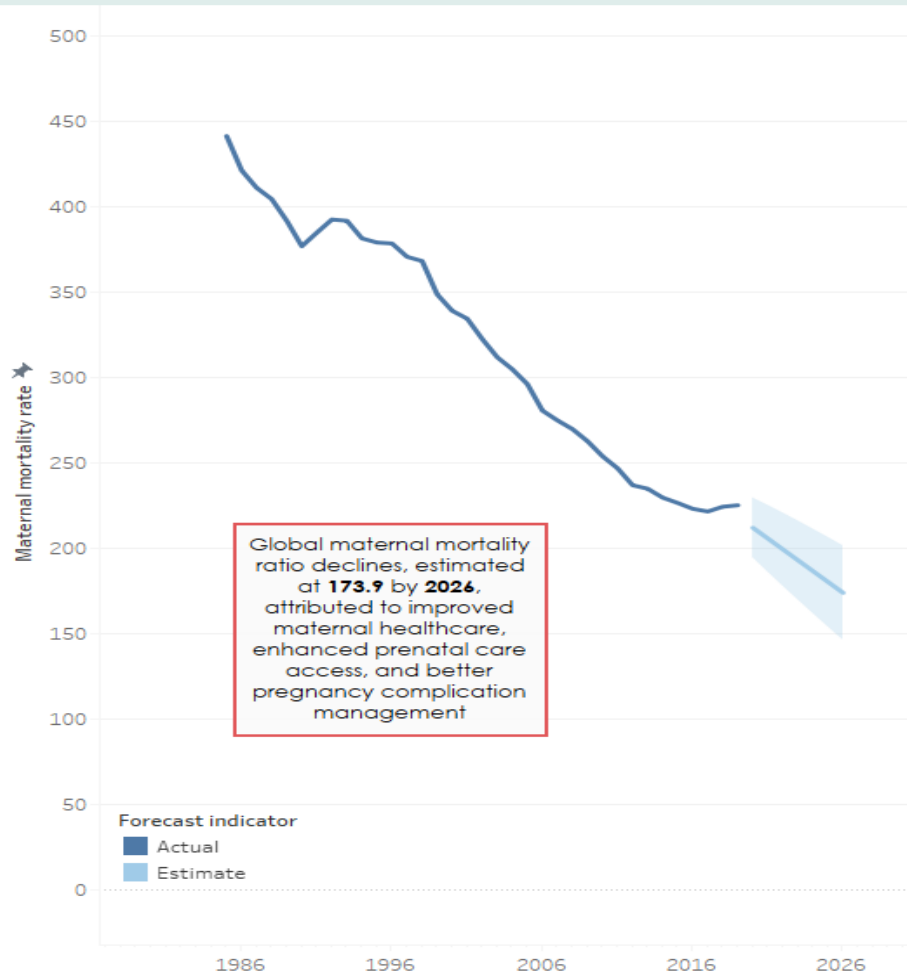


Comparative Analysis: Maternal mortality ratio (1985-2020)

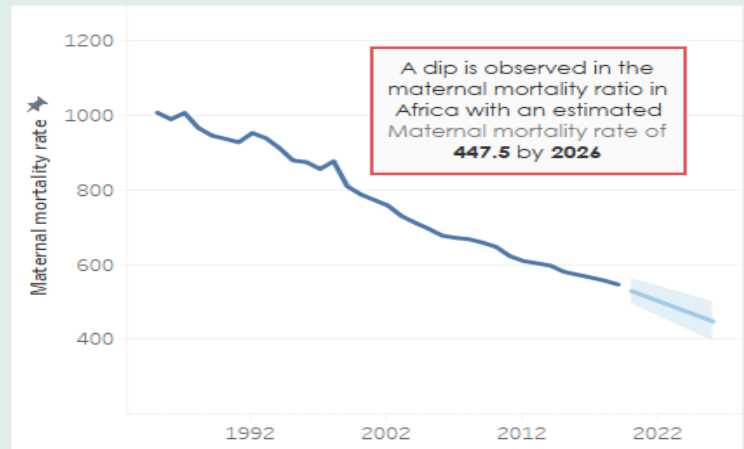


Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

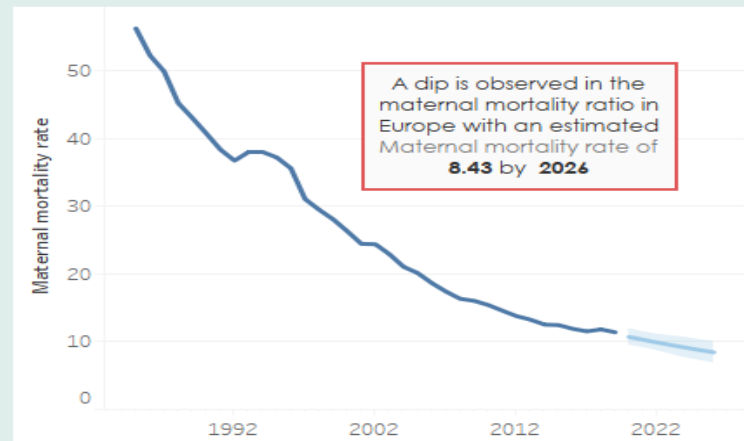
Maternal mortality ratio trend (World)



Maternal mortality ratio trend (Africa)



Maternal mortality ratio trend (Europe)



Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Dashboard

Exploratory Analysis

Exploratory Analysis

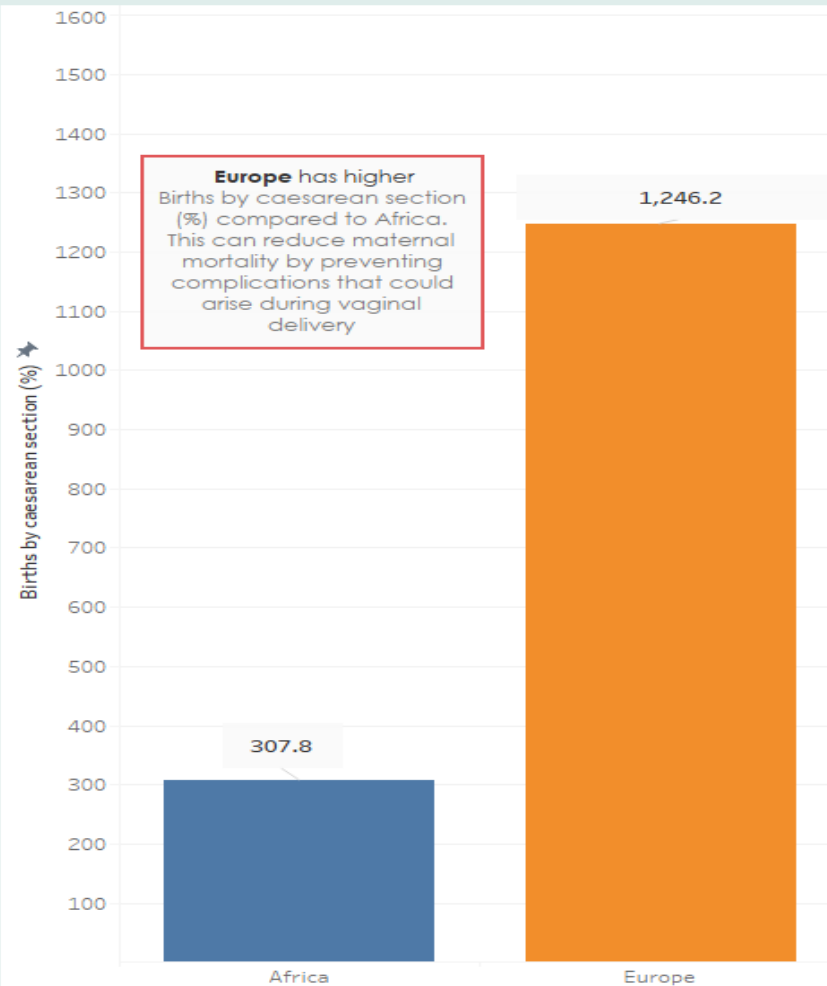
Trend Analysis

Comparative Analysis

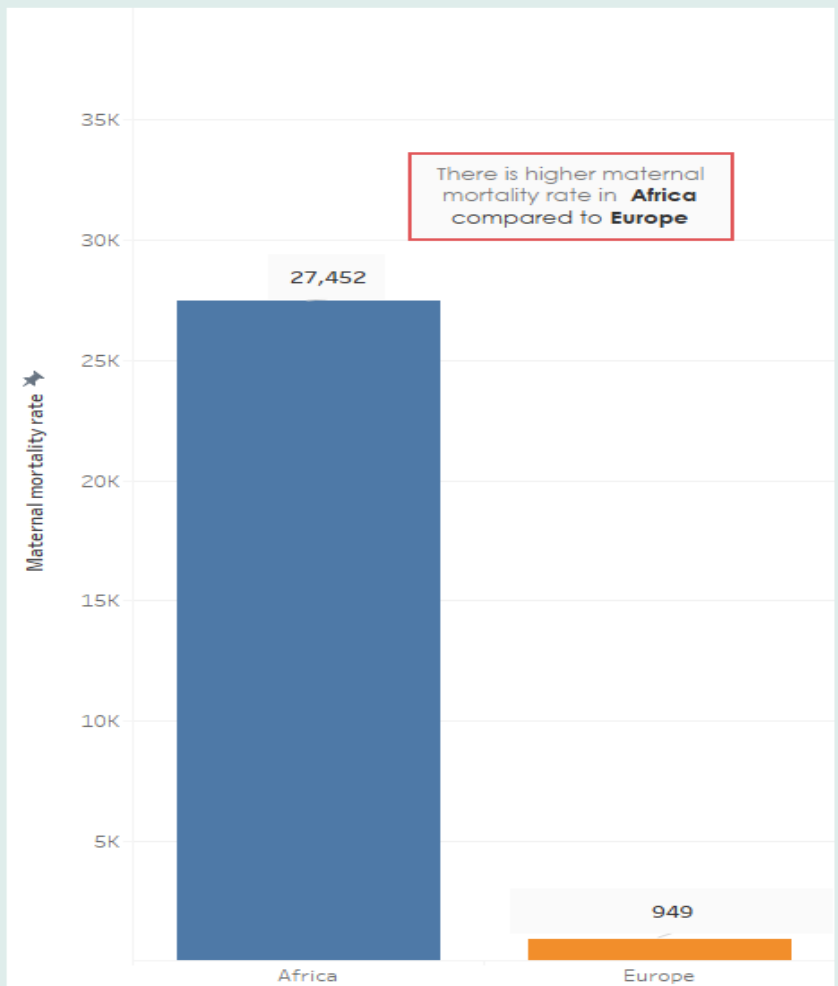
Risk Factors

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Inf
Ma

Comparative analysis: Caesarean section



Comparative analysis: Maternal mortality rate (1985-2020)



Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Dashboard

Exploratory Analysis

Exploratory Analysis

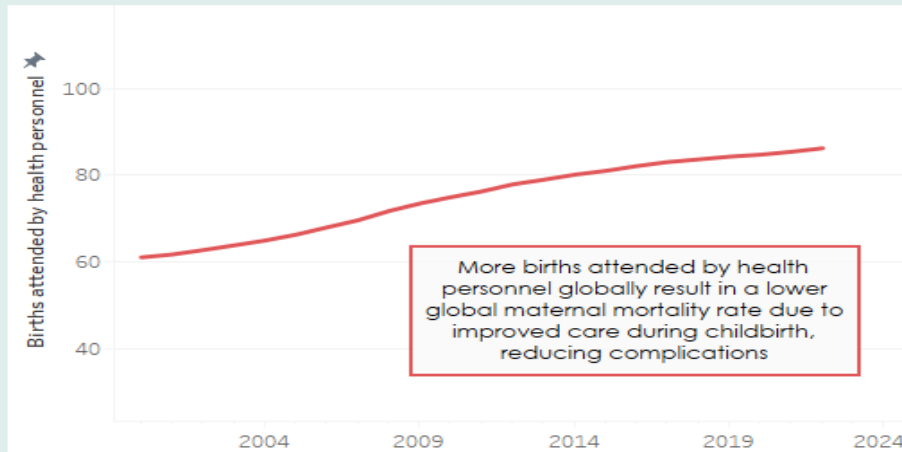
Trend Analysis

Comparative Analysis

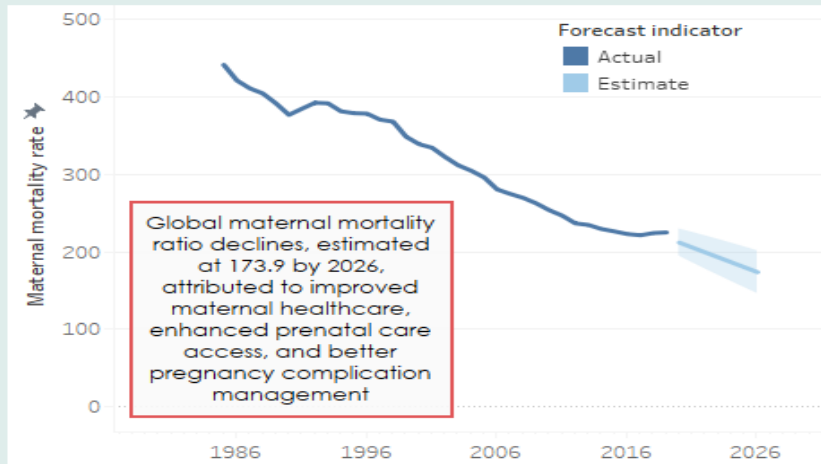
Risk Factors

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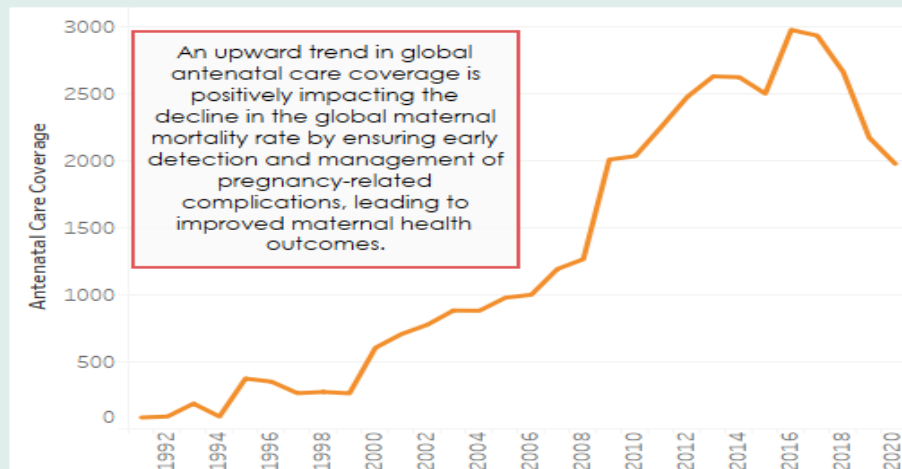
World trend of birth attended by health personnel



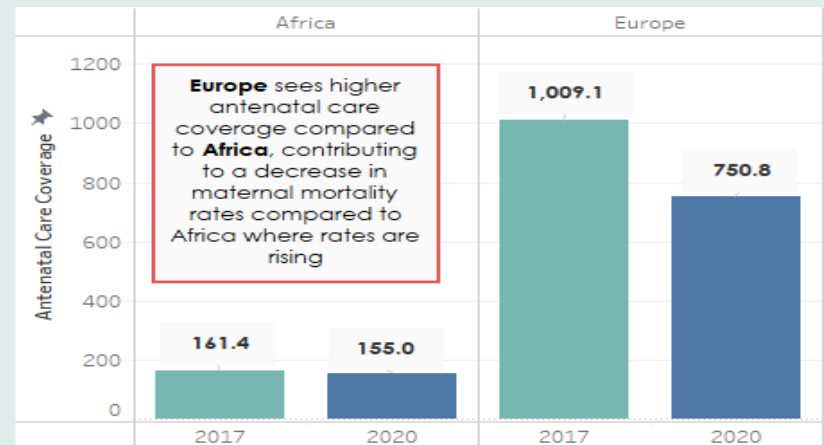
Maternal mortality ratio trend (World)



World trend of antenatal care coverage - at least four visits (%)



Comparative analysis: Antenatal care coverage - at least four visits (%)



Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Comparative Analysis

Risk Factors

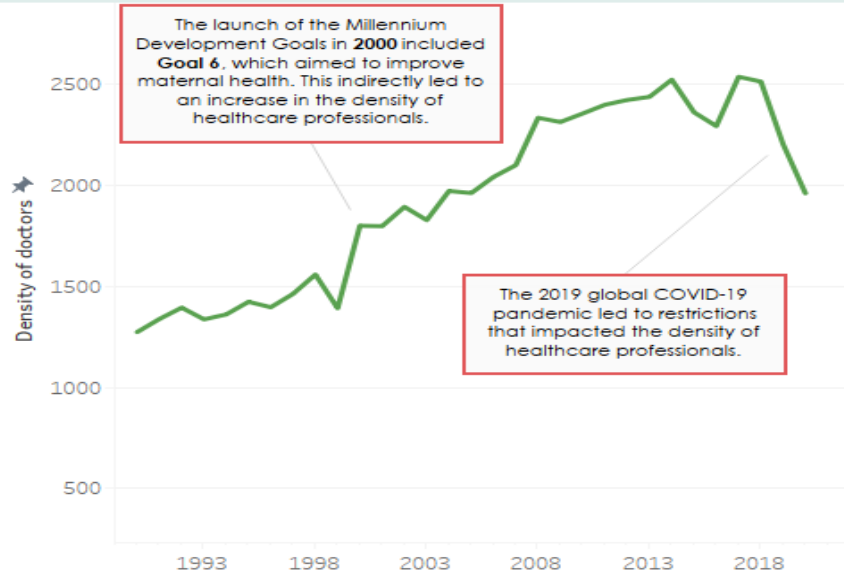
Healthcare
Infrastructure and
Maternal Mortality

Adolescent Birth Rate

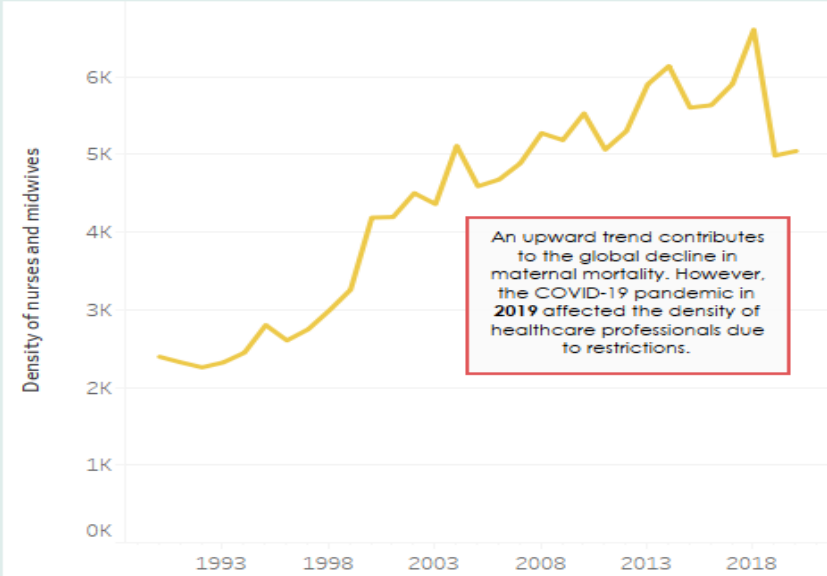
Socioeconomic Factors

Anaemia and Mater
Mortality

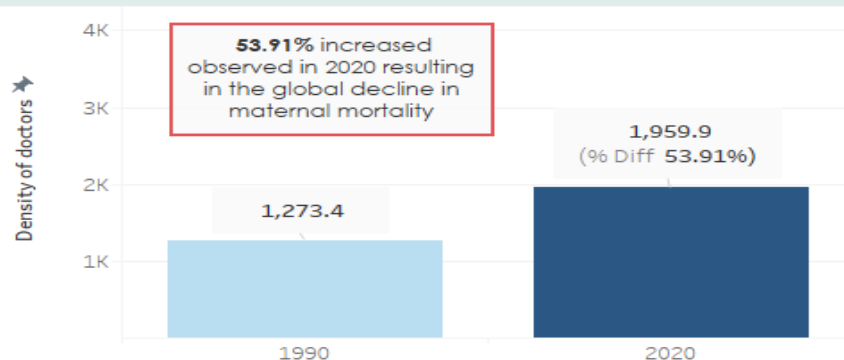
Global trend of density of doctors



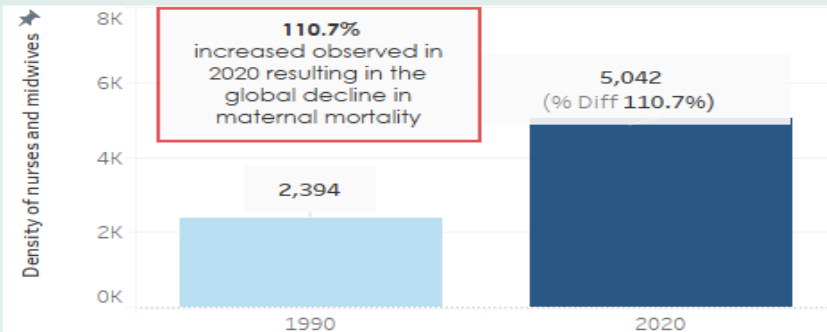
Global trend of density of nurses and midwives



Comparative analysis: Global density of doctor



Comparative analysis: Global density of nurses and midwives



Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Comparative Analysis

Risk Factors

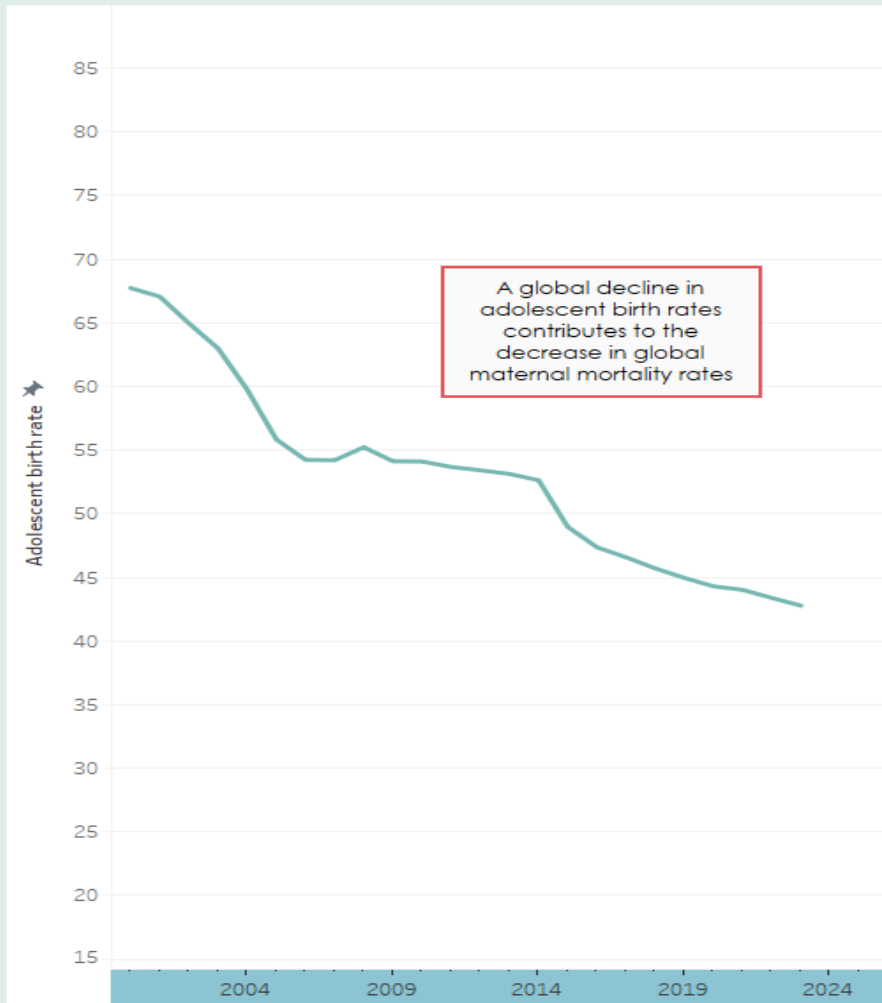
Healthcare
Infrastructure and
Maternal Mortality

Adolescent Birth Rate

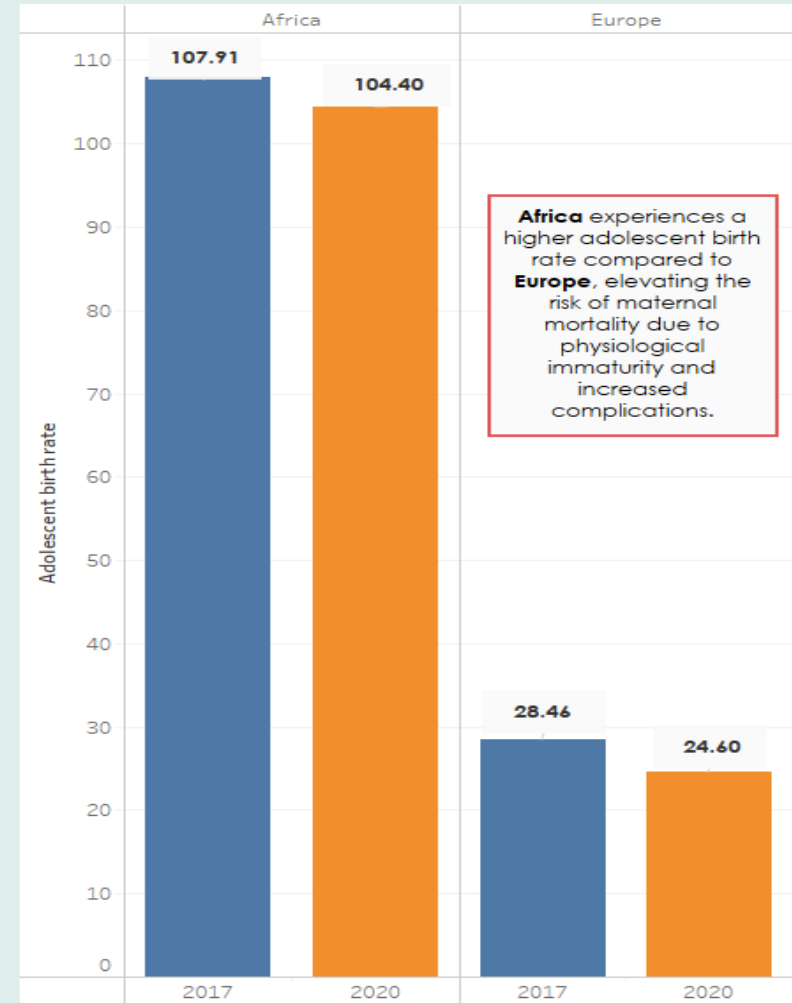
Socioeconomic Factors

Anaemia and Maternal
Mortality

Global adolescent birth rate trend



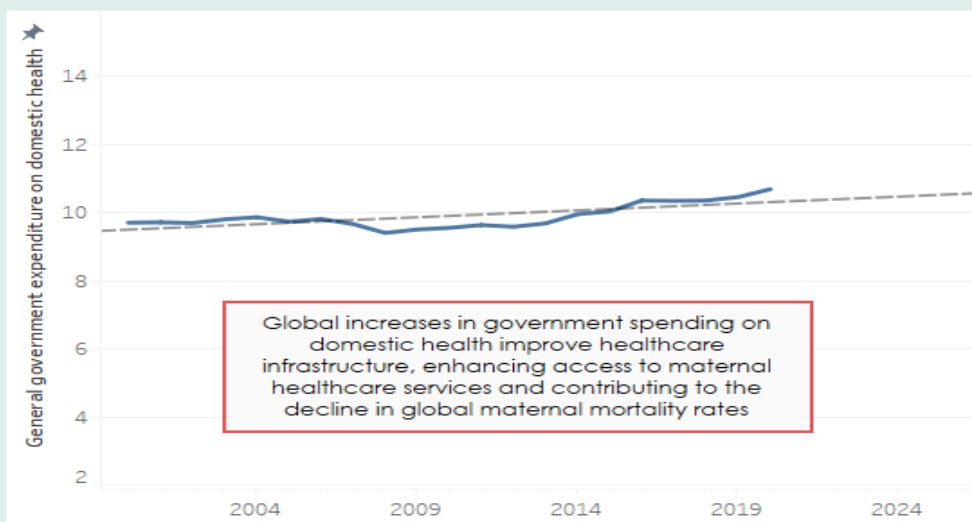
Comparative Analysis: Adolescent birth rate



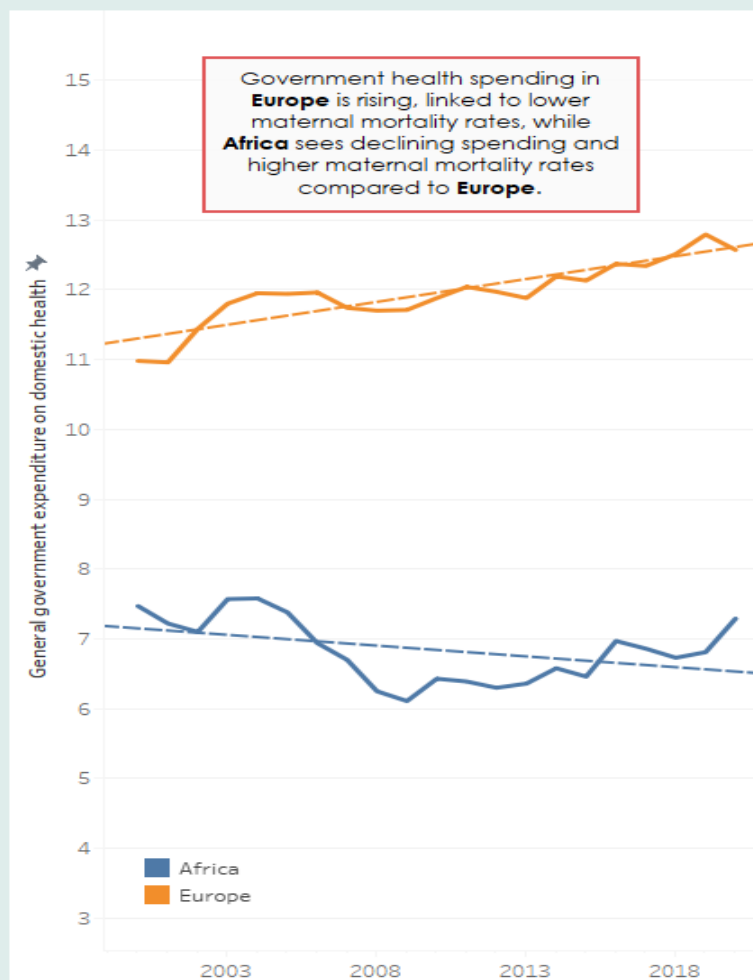
Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

<	Comparative Analysis	Risk Factors	Healthcare Infrastructure and Maternal Mortality	Adolescent Birth Rate	Socioeconomic Factors	Anaemia and Maternal Mortality	>
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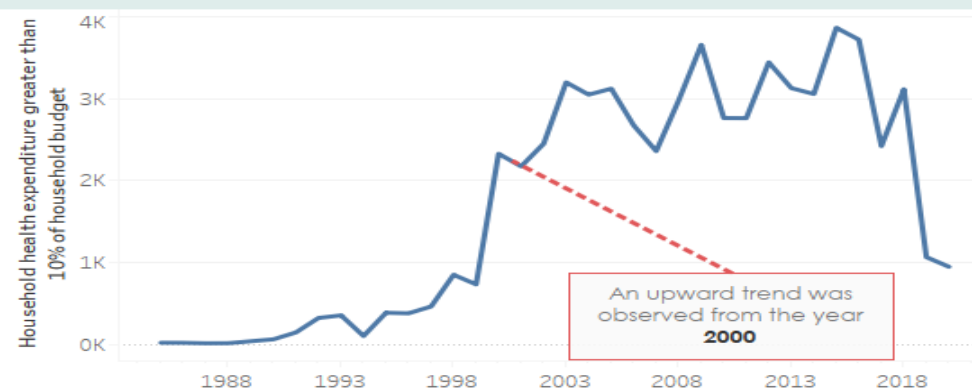
Global trend of government expenditure on domestic health



Comparative analysis: Trend of government expenditure on domestic health



Global trend of household health expenditure greater than 10% of household budget



Exploring Factors Influencing Maternal Mortality: A Comprehensive Analysis

Comparative Analysis

Risk Factors

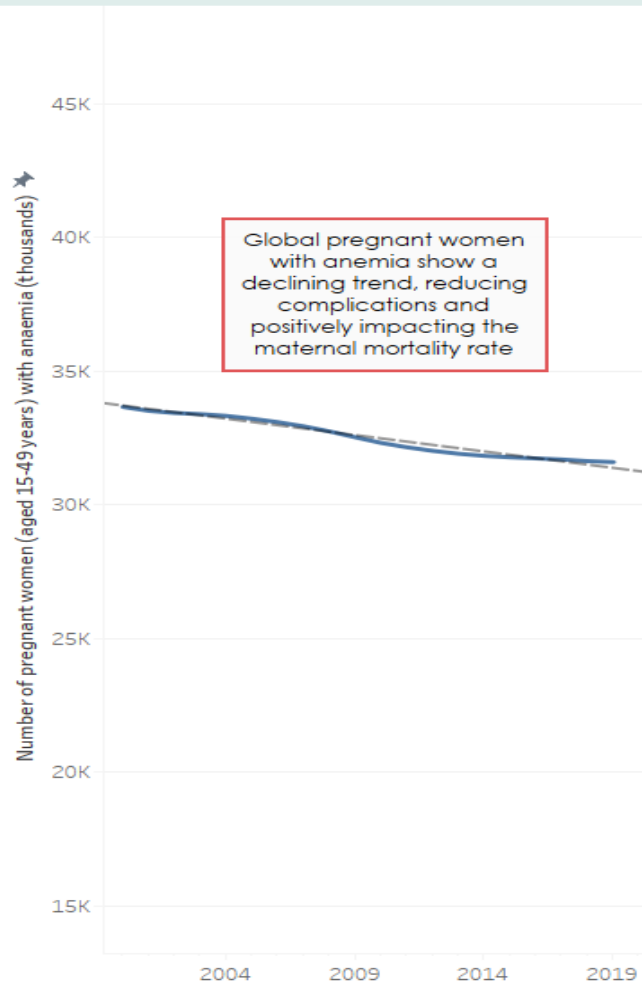
Healthcare
Infrastructure and
Maternal Mortality

Adolescent Birth Rate

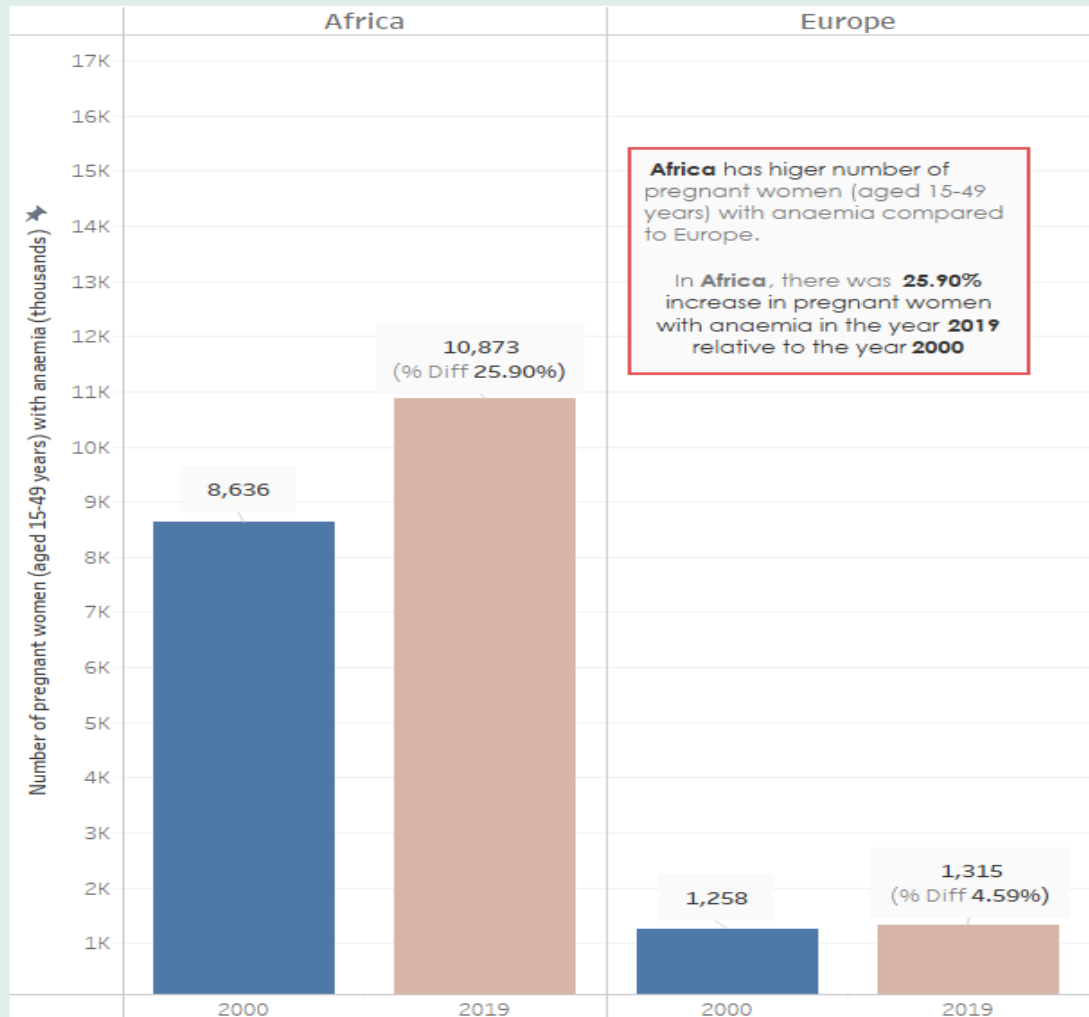
Socioeconomic Factors

Anaemia and Maternal
Mortality

Global trend of pregnant women with anaemia



Comparative analysis: Pregnant women (aged 15-49) with anaemia



Findings



These findings are corroborated by various sources, including reputable organizations and research institutions, and contribute to a broader understanding of maternal health trends and disparities globally.

- **South Sudan has the highest maternal mortality rate per 100k live births in Africa**

This finding is consistent with data from the World Health Organization (WHO), which indicates that South Sudan has one of the highest maternal mortality rates in Africa ("[World Health Organization - Maternal Mortality](#)").

- **World maternal mortality rate per 100k live births stands at 223.5 as of 2020**

This statistic corresponds to data from the WHO, which reports on global maternal mortality rates ("[World Health Organization - Maternal Mortality](#)").

- **Africa maternal mortality rate per 100k live births stands at 531.5 as of 2020**

This statistic is in line with findings from WHO, which highlight Africa's disproportionately high maternal mortality rate compared to other regions ("[World Health Organization - Maternal Mortality](#)").

- **Europe maternal mortality rate per 100k live births stands at 13.18 as of 2020**

This statistic corresponds to data from the WHO, which provides information on maternal mortality rates in European countries ("[World Health Organization - Maternal Mortality](#)").

- **Africa has the highest maternal mortality rate per 100k live births with Europe having the lowest**

This finding is supported by various studies and reports comparing maternal mortality rates across regions, including those by WHO.

Findings Contd



- **High density of health per 10k population (doctors, nurses and midwives) in Europe compared to Africa**

This observation is consistent with data from WHO, which provide information on healthcare workforce density by region ("[World Health Organization – Density of Doctors](#)"; "[World Health Organization – Density of Nurses and Midwives](#)")

- **South-East Asia and Africa have a higher percentage of pregnant women with anaemia relative to other regions**

This finding corresponds to data from studies and reports by WHO, which highlight anaemia prevalence among pregnant women in South-East Asia and Africa ("[World Health Organization - Anaemia in women \(age 15 to 49\)](#)").

- **Africa has the highest percentage of Adolescent birth rate per 1k women which is approximately 3 times that in Europe, elevating the risk of maternal mortality due to physiological immaturity and increased complications.**

This finding is supported by data from the WHO and the Global Health Observatory (GHO), which highlight the high adolescent birth rates in Africa compared to Europe ("[WHO - Adolescent birth rate](#)"; "[GHO - Adolescent birth rate \(per 1000 women\)](#)").

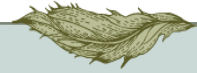
- **Americas and Europe are the top regions with Antenatal care coverage - at least four visits.**

This observation corresponds to statistics from GHO, which report on antenatal care coverage rates by region, highlighting higher coverage in the Americas and Europe ("[GHO - Antenatal care coverage - at least four visits](#)").

- **Americas and Europe are the top regions with government expenditure on domestic health with Africa being the least region with government expenditure on domestic health**

This finding is consistent with data from the WHO and GHO, which provide information on government healthcare expenditure by region, showing higher spending in the Americas and Europe compared to Africa ("[WHO - Domestic general government health expenditure \(GGHE-D\)](#)"; "[GHO - Domestic general government health expenditure \(GGHE-D\)](#)").

Conclusion



- **Regional Disparities in Maternal Mortality**

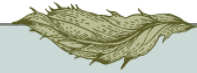
Significant regional disparities in maternal mortality rates are evident, with Africa, South-East Asia, and the Western Pacific ranking highest. Ukraine reports the highest rate (17) in Europe, while South Sudan (1,223) leads in Africa. These disparities underscore the urgent need for targeted interventions to address maternal health challenges in these regions.

Efforts should focus on improving access to quality maternal healthcare services, enhancing prenatal care coverage, and addressing socio-economic factors contributing to maternal mortality. Collaborative initiatives between governments, healthcare organizations, and international agencies are essential to reduce these disparities and improve maternal health outcomes globally

- **Role of Adolescent Pregnancy**

The disproportionately high adolescent birth rates in Africa (104.40) relative to Europe (24.60) as of 2020, underscore the increased risk of maternal mortality due to physiological immaturity and complications associated with adolescent pregnancies. Comprehensive reproductive health education and services are essential for addressing this challenge.

Conclusion Contd



- **Global Maternal Health Challenges**

The persistently high global maternal mortality rate (223.5) as of 2020 underscores the continued challenges in safeguarding maternal health worldwide. Despite advancements, disparities persist, notably in regions like Africa and South-East Asia.

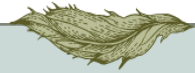
These regions face significant hurdles due to inadequate healthcare resources and infrastructure, including insufficient density of health professionals and inadequate government expenditure on domestic health.

To address these disparities, targeted interventions are crucial, including investment in healthcare infrastructure, strengthening healthcare workforce capacity, and improving access to essential maternal healthcare services. Collaborative efforts between governments, healthcare organizations, and international agencies are imperative to mitigate these challenges and achieve equitable maternal health outcomes globally.

- **Importance of Antenatal Care**

Regions with higher antenatal care coverage, such as the Americas and Europe, demonstrate lower maternal mortality rates. Access to quality antenatal care plays a crucial role in early detection and management of pregnancy-related complications, leading to improved maternal health outcomes.

Conclusion Contd



- **Impact of Healthcare Infrastructure**

Disparities in healthcare infrastructure, such as variations in the density of health professionals, antenatal care coverage, and government expenditure on domestic health, significantly influence maternal mortality rates across regions.

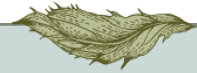
Inadequate healthcare infrastructure, particularly in low-resource settings, exacerbates maternal health challenges and contributes to higher mortality rates. Thus, prioritizing investments in healthcare infrastructure is paramount for improving maternal health outcomes globally.

These investments should focus on enhancing access to skilled healthcare providers, expanding antenatal care coverage, and increasing government spending on domestic health services. By addressing disparities in healthcare infrastructure, we can effectively reduce maternal mortality rates and improve the overall well-being of mothers and infants worldwide.

- **Effectiveness of Healthcare Interventions**

The decline in global maternal mortality rates is attributed to several factors, including advancements in maternal healthcare, increased births attended by health personnel, expanded antenatal care coverage for early detection and management of complications, higher government spending on domestic health, and improved density of health professionals such as doctors, nurses, and midwives. These collective efforts have fostered improved maternal health outcomes worldwide.

Conclusion Contd



Future Directions

To sustain progress and further reduce maternal mortality rates globally, concerted efforts are needed:

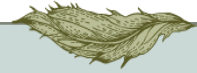
- Addressing Underlying Determinants of Maternal Health

1. Implementing comprehensive policies targeting social determinants of health, including education, income inequality, and gender equity, to address root causes of maternal mortality.
2. Conducting community-based health education programs to empower women with knowledge about maternal health, family planning, and pregnancy care

- Strengthening Healthcare Systems

1. Enhancing primary healthcare infrastructure and services, including maternal health clinics and facilities, to ensure access to quality care for pregnant women.
2. Investing in capacity building for healthcare workers, including training programs for midwives, nurses, and other maternal health professionals, to improve the delivery of maternal healthcare services

Conclusion Contd



Limitations

Despite these limitations, the findings provide valuable insights into the current status of maternal health globally and highlight areas for targeted interventions and future research endeavors

- **Data Completeness**

1. Variations in data completeness and quality across regions may affect the accuracy of comparisons and analyses, potentially leading to biased interpretations.

- **Temporal Trends**

1. The findings are based on data from specific time periods, and temporal trends may not fully capture recent developments or emerging challenges in maternal health.

- **Causal Inference**

1. While relationships between variables are identified, causal relationships cannot be inferred from the observational nature of the data analysis



Reference

Data Sources:

1. <https://data.who.int/indicators>
2. <https://www.who.int/data/gho/data/indicators>

