**Assessing the Role of Socioeconomic and Clinical Determinants in Maternal and Neonatal Delivery Outcomes in The Gambia: A Hospital-Based Study.**

**Abstract**

Maternal and neonatal health outcomes in low-resource settings like The Gambia remain a critical public health concern, with high mortality rates driven by socioeconomic and clinical factors. This hospital-based study at Edward Francis Small Teaching Hospital (EFSTH) examined the interplay of these determinants among 200 Gambian women. Data were collected via structured questionnaires and medical records, analyzing socioeconomic status (SES), clinical variables, and delivery outcomes using SPSS.

Results revealed no significant association between SES indicators (income, education) and adverse outcomes (*p* > 0.05), likely due to population homogeneity and universal healthcare access. However, clinical factors were pivotal: antenatal care (ANC) participation significantly improved outcomes (*p* = 0.02), though visit frequency was non-significant (*p* = 0.17). Comorbidities like preeclampsia (4%) and neonatal indicators (birth weight, APGAR scores) were strongly linked to complications (*p* < 0.05). Most deliveries were vaginal (82.5%), with 3% stillbirths and 10% low birth weight neonates.

The study underscores the dominance of clinical over socioeconomic factors in this cohort, emphasizing the need for quality ANC, early comorbidity management, and community-based education. Policymakers should prioritize ANC quality and equitable healthcare access to mitigate risks. Future research should employ longitudinal designs to explore causal relationships and include rural populations for broader generalizability.

***Keywords:* Maternal Health, Neonatal Outcomes, Socioeconomic Status (SES), Antenatal Care (ANC), Clinical Determinants**

**Introduction**

Maternal and neonatal health remains a critical public health concern, particularly in low-resource settings like The Gambia, where high maternal and infant mortality rates persist despite global advancements (**Cresswell** *et al.,* 2025; World Health Organization [WHO], 2020). Delivery outcomes including preterm birth, low birth weight, stillbirth, and maternal complications are influenced by a complex interplay of socioeconomic status (SES) and clinical factors during pregnancy (World Health Organization [WHO], 2020). Understanding these relationships is essential for developing targeted interventions to improve maternal and child health in The Gambia.  Sub-Saharan Africa accounted for approximately 70% of global maternal deaths in 2023, with an estimated 182,000 fatalities. The Gambia’s maternal mortality ratio (MMR) stands at 706 deaths per 100,000 live births significantly higher than the global average of 197 per 100,000. To meet the Sustainable Development Goal (SDG) target of reducing the global MMR below 70 by 2030, an annual reduction rate of nearly 15% is required a pace rarely achieved at the national level. Additionally, neonatal mortality in The Gambia remains a critical concern, estimated at 24.4 deaths per 1,000 live births (UNICEF, 2018; WHO, 2024; WHO, 2025). These statistics underscore the urgent need to examine the socioeconomic and clinical factors influencing delivery outcomes in the country.

Existing literature highlights that socioeconomic status (SES) profoundly influences maternal and neonatal health outcomes. Key indicators such as maternal education, household income, and geographic access to antenatal care (ANC) significantly affect birth outcomes (Ahmed *et al.,* 2010; Nicholls-Dempsey *et al.,* 2023; Sui *et al*., 2020; Khatri *et al*., 2022; Emmanuel *et al.,* 2024). Studies in sub-Saharan Africa consistently demonstrate that women with higher education and economic stability experience lower risks of complications such as preterm birth, low birth weight, and stillbirth (Tekeba *et al.,* 2024; Yahaya *et al.,* 2024; Regassa *et al.,* 2024; Some *et al*., 2020; Afulani *et al.,* 2019). However, in The Gambia, where nearly 48.6% of the population lives below the poverty line, financial constraints and limited healthcare access exacerbate adverse outcomes (International Monetary fund, 2021). Additionally, cultural practices, such as home deliveries assisted by traditional birth attendants (TBAs), further contribute to preventable maternal and neonatal complications (Nyanzi *et al*., 2007; Lerberg *et al*., 2014; Lowe *et al.,* 2016; Yaya *et al*., 2020). A significant proportion of Gambian women, particularly in rural areas, rely on traditional birth attendants (TBAs) due to cost constraints, distance to health facilities, or cultural preferences (Nyanzi *et al*., 2007; Jallow *et al.,* 2012; Lerberg *et al*., 2014; Lowe *et al.,* 2016; Rutledge *et al.,* 2024). While TBAs provide essential care in resource-limited settings, their inability to manage obstetric emergencies such as postpartum hemorrhage or neonatal asphyxia contributes to preventable maternal and neonatal deaths.

Beyond socioeconomic barriers, clinical determinants significantly influence maternal and neonatal survival. Clinical determinants, including maternal age, parity, and pre-existing medical conditions, are well-documented risk factors for adverse birth outcomes (Nigatu *et al*., 2023; Daniels-Donkor *et al*., 2024). Adolescent pregnancies, which account for nearly 30% of all births in The Gambia, are associated with higher risks of preterm delivery, low birth weight, and eclampsia (Ogbo *et al*., 2019; Tamir *et al.,* 2024; Ahmed *et al.,* 2024). Conversely, advanced maternal age (≥35 years) increases the likelihood of gestational hypertension, postpartum hemorrhage, obstructed labor, and stillbirths ([Correa-de-Araujo](https://pubmed.ncbi.nlm.nih.gov/?term=%22Correa-de-Araujo%20R%22%5BAuthor%5D), and [Yoon](https://pubmed.ncbi.nlm.nih.gov/?term=%22Yoon%20SS%22%5BAuthor%5D), 2021; Nyongesa *et al.,* 2023; Masembe *et al.,* 2024; Ye *et al.*, 2024). Furthermore, infections such as malaria and HIV, prevalent in The Gambia, are associated with intrauterine growth restriction and preterm delivery (Uneke *et al.,* 2009*;* Saito *et al.,* 2024; Ssentongo *et al,* 2020; Obase, *et al*., 2020; Fall *et al*., 2015; Ekuma *et al.,* 2023). Additionally, gestational diabetes and hypertensive disorders contribute to complications such as preeclampsia and cesarean deliveries ([Yang](https://pubmed.ncbi.nlm.nih.gov/?term=%22Yang%20Y%22%5BAuthor%5D) and [Wu](https://pubmed.ncbi.nlm.nih.gov/?term=%22Wu%20N%22%5BAuthor%5D), 2022; Onuoha *et al.,* 2024; Li *et al*.,2025; John-Emaimo *et al.,* 2025). Despite these documented risks, there remains a paucity of localized studies examining the intersection of socioeconomic and clinical factors in shaping maternal and neonatal outcomes in The Gambia. This study seeks to bridge this gap by analyzing how socioeconomic disparities and clinical risk factors collectively influence delivery outcomes. By identifying key modifiable determinants, the findings will inform targeted interventions to improve maternal and neonatal survival rates in The Gambia.

**Materials and methods**

**Study area**

This research was conducted at Edward Francis Small Teaching Hospital (EFSTH) in Banjul, The Gambia (13°27′27″N, 16°34′39″W). As the nation's largest tertiary hospital, EFSTH is central to Gambia’s healthcare system. Founded in 1853 as the Royal Victoria Teaching Hospital (RVTH) under British rule, it was renamed in 2013 after Edward Francis Small, a prominent Gambian nationalist. Since the 1990s, EFSTH has partnered with the University of The Gambia to offer a six-year MBBS program, training local physicians 76 graduates by 2011. The pediatric department has 100 beds, admitting around 3,000 annual cases, mainly severe malaria, respiratory infections, malnutrition, septicemia, and gastroenteritis.

Maternal healthcare in The Gambia is government-funded, with EFSTH providing critical obstetric and neonatal services (John-Emaimo *et al.,* 2025). Given its dual role in medical education and high patient load, EFSTH was an ideal site for this study on antenatal care and maternal health outcomes.

**Ethical Consideration**

Ethical approval for this study was obtained from the Research and Ethics Committee of Edward Francis Small Teaching Hospital (EFSTH) in Banjul, The Gambia, prior to data collection. The study involved accessing patients' antenatal cards and delivery notes from hospital records, ensuring compliance with institutional and national ethical guidelines.

The research adhered to the ethical principles outlined in the World Medical Association (WMA) Declaration of Helsinki (World Medical Association, 2024), safeguarding the rights, dignity, and welfare of all participants. Written informed consent was obtained from each participant, with clear explanations provided regarding the study's objectives, procedures, and their right to withdraw at any time without consequences.

To protect participant confidentiality, all identifiable information was anonymized during data collection and analysis. Data were stored securely and accessed only by the research team. The study employed standard obstetric methodologies and maintained transparency in reporting findings to contribute meaningfully to maternal and neonatal health research. No financial incentives were offered to participants, and the study posed minimal risk, aligning with its cross-sectional, observational design.

**Inclusion and Exclusion Criteria**

This study included women aged 18–45 years who delivered at Edward Francis Small Teaching Hospital (EFSTH) between December 16, 2021, and January 20, 2022, provided informed consent, and had complete medical records, while excluding women who used alternative health systems for delivery, had incomplete records, declined to participate, or delivered outside the specified study period.

#### **Study Design**

#### This study employed a **prospective, cross-sectional, descriptive design** to assess the role of socioeconomic and clinical determinants in maternal and neonatal delivery outcomes among women at Edward Francis Small Teaching Hospital (EFSTH) in The Gambia. The cross-sectional approach allowed for the collection of data at a single point in time, providing a snapshot of the relationships between variables. The study focused on analyzing both **socioeconomic status (SES) indicators (**e.g., income, education, occupation) and **clinical variables** (e.g., antenatal care participation, comorbidities, neonatal health metrics) to determine their association with delivery outcomes (e.g., mode of delivery, neonatal survival, complications).

#### **Sampling Selection**

**Sampling Method:** A**convenience sampling** technique was used to recruit participants. This non-probability method was chosen due to its practicality in a hospital setting, where accessibility and time constraints were considerations.

**Sample Size:** The study included **200 women** who delivered at EFSTH during the study period (December 16, 2021, to January 20, 2022). **This hospital-based study in The Gambia used the Cochrane formula to calculate a sample size of 200 women, ensuring 95% confidence and 5% margin of error to assess socioeconomic and clinical factors affecting maternal-neonatal outcomes.** The sample size accounted for finite population correction at this tertiary hospital and included a 10% buffer for attrition.

**Data Collection**

Data were collected using a pretested, validated structured questionnaire administered to assess:

* **Socioeconomic Status (SES) Indicators:** Household income, education level, occupation, and healthcare access (insurance coverage, distance to facility).
* **Pregnancy-Related Clinical Variables:** Antenatal care attendance, pre-existing medical conditions (hypertension, diabetes, anemia), gestational age at delivery, parity, and pregnancy complications (e.g., preeclampsia, infections) [Table 1].

Hospital delivery records were reviewed to extract:

* Mode of delivery (vaginal or cesarean)
* Birth weight
* APGAR scores (neonatal health assessment)
* Maternal complications (postpartum hemorrhage, preeclampsia) [Table 2]

Two trained research assistants from the Medical School facilitated data collection. Participants were counseled, and written informed consent was obtained. Data were collected from antenatal record cards and labor ward delivery notes at EFSTH using a structured data extraction tool covering sociodemographic and clinical variables.

**Statistical analysis**

Statistical analysis was performed using SPSS Version 23. Continuous variables were analyzed using the Chi-square test, whereas categorical variables were assessed descriptively using pie charts, bar charts, tables, and histograms. A 95% confidence interval was applied, and statistical significance was set at p < 0.005.

**Table 1:** Socio-Demographical variable of the mother includes:

|  |  |  |
| --- | --- | --- |
| Variables | Types | Dimension |
| Age | Quantitative discrete | <18  18 to 25  26 to 40  > 40 |
| Religion | Qualitative nominal | Islam  Christianity  Others |
| Marital status | Qualitative nominal | Singled  Married |
| Maternal education  Paternal Education | Qualitative ordinal | Non formal/vocational  Primary  Junior  Senior  Tertiary |
| Occupation | Qualitative nominal | Health Care  Non Health Care  Not Employed |
| Number of children | Quantitative discrete | 1  2  3 to 5  > 5  non |

**Table 2:** Clinical variables

|  |  |  |
| --- | --- | --- |
| Variables | Types | Dimension |
| Antenatal card participation | Qualitative nominal | Unbooked  Booked |
| Number of antenatal visits | Quantitative discrete | 0  1-2  3 - 4  5 - 6  7 -8 |
| Gravida | Quantitative discrete | 1  2-3  4-5  6-7  More than 7 |
| Parity | Quantitative discrete | 0  1  2-3  4-5  5-7  More than 7 |

|  |  |  |
| --- | --- | --- |
| Abortion | Quantitative discrete | 0  1-2 |
| Comorbidities | Qualitative nominal | Non  Preeclampsia  Asthma |
| Reason for admission | Qualitative nominal | Active phase of labour  Abruption placentae |
| Age on admission | Qualitative ordinal | Preterm <37 weeks  Full term 37 to 40 weeks  Post term >41 |
| Delivery | Qualitative nominal | Vaginal delivered  Emergency |
| Delivery Outcomes | Qualitative nominal | Normal  Postpartum hemorrhage  Preeclampsia |
| Neonatal outcome | Qualitative nominal | Alive  Stillbirth |
| APGAR 5 Mins | Quantitative discrete | 1-3  4-6  7-10  0 |
| Birth weight | Quantitative discrete | < 2.5kg  2.5 to 3.9 kg  4 kg  > 4kg |
| Anomalies | Qualitative nominal | Non  Hydrosfetalis |
| Emergencies | Qualitative nominal | CPD  Obstructed labour  Fetal distress  Abruption placentae  Retained second twin  Previous caesarean section  Abnormal lie  Severe preeclampsia  No emergency |

## Result

**Figure 1**: Bar Chart shows the frequency of **Age Distribution of** the respondent

**Figure 2:** Stack column Shows the marital status of the respondents.

**Figure 3**: Pie-Chart shows the **Religion** of respondents

**Figure 4**: Area-Chart shows the **Nationality** of respondents

**Figure 5**: Pie-chart shows Spouse educational level of the respondents

**Figure 6:** Pie-chart showing Maternal Education Level

**Figure 7:** Stack column shows the frequency of the respondents based on their ethnic groups.

**Figure 8**: Stack column shows the differences in distance covered to facilities

**Figure 9:** Pie-Chart hows the variation of the respondents based on their monthly income.

**Figure 10:** Stack column shows the number of children of the respondents

**Figure 11**: Pie-chart shows the frequency and percentages of other underline illness/es of the respondents.

**Figure 12:** Clustered Column shows variation of pregnancy/ies of the respondents.

**Figure 13:** Stacked Column shows the number of previous deliveries of the respondent.

**Figure 14**: Clustered column shows the frequency and percentage of miscarriage (ies) of the respondents.

**Figure 15**: Pie-Chart shows the reasons for admission of the respondents.

**Figure 16:** Clustered column shows estimated gestational age of the respondents.

**Figure 17**: Pie-chart shows the mode of delivery of the respondents.

**Figure 18**: Stacked Column shows the responses of the respondents delivery outcome.

**Figure 19:** Stacked Column shows the Neonate outcome for the respondents.

**Figure 20**: Stacked Column shows APGA 5 minutes score

**Figure 21:** Clustered column shows the frequency distribution and percentage of the respondents on birth weight.

**Figure 22**: Pie-chart shows the frequency table and percentage of the respondents on Anomalies Detected.

### **Table 3: Delivery Outcome vs. Family Monthly Income**

| **Delivery Outcome** | **Undetermined Income** | **D3000–D5000** | **D5000–D10,000** | **>D10,000** | **Total** | **χ² (p-value)** |
| --- | --- | --- | --- | --- | --- | --- |
| **Normal** | 72 (37.9%) | 100 (52.6%) | 17 (8.9%) | 1 (0.5%) | 190 (95%) | **0.93** |
| **Postpartum Hemorrhage** | 2 (66.7%) | 1 (33.3%) | 0 (0%) | 0 (0%) | 3 (1.5%) |  |
| **Preeclampsia** | 3 (42.9%) | 4 (57.1%) | 0 (0%) | 0 (0%) | 7 (3.5%) |  |
| **Total** | 77 (38.5%) | 105 (52.5%) | 17 (8.5%) | 1 (0.5%) | 200 (100%) |  |

The overall p-value (**0.93**) indicates **no significant association** between delivery outcomes and family income (p > 0.05).

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### **Table 4: Chi-square Results for Socio-Demographic Variables**

| **Variable** | **χ² (p-value)** |
| --- | --- |
| Age | 0.97 |
| Marital Status | 0.97 |
| Maternal Education | 0.45 |
| Paternal Education | 0.81 |
| Ethnicity | 0.50 |
| Family Income | 0.93 |

**Key**: All p > 0.05 (non-significant).

### **Table 5: Significant Clinical Variables Affecting Delivery Outcomes**

**(n=200)**

|  |  |  |
| --- | --- | --- |
| **Clinical variables** | **Delivery Outcomes** | |
| **χ² (p-value)** | **Cramer’s V (Effect Size)** |
| Delivery | *0.54* | *0.79* |
| **\***Newborn | ***\*****0.00* | *0.46* |
| **\***Antenatal care participation | ***\*****0.02* | *0.20* |
| Gravidity | *0.76* | *0.11* |
| Parity | *0.68* | *0.13* |
| Abortion | *0.71* | *0.06* |
| **\***Comorbidities | ***\*****0.00* | *0.37* |
| **\***Reason for admission | ***\*****0.00* | *0.81* |
| **\*** Estimated Gestaional Age on admission | ***\*****0.01* | *0.18* |
| **\***APGAR 5 minutes score | ***\*****0.00* | *0.35* |
| **\***Birth weight | ***\*****0.03* | *0.18* |
| Anomalies | *0.97* | *0.02* |
| **\***Emergencies | ***\*****0.02* | *0.28* |

**Key**: Asterisks (\*) indicate p < 0.05 (significant).

### **Table 6: Antenatal Visits vs. Delivery Outcomes**

| **Antenatal Visits** | **Normal** | **Postpartum Hemorrhage** | **Preeclampsia** | **Total** | ***p*-value** |
| --- | --- | --- | --- | --- | --- |
| 1–2 | 15 (8%) | 1 (0.5%) | 2 (1%) | 18 (9%) | 0.17 |
| 3–4 | 82 (41%) | 2 (1%) | 5 (3%) | 89 (44.5%) |  |
| 5–6 | 71 (36%) | 0 (0%) | 0 (0%) | 71 (36%) |  |
| 7–8 | 21 (11%) | 0 (0%) | 0 (0%) | 21 (11%) |  |
| 0 | 1 (0.5%) | 0 (0%) | 0 (0%) | 1 (0.5%) |  |

**Note**: Non-significant association (p > 0.05). Percentages are column-based (total = 200).

**Figure 23**: Cluster Column illustrating the delivery outcome related to number of Antenatal visits of women that visited EFSTH Obstetric unit for delivery.

#### **A. Socio-Demographic Characteristics**

**Age Distribution**: Most respondents (61%) were 18–28 years, followed by 29–38 years (33%). Older age groups (39 and above) were minimally represented (3%) (Figure 1). **Marital Status**: Nearly all respondents (99.5%) were married (**Figure 2)**.

**Religion and Nationality**: All respondents identified as Muslims and were Gambian nationals (Figures 3 and 4). Underrepresentation of certain groups (e.g., older women, non-Muslims) may affect generalizability.

**Education Levels**: **Spouse Education**: Exactly, 93 respondents 46.5% had secondary certificates, 44 (22.0%) of them had nonformal/ vocational training, 40 (20%) had primary certificates, 20 (10%) of them had junior cert, while only 0.5% had tertiary education (Figure 5). **Maternal Education**: 51% had formal/vocational training, 34% had senior certificates, 8% had no formal education, 5% had junior cert, and 2% had tertiary education (Figure 6).

**Ethnicity**: The largest ethnic group was Wallof (28.5%), followed by Fula (19.5%), Jola (13.5%), Madinka and Serahulli both had 23 (11.5%) each, Serere 17 (8.5%) and Aku 14 (7.0%) were the least representation of the ethnic group of the respondents (Figure 7).

**Distance to facility**: It is shown that 2 (1.0%) are walking, 48 (24.0%) have less than a 30-minute drive, and 134 (67.0%) are up to an hour to the facility while 16 (8.0%) of the respondents drove for more than an hour to the facility respectively (Table 7).

**Income**: Over half 105 (52.5%) earned between D3000–D5000 monthly, 17 (8.5%) earned between D5000-D10,000 per month, 1 (0.5 %) earned more than D10,000 per month, while 77 (38.5%) had undetermined income (Figure 9).

#### **B. Clinical and Obstetric History**

**Pregnancy and Delivery**: Regarding the number of children of the respondents, it is indicated that 36 (18.0%) of the respondents have 1 child, 41 (20.5%) of them have two children, 52 (26.0%) of them have 3-5 children, 12 (6.0%) have more than 5 children. Finally, 59 (29.5%) of them do not have a child respectively (**Figure 10)**. **Figure 11**: shows the frequency and percentages of other underline illnesses/es of the respondents. It is shown that 191 (95.5%) have non (other underline illness/es), 8 (4.0%) have Preclampsia, and finally, 1 (0.5%) have asthma respectively. **Number of pregnancies/IES**: 73 (36.5%) had 2–3 pregnancies, 54 (27.0%) had 4-5, 13 (6.5%) had 6-7, while 3(1.5%) had more than 7 (Figure 12).  It shows that 54 (27.0%) of the respondents have 0 number of deliveries, 33 (16.5%) of them have (1), 88 (44.0%) is 3-Feb, 14 (7.0%) of them visited 5-Apr, 10 (5.0%) 7-May, while 1 (0.5%) more than 7 delivery respectively (Figure 13). Percentage of miscarriage; 94% reported no miscarriages; 6% had 1–2 miscarriages (Figure 14).

#### **Admission and Delivery**: 198 (99%) were admitted due to active labor; 2 (1%) had abruptio placentae (Figure 15). Gestation age: It shows that 18 (9.0%) of the respondents were preterm <37 weeks, 181 (90.5%) were full-term 37-40 weeks, and 1(0.5) was post-term>41 respectively (Figure 16). Mode of delivery: Vaginal delivery was predominant 160 (82.5%), with 35 (18.5%) requiring emergency intervention (Figure 17). The high prevalence of vaginal deliveries and full-term births reflects positive maternal care standards. Delivery outcome: It is indicated in the table that 190 (95.0%) modes of delivery were “normal”, 3 (1.5%) “Postpartum”, and finally 7 (3.5%) “Preeclampsia” respectively (Figure 18). **Neonatal Outcomes**: 194 (97%) of neonates were born alive; 6 (3%) were stillbirths (Figure 19). Most of the respondent, 185 (92.5%) had APGAR scores of 7–10 at 5 minutes, followed by 2 (1.0%) of the respondents had 1-3 minutes score, 6 (3.0%) had 4-6 minutes score, 185 (92.5%) had 7-10 minutes score. Finally 7 (3.0%) of them have 0 minutes score respectively (Figure 20). 174(87%) of newborns weighed 2.5–3.9 kg; 20 (10%) were under <2.5kg, 41 (2.0%) had 4kg, while 2 (1.0%) had 4kg birth weight and above (Figure 21). Anomalies Detected. It shows that 199 (99.5%) of the respondents have non-anomalies while 1 (0.5%) have Hydros fetalis respectively (Figure 22).

#### **C. Statistical Relationships**

**Socio-Demographic Variables**: No significant association was found between delivery outcomes and age, marital status, education, ethnicity, or income (*p > 0.05*) (Tables 3, and 4). **Clinical Variables**: in Table 5, Significant associations (*p < 0.05*) were observed between delivery outcomes and: Newborn status (alive/stillbirth), Antenatal care participation, Comorbidities (e.g., preeclampsia), Reason for admission (e.g., abruptio placentae). Gestational age, APGAR scores, and birth weight. The significant impact of clinical factors (e.g., comorbidities, gestational age) underscores the need for targeted prenatal monitoring.

**Antenatal Visits**: No significant link was found between the number of antenatal visits and delivery outcomes (*p = 0.17*), though most women with normal outcomes attended 3–4 visits (41%) (Table 6). Despite high antenatal visit rates, their non-significance suggests qualitative aspects (e.g., care quality) may be more critical than frequency.

**Discussion**

The present study sought to elucidate the relationship between socioeconomic status (SES), pregnancy-related clinical variables, and delivery outcomes among women delivering at Edward Francis Small Teaching Hospital (EFSTH) in The Gambia. The findings contribute to the growing body of literature on maternal and neonatal health in low-resource settings, offering critical insights into the modifiable factors that influence obstetric outcomes. Below, we contextualize the results within existing evidence, discuss their implications for policy and clinical practice, and outline recommendations for future research.

* 1. ***Socioeconomic Status and Maternal Health Outcomes***

Contrary to well-established global evidence (Ahmed *et al.,* 2010; Nicholls-Dempsey *et al.,* 2023; Sui *et al*., 2020; Khatri *et al*., 2022; Emmanuel *et al.,* 2024; Adeyemo *et al.,* 2024), our analysis did not detect a statistically significant association between SES indicators such as income, education, and occupation and adverse delivery outcomes (*p* > 0.05). This finding may be attributed to several factors:

1. Homogeneity of the Study Population: Nearly all participants (99.5%) were married, 100% identified as Muslim, and all were Gambian nationals. This demographic uniformity may have limited the variability required to detect SES-related disparities. Underrepresentation of certain groups (e.g., older women, non-Muslims) may affect generalizability.
2. Income distribution was heavily skewed toward lower brackets, with 52.5% earning between D3000–D5000 monthly (approximately 50–50–85), reflecting widespread economic constraints.
3. Universal Healthcare Access: The Gambia’s government-funded maternal healthcare system may mitigate some SES-related barriers, as evidenced by the high proportion of women receiving antenatal care (ANC). However, qualitative research is needed to assess whether financial constraints still influence care-seeking behaviors indirectly.
4. Measurement Limitations: Self-reported SES data are susceptible to recall bias, and the study’s cross-sectional design precludes causal inferences. Future studies should incorporate longitudinal SES assessments and objective economic indicators (e.g., asset-based wealth indices) to enhance robustness.

Contrary to our finding earlier report revealed that socioeconomic status was a significant factor affecting delivery outcome. The study reiterate that expectant mothers from economically disadvantaged households are more likely to experience stillbirths compared to those from wealthier families. Previous research conducted in SSA (Terefe *et al.,* 2025; Adeyemo *et al.,* 2024), East Africa (Tesema *et al.,* 2021, Uganda (Kujala *et al.,* 2017), Ethiopia (Jena *et al.,* 2020), and Nepal (Kc *et al.,* 2016) have confirmed.

Despite the non-significant findings, SES remains a critical social determinant of health. The lack of observed association in this study should not diminish its policy relevance but rather prompt further investigation into how structural inequities manifest in this specific context.

* 1. ***Clinical Determinants of Delivery Outcomes***

The study identified several clinically significant predictors of delivery outcomes, aligning with global maternal health literature:

Antenatal Care (ANC) Utilization

1. ANC participation was significantly associated with improved delivery outcomes (*p* = 0.02), reinforcing WHO (2020) guidelines on the importance of prenatal visits.
2. However, the number of ANC visits (1–2 vs. 3–4) did not yield significant differences (*p* = 0.17), suggesting that the quality of care such as screening for hypertension, anemia, and infections may be more impactful than frequency alone. This finding resonates with studies emphasizing the need for standardized, high-content ANC in low-resource settings (Nigatu *et al*., 2023; Daniels-Donkor *et al*., 2024; John-Emaimo *et al*., 2025).

Comorbidities and Pregnancy Complications

1. Preeclampsia (4.0%) and asthma (0.5%) were significantly linked to adverse outcomes (*p* < 0.05), corroborating evidence that hypertensive disorders and chronic conditions elevate obstetric risks (Fall *et al*., 2015; Mwilike *et al.,* 2024; John-Emaimo *et al*., 2025).
2. The high prevalence of unbooked cases (i.e., women without ANC records) warrants targeted interventions, such as community-based hypertension screening and patient education programs (Comfort *et al.,* 2019; USAID SQALE *et al.,* 2019; Maryline-Mireku *et al.,* 2019; Karuga *et al.,* 2019; Alhassan *et al*., 2024).

Neonatal Health Indicators

1. Birth weight and APGAR scores were significant predictors (*p* = 0.03 and *p* < 0.05, respectively), with 10% of neonates classified as low birth weight (<2.5 kg). These underscore the importance of neonatal health metrics in assessing delivery success. This aligns with regional data linking malnutrition and malaria to intrauterine growth restriction (Uneke *et al.,* 2009*;* Saito *et al.,* 2024; Ssentongo *et al,* 2020; Obase, *et al*., 2020; Fall *et al*., 2015).
2. The 3% stillbirth rate, though lower than some Sub-Saharan African pooled estimates prevalence of stillbirths of 1.54% per 100 [95% CI 1.19-2.01] (Terefe *et al.,* 2025), underscores the need for enhanced intrapartum monitoring and emergency obstetric care.

**Limitations and Methodological Considerations:**

1. **Study Design**: The cross-sectional design limits causal inference. Prospective cohort studies would better delineate temporal relationships between SES, clinical factors, and outcomes.
2. **Sampling Bias**: Convenience sampling at a single tertiary hospital may not represent rural populations or women utilizing lower-level health facilities.
3. **Unmeasured Confounders**: Factors such as nutritional status, intimate partner violence, and environmental stressors were not assessed but may mediate SES-outcome relationships.
4. **Enhancing ANC quality**: While ANC attendance was high (90.5% delivered at full term), optimizing care content (e.g., malaria prophylaxis, nutritional counseling) could further improve outcomes
5. **Addressing comorbidities**: Screening and management of conditions like preeclampsia (4% of respondents) should be prioritized in prenatal programs.
6. **Community-based education**: Given the low variability in SES, community health campaigns could uniformly elevate health literacy and access (Mbuagbaw *et al*., 2015; Karuga *et al.,* 2019; Adeyemo *et al.,* 2024).

**Policy and Practice Implications**

1. **Strengthening ANC Quality**:
   1. Beyond increasing visit frequency, ANC programs should integrate routine screening for gestational diabetes, anemia, and hypertensive disorders, coupled with patient education.
2. **Community-Based Interventions**:
   1. Mobile health clinics and community health workers could improve early detection of high-risk pregnancies, particularly in rural areas with limited facility access (Bawadi *et al.,* 2023; Mwilike *et al.,* 2024).
3. **Health System Financing**:
   1. While maternal care is government-funded, indirect costs (transport, lost wages) may still deter care-seeking. Conditional cash transfers or transportation vouchers could mitigate these barriers.

**Conclusion**

This study highlights the predominant role of clinical factors particularly ANC participation, comorbidities, and neonatal health indicators in shaping delivery outcomes in The Gambia. While SES did not emerge as a significant predictor in this cohort, its broader societal impact warrants further exploration through mixed-methods research. Policymakers and clinicians should prioritize:

1. Quality-optimized ANC
2. Early detection and management of obstetric complications
3. Equity-focused health system strengthening

Future studies should employ longitudinal designs and geographically diverse samples to better capture the interplay of socioeconomic and clinical determinants in this setting.

**Ethical Approval:** Ethical approval for this study was obtained from the relevant institutional review board. Documentation is available from the corresponding author upon reasonable request.

### **References**

# Adeyemo, Q. E,  Yahaya, H., Ajayi, O. E, Aboagye-Mensah, P., Adeyemo J. B, Ikome, T. I (2024). A Scoping Review on Influence of Socioeconomic Status on Antenatal Care Utilization and Pregnancy Outcomes in Sub-Saharan Africa. MedRxiv. doi: https://doi.org/10.1101/2024.01.11.24301063

1. Afulani, P. A., Buback, L., Essandoh, F., Kinyua, J., Kirumbi, L., & Cohen, C. R (2019). Quality of antenatal care and associated factors in a rural county in Kenya: an assess­ment of service provision and experience dimensions. *BMC Health Service Research*, **19**(1), 684.

# [Ahmed](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), K. Y., [Thapa](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), S., [Hassen](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), T. A., [Tegegne](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), T. K., [Dadi](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), A. F., [Odo](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), D. B., [Bizuayehu](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), H. M., [Shifti](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), D. M., [Belachew](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), S. A., [Kibret](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), G. D., [Ketema](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), D. B., [Kassa](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), Z. Y., [Amsalu](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), E., [Bore](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), M. G., [Seid](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), A., [Mesfin](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), Y. M., [Kibret](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), K. T., [M., Huda](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), M.,  [Mahmood](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), S.,  [Anyasodor](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), A. E., and [Ross](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(24)00261-X/fulltext), A. G (2024). Population modifiable risk factors associated with neonatal mortality in 35 sub-Saharan Africa countries: analysis of data from demographic and health surveys. *EclinicalMedicine*[, 73](https://www.thelancet.com/journals/eclinm/issue/vol73nonull/PIIS2589-5370(24)X0007-3)102682July 2024

1. Ahmed, S., Creanga, A. A., Gillespie, D. G., and Tsui, A. O (2010). Economic Status, Education and Empowerment: Implications for Maternal Health Service Utilization in Developing Countries. *Public Library of Science* One, 5(6): e11190. https://doi.org/10.1371/journal.pone.0011190
2. Alhassan, Y., Otiso, L., Okoth, L., Murray, L., Hemingway, C., Lewis, J. M., Oguche, M., Doyle, V., Muturi, N., Ogwang, E., Barsosio, H. C., & Taegtmeyer, M (2024). Four antenatal care visits by four months of pregnancy and four vital tests for pregnant mothers: Impact of a community-facility health systems strengthening intervention in Migori County, Kenya. *BMC Pregnancy and Childbirth,24*, 224.
3. [Bawadi](https://pubmed.ncbi.nlm.nih.gov/?term=%22Bawadi%20HA%22%5BAuthor%5D), H. A.,  [Abu Abed](https://pubmed.ncbi.nlm.nih.gov/?term=%22Abu%20Abed%20AS%22%5BAuthor%5D), A. S.,   [Al-Hamdan](https://pubmed.ncbi.nlm.nih.gov/?term=%22Al-Hamdan%20ZM%22%5BAuthor%5D), Z. A., and  [Alzubi](https://pubmed.ncbi.nlm.nih.gov/?term=%22Alzubi%20SM%22%5BAuthor%5D), S. M (2023). Receiving antenatal care via mobile clinic: Lived experiences of Jordanian mothers. *International Journal of Nursing Science,* 17;10(2):230–237. doi: [10.1016/j.ijnss.2023.03.005](https://doi.org/10.1016/j.ijnss.2023.03.005)
4. Comfort, A. B., Juras, R. C., Bradley, S. E. K., Ranjalahy, R. J., Noeliarivelo, R. A., &Harper, C. C (2019). Do home pregnancy tests bring women to commu­nity health workers for antenatal care counselling? A randomized controlled trial in Madagascar. *Health Policy Planning*, *34*(8), 566–73.
5. [Correa-de-Araujo](https://pubmed.ncbi.nlm.nih.gov/?term=%22Correa-de-Araujo%20R%22%5BAuthor%5D), R and [Yoon](https://pubmed.ncbi.nlm.nih.gov/?term=%22Yoon%20SS%22%5BAuthor%5D), S. S. S (2021). Clinical Outcomes in High-Risk Pregnancies Due to Advanced Maternal Age. *Journal of Womens Health* (Larchmt), 2;30(2):160–167. doi: [10.1089/jwh.2020.8860](https://doi.org/10.1089/jwh.2020.8860)
6. Cresswell, J. A., Alexander, M., Chong, M. Y. C., Link, H. M., Pejchinovska, M., Gazeley, U., Ahmed, S. M. A., Chou, D., Moller, A.-B., Simpson, D., Alkema, L., Villanueva, G., Sguassero, Y., Tunçalp, Ö., Long, Q., Xiao, S., and Say, L. (2025). Global and regional causes of maternal deaths 2009–2020: A WHO systematic analysis. *The Lancet Global Health, 13*(4), 626–e634. <https://doi.org/10.1016/S2214-109X(24)00560-6>
7. Daniels‑Donkor, S. S., Afaya, A., Daliri, D. B., Laari, T. T., Salia, S. M., Avane, M. A., Afaya, R. A., Yakong, V. N., Ayanore, M. A., & Alhassan, R. K (2024). Factors associated with timely initiation of antenatal care among reproductive age women in The Gambia: a multilevel fixed effects analysis. *Archives of Public Health,* 82*:*73.
8. Ekuma, P. U., Ibiam, F. A., Ekuma, M I., Iroha, C. S., Peter, I. U and Iroha, I. R (2023*).* Evaluating the Bacteria Profile and Drug Susceptibility Patterns of Urinary Tract Infectious Pathogens in Pregnant Women in Abakaliki Metropolis, Nigeria.*International Journal of Pathogen Research*, **12** (5):52-62.
9. Emmanuel, K. K., Odek, A., and Gichuhi, D (2024). Influence of Household Socio-Economic, Demographic, and Cultural Factors on Women's Access to Maternal Healthcare in Malindi Sub County, Kilifi County, Kenya. *African Journal of Empirical Research*, 5 (4); 137-150
10. [Fall](https://pubmed.ncbi.nlm.nih.gov/?term=Fall+CH&cauthor_id=25999096), C. H. D.,  [Sachdev](https://pubmed.ncbi.nlm.nih.gov/?term=Sachdev+HS&cauthor_id=25999096), H. S., [Osmond](https://pubmed.ncbi.nlm.nih.gov/?term=Osmond+C&cauthor_id=25999096), C.,  [Restrepo-Mendez](https://pubmed.ncbi.nlm.nih.gov/?term=Restrepo-Mendez+MC&cauthor_id=25999096), M. C., [Victora](https://pubmed.ncbi.nlm.nih.gov/?term=Victora+C&cauthor_id=25999096), C., [Martorell](https://pubmed.ncbi.nlm.nih.gov/?term=Martorell+R&cauthor_id=25999096), R.,  [Stein](https://pubmed.ncbi.nlm.nih.gov/?term=Stein+AD&cauthor_id=25999096), A. D., [Sinha](https://pubmed.ncbi.nlm.nih.gov/?term=Sinha+S&cauthor_id=25999096),S., [Tandon](https://pubmed.ncbi.nlm.nih.gov/?term=Tandon+N&cauthor_id=25999096), N., [Adair](https://pubmed.ncbi.nlm.nih.gov/?term=Adair+L&cauthor_id=25999096), L., [Bas](https://pubmed.ncbi.nlm.nih.gov/?term=Bas+I&cauthor_id=25999096), I., [Norris](https://pubmed.ncbi.nlm.nih.gov/?term=Norris+S&cauthor_id=25999096), S.,  [Richter](https://pubmed.ncbi.nlm.nih.gov/?term=Richter+LM&cauthor_id=25999096), L. M., and [COHORTS investigators](https://pubmed.ncbi.nlm.nih.gov/?term=COHORTS+investigators%5BCorporate+Author%5D) (2015). Association between maternal age at childbirth and child and adult outcomes in the offspring: A prospective study in five low-income and middle-income countries (COHORTS collaboration). *Lancet of Global Health*, **3**(7):366-77.doi: 10.1016/S2214-109X(15)00038-8.
11. International Monetary fund (2021). THE GAMBIA; Selected Issue; IMF Country Report No. 21/266. https://www.imf.org//media/Files/Publications/CR/2021/English/1GMBEA2021004.ashx
12. Jallow, I. K., Chou, Y. J., Liu, T. L., and Huang, N (2012). Women’s perception of antenatal care services in public and private clinics in the Gambia. *International Journal for Quality in Health* Care, *24*(6), 595–600.
13. Jena, B. H., Biks, G. A., Gelaye, K. A., and Gete, Y. K (2020). Magnitude and trend of perinatal mortality and its relationship with inter-pregnancy interval in Ethiopia: a systematic review and meta-analysis. *BMC Pregnancy Childbirth,* **20**:1–13.
14. John-Emaimo, C. N., Emaimo, A. J and Peter, I. U (2025). Insights into the Importance of Regular Antenatal Care Visits for Improving Delivery Outcomes in Pregnant Patients: A Cross-Sectional Study. *European Journal of Science Innovation and Technology****,*** 5(2):77-84
15. Karuga, R. N., Mireku, M., Muturi, N., McCollum, R., Vallieres, F., & Kumar, M., Taegtmeyer, M., & Otiso, L. (2019). Supportive supervision of close-to-community providers of health care: findings from action research conducted in two counties in Kenya. *Public Library of Science One*, *14*(5), 0216444. https://doi.org/10.1371/journal.pone.0216444
16. Kc, A., Wrammert, J., Ewald, U., Clark, R. B., Gautam, J., Baral G, et al (2016). Incidence of intrapartum stillbirth and associated risk factors in tertiary care setting of Nepal: A case-control study. *Reproductive Health*, 13:1–11.
17. Khatri, R. B., Mengistu, T. S., & Assefa, Y. (2022). Input, process, and output factors contribut­ing to quality of antenatal care services: a scoping review of evidence. *BMC Pregnancy Childbirth*, 22(1), 977-979.
18. Kujala, S., Waiswa, P., Kadobera, D., Akuze, J., Pariyo, G., and Hanson, C (2017). Trends and risk factors of stillbirths and neonatal deaths in Eastern Uganda (1982–2011): a cross-sectional, population-based study. *Tropical Medicine International Health,* 22(1):63–73.
19. Lerberg, P. M., Sundby, J., Jammeh, A., and Fretheim, A. (2014). Barriers to Skilled Birth Attendance: A Survey among Mothers in Rural Gambia. African Journal of Reproductive Health, **18**(1): 35-43
20. Li, H., Yin, B., Jiang, N., and Zhu, B (2025). Effect of Combined Gestational Diabetes Mellitus and Preeclampsia on Pregnancy Outcomes. *Clinical and Experimental Obstetric Gynecology*, 52(2): 27065
21. Lowe, M., Chen, D. R., and Huang, S. L (2016) Social and Cultural Factors Affecting Maternal Health in Rural Gambia: An Exploratory Qualitative Study. *Public Library of Science* One, 11(9): 0163653. https://doi.org/10.1371/journal.pone.0163653
22. Maryline-Mireku, M. K., Rosalind M. M., Taegtmeyer, K. D., & Koning, O. L. (2019). *Context analysis: close-to-community health service providers in Kenya*. Kenya: REACHOUT Consortium; 2014.
23. [Masembe](https://pubmed.ncbi.nlm.nih.gov/?term=%22Masembe%20S%22%5BAuthor%5D), S., [Migisha](https://pubmed.ncbi.nlm.nih.gov/?term=%22Migisha%20R%22%5BAuthor%5D), R.,  [Turyasingura](https://pubmed.ncbi.nlm.nih.gov/?term=%22Turyasingura%20G%22%5BAuthor%5D), G., [Aheisibwe](https://pubmed.ncbi.nlm.nih.gov/?term=%22Aheisibwe%20H%22%5BAuthor%5D), H.,  [Nzabandora](https://pubmed.ncbi.nlm.nih.gov/?term=%22Nzabandora%20E%22%5BAuthor%5D), E.,  [and Lule](https://pubmed.ncbi.nlm.nih.gov/?term=%22Lule%20JC%22%5BAuthor%5D), J. C. (2024) Adverse maternal outcomes and associated factors among mothers of advanced age delivering at a tertiary hospital, Southwestern Uganda: A cross-sectional study. *BMC Pregnancy Childbirth*, 7;24:348. doi: [10.1186/s12884-024-06557-1](https://doi.org/10.1186/s12884-024-06557-1)
24. Mbuagbaw, L., Medley, N., Darzi, A. J., Richardson, M., Habiba Garga, K., and Ongolo-Zogo, P. (2015). Health system and community level interventions for improving antenatal care coverage and health outcomes. *Cochrane Database System Reviews*, *1*(12).https://doi.org/10.1002/14651858.CD010994.pub2
25. Mwilike, B. E., Welsh, J., Nyamuryekung’e, K. K., Nyaruchary, A. J., Pembe, A. B., Gross, M.M. (2024). Midwife-Led Mobile Antenatal Clinic: An Innovative Approach to Improve Utilization of Services in Pwani, Tanzania. *International Journal of Environmental Research and Public Health,* 21:1446. https:// doi.org/10.3390/ijerph21111446
26. [Nicholls-Dempsey](https://pubmed.ncbi.nlm.nih.gov/?term=%22Nicholls-Dempsey%20L%22%5BAuthor%5D), L.,  [Badeghiesh](https://pubmed.ncbi.nlm.nih.gov/?term=%22Badeghiesh%20A%22%5BAuthor%5D), A., [Baghlaf](https://pubmed.ncbi.nlm.nih.gov/?term=%22Baghlaf%20H%22%5BAuthor%5D), H., and  [Dahan](https://pubmed.ncbi.nlm.nih.gov/?term=%22Dahan%20MH%22%5BAuthor%5D), M. H. (2023). How does high socioeconomic status affect maternal and neonatal pregnancy outcomes? A population-based study among American women. *European Journal of Obstetric, Gynecology, Reproductive Biology*, 12;20:100248. doi: [10.1016/j.eurox.2023.100248](https://doi.org/10.1016/j.eurox.2023.100248).
27. [Nigatu](https://pubmed.ncbi.nlm.nih.gov/?term=%22Nigatu%20SG%22%5BAuthor%5D), S. G., & [Birhan](https://pubmed.ncbi.nlm.nih.gov/?term=%22Birhan%20TY%22%5BAuthor%5D), T. Y. (2023).The Magnitude and Determinants of delayed initiation of antenatal care among pregnant women in Gambia; evidence from Gambia demographic and health survey data. *BMC Public Health*, 23:599
28. Nyanzi, S., Manneh, H., and Walraven, G., (2007). *Traditional* Birth Attendants in Rural Gambia: Beyond Health to Social Cohesion, African Journal of Reproductive Health, 11:1-45.
29. Nyongesa, P., Ekhaguere, O. A., Marete, I., Tenge, C., Kemoi, M., Bann, C. M., Bucher, S. L., Patel, A. B., Hibberd, P. L., Naqvi, F., Saleem, S., Goldenberg, R. L., Goudar, S. S., Derman, R. J., Krebs, N. F., Garces, A., Chomba, E., Carlo, W. A., Mwenechanya, M., Lokangaka, A., Tshefu, A. K., Bauserman, M., KosoThomas, M., Moore, J. L., McClure, E. M., Liechty, E. A., and Esamai, F. (2023) Maternal age extremes and adverse pregnancy outcomes in low-resourced settings. *Frontier in Global Womens Health,* 4:1201037. doi: 10.3389/fgwh.2023.1201037
30. Obase, B.N., Bigoga, J. D., and Nsagha, D.S. (2023) Malaria and HIV Co-Infection among Pregnant Women in Africa: Prevalence, Effect on Immunity and Clinical Management: Review. *International. Journal of Translational Medicine*, 3:187–202. https:// doi.org/10.3390/ijtm3020014
31. [Ogbo](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Felix_Akpojene-Ogbo-Aff1-Aff2), F. A.,  [Ezeh](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Osita_Kingsley-Ezeh-Aff3), O. K.,  [Awosemo](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Akorede_O_-Awosemo-Aff2), A. O., [Ifegwu](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Ifegwu_K_-Ifegwu-Aff2), I. K., [Tan](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Lawrence-Tan-Aff4), L., [Jessa](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Emmanuel-Jessa-Aff4), E.,  [Charwe](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Deborah-Charwe-Aff5), D., and  [Agho](https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7547-x#auth-Kingsley_Emwinyore-Agho-Aff1-Aff3), K. E (2019). Determinants of trends in neonatal, post-neonatal, infant, child and under-five mortalities in Tanzania from 2004 to 2016. [*BMC Public Health*](https://bmcpublichealth.biomedcentral.com/),19: 1243 (2019)
32. Onuoha, C., Schulte, C. C.M,  Thaweethai, T.,  Hsu, S.,  Pant, D.,   James, K. E., Sen, S.,   Kaimal, A., and  Powe, C. E (2024).The simultaneous occurrence of gestational diabetes and hypertensive disorders of pregnancy affects fetal growth and neonatal morbidity. [*American Journal of Obstetrics and Gynecology*](https://www.sciencedirect.com/journal/american-journal-of-obstetrics-and-gynecology)*,* [231(5](https://www.sciencedirect.com/journal/american-journal-of-obstetrics-and-gynecology/vol/231/issue/5)): 548.1-548.e21
33. Regassa, Y., Lemi, H and Charkos, T. G. (2024). Determinants of stillbirth among mothers who gave birth at Bishoftu General Hospital, Ethiopia: using a Bayesian logistic regression model. *Frontier of Global Womens Health,* 5:1441636. doi: 10.3389/fgwh.2024.1441636
34. Rutledge, J. D., Kiyanda, A., Jean-Louis, C., Raskin, E., Gaillard, J., Maxwell, M., (2024). Recommendations for integrating traditional birth attendants to improve maternal health outcomes in low- and middle-income countries. *International of Journal of* *MCH AIDS,* 13:019. doi: 10.25259/ IJMA\_16\_2024

## Saito, M., Briand, V.,  Min, A. M and [McGready](https://www.sciencedirect.com/author/7005266624/r-m-mcgready), R (2020). Deleterious effects of malaria in pregnancy on the developing fetus: A Review on prevention and treatment with antimalarial drugs. [T*he Lancet Child & Adolescent Healt*h](https://www.sciencedirect.com/journal/the-lancet-child-and-adolescent-health), [4(10](https://www.sciencedirect.com/journal/the-lancet-child-and-adolescent-health/vol/4/issue/10)), 761-774.

1. Some A., [Baguiya](https://pubmed.ncbi.nlm.nih.gov/?term=Baguiya+A&cauthor_id=34077088), A., [Coulibaly](https://pubmed.ncbi.nlm.nih.gov/?term=Coulibaly+A&cauthor_id=34077088), A., [Bagnoa](https://pubmed.ncbi.nlm.nih.gov/?term=Bagnoa+V&cauthor_id=34077088), V., & [Kouanda](https://pubmed.ncbi.nlm.nih.gov/?term=Kouanda+S&cauthor_id=34077088), S. (2020). Prevalence and factors Associated with Late First Antenatal Care visit in Kaya Health District, Burkina Faso. *African Journal of Reproductive Health*. 24(2), 19–26.
2. [Ssentongo](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Paddy-Ssentongo-Aff1-Aff2), P., [Ba](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Djibril_M_-Ba-Aff2-Aff3), D. M., [Ssentongo](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Anna_E_-Ssentongo-Aff2), A. E., [Ericson](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Jessica_E_-Ericson-Aff4), J. E., [Wang](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Ming-Wang-Aff2), M.,  [Liao](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x#auth-Duanping-Liao-Aff2), D., and [Chinchilli](https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-020-03064-x" \l "auth-Vernon_M_-Chinchilli-Aff2), V. M (2020). Associations of malaria, HIV, and coinfection, with anemia in pregnancy in sub-Saharan Africa: a population-based cross-sectional study. [*BMC Pregnancy and Childbirth*](https://bmcpregnancychildbirth.biomedcentral.com/),20: 379-380.
3. Sui, Y., Ahuru, R. R., Huang, K., Anser, M. K., and Osabohien, R. (2021). Household Socioeconomic Status and Antenatal Care Utilization Among Women in the Reproductive-Age. *Frontier of Public Health*, 13:9:724337. doi: 10.3389/fpubh.2021.724337.
4. [Tamir](https://pubmed.ncbi.nlm.nih.gov/?term=Tamir+TT&cauthor_id=38848390), T. T.,[Mohammed](https://pubmed.ncbi.nlm.nih.gov/?term=Mohammed+Y&cauthor_id=38848390), Y.,  [Kassie](https://pubmed.ncbi.nlm.nih.gov/?term=Kassie+AT&cauthor_id=38848390), A. T., and  [Zegeye](https://pubmed.ncbi.nlm.nih.gov/?term=Zegeye+AF&cauthor_id=38848390), A. F. (2024). Early neonatal mortality and determinants in sub-Saharan Africa: Findings from recent demographic and health survey data. *Public Library of Science* One, 7;19(6):e0304065. doi: 10.1371/journal.pone.0304065.
5. Tekeba, B., Techane, M. A., Workneh, B. S., Zegeye, A. F., Gonete, A.T., Ahmed, M. A, et al. (2024) Determinants of preterm birth among reproductive age women in sub-Saharan Africa: Evidence from the most recent Demographic and Health Survey data-2019-2022. *Public Library of Science* One, 19(6): e0305810. https://doi.org/10.1371/journal.pone.0305810.
6. [Terefe](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Bewuketu-Terefe-Aff1), B.,  [Jembere](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Mahlet_Moges-Jembere-Aff2), M. M.,   [Abrha](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Nega_Nigussie-Abrha-Aff2), N. N.,  [Asgedom](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Dejen_Kahsay-Asgedom-Aff3), D. K.,  [Assefa](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Solomon_Keflie-Assefa-Aff4-Aff5), S. K., &  [Assimamaw](https://ghrp.biomedcentral.com/articles/10.1186/s41256-024-00395-6#auth-Nega_Tezera-Assimamaw-Aff6), N. T (2025). Pooled prevalence and multilevel determinants of stillbirths in sub-Saharan African countries: implications for achieving sustainable development goal. [*Global Health Research and Policy*](https://ghrp.biomedcentral.com/)**, 10**(11):20-25
7. Tesema, G. A., Tessema, Z. T., Tamirat, K. S and Teshale, A. B. (2021). Prevalence of stillbirth and its associated factors in East Africa: generalized linear mixed modeling. *BMC Pregnancy Childbirth*, 21(1):414.
8. [Uneke](https://pubmed.ncbi.nlm.nih.gov/?term=%22Uneke%20CJ%22%5BAuthor%5D), C. J.,  [Duhlinska](https://pubmed.ncbi.nlm.nih.gov/?term=%22Duhlinska%20DD%22%5BAuthor%5D), D. D., [and Ujam](https://pubmed.ncbi.nlm.nih.gov/?term=%22Ujam%20TN%22%5BAuthor%5D), T. N (2009). Effects of Maternal Plasmodium falciparum Malaria and HIV infection on Birth Weight in Southeastern Nigeria. *McGill Journal of Medicine*, 16;12(2):42.
9. UNICEF, (2018) Maternal and Newborn Health Disparities in The Gambia
10. USAID SQALE. (2019). *Sharing knowledge and experience on quality improvement for community health and sustaining change: USAID SQALE Learning Event Report 2019*. Nairobi, Kenya: USAID SQALE.
11. WHO (2024). Neonatal mortality rate (per 1000 live births). https://data.who.int/indicators/i/E3CAF2B/A4C49D3

# WHO (2025). Maternal mortality. https://www.who.int/news-room/fact-sheets/detail/maternal-mortality

1. WHO. (2020). The role of religion in enhancing universal access to maternal healthcare. World Health Organization
2. World Health Organization (WHO). (2020). Antenatal care recommendations for a positive pregnancy experience Nutritional interventions update: Multiple micronutrient supplements during pregnancy. In *WHO antenatal care recommendations for a positive pregnancy experience Nutritional interventions update: Multiple micronutrient supplements during pregnancy*(p. 68-68).
3. World Medical Association (2024).  World Medical Association Declaration of Helsinki: ethical principles for medical research involving human participants. ﻿*Journal of American Medical Association*. Published online October 19, 2024. doi:10.1001/jama.2024.21972

## Yahaya, H.,  Adeyemo, Q. E., and  Kumah, A (2024). Adverse perinatal outcomes and their associated determinants in Sub-Saharan Africa. [*Journal of Medicine, Surgery, and Public Health*](https://www.sciencedirect.com/journal/journal-of-medicine-surgery-and-public-health), <https://doi.org/10.1016/j.glmedi.2024.100124>

1. [Yang](https://pubmed.ncbi.nlm.nih.gov/?term=%22Yang%20Y%22%5BAuthor%5D), Y., and [Wu](https://pubmed.ncbi.nlm.nih.gov/?term=%22Wu%20N%22%5BAuthor%5D), N (2022). Gestational Diabetes Mellitus and Preeclampsia: Correlation and Influencing Factors. *Frontier in Cardiovascular Medicine*, 16;9:831297. doi: [10.3389/fcvm.2022.831297](https://doi.org/10.3389/fcvm.2022.831297)
2. Yaya, S., Oladimeji, O., Oladimeji, K. E ., & Bishwajit, G. (2020).Prenatal care and uptake of HIV testing among pregnant women in Gambia: A Cross-sectional study. *BMC Public Health*, 20:485-489

# Ye, X., Baker, P. N., and  Tong, C  (2024). The updated understanding of advanced maternal age. [*Fundamental Research*](https://www.sciencedirect.com/journal/fundamental-research), [4(6](https://www.sciencedirect.com/journal/fundamental-research/vol/4/issue/6)), 1719-1728