

Trend analysis of age-specific adolescent pregnancy among antenatal care registrants, Savannah Region, Ghana 2018 to 2022

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ABSTRACT

Introduction: Adolescent pregnancy prevalence is a key determinant of health and socio-economic growth, affecting maternal and perinatal outcomes. In Ghana, it is roughly three times higher than in developed countries. Understanding age-specific dynamics is essential for meeting the sustainable development goal (SDG) for reproductive health targets. This study aimed to assess the period prevalence of adolescent pregnancies in the Savannah region, identify the district with the highest prevalence, determine the age-specific adolescent birth rate, and analyze trends in reducing birth rate for both early and late adolescent pregnancies. **Methods:** We conducted a cross-sectional analysis of a single data set over five years (2018 – 2022) in the Savannah Region. Records of adolescent mothers on ante-natal visits at registration from the District Health Information Management System 2 DHIMS2 were utilized. Age-specific bivariate analysis was conducted at a 95% confidence interval using Microsoft Excel 2018. We analysed the data by year and determined the period prevalence, age-specific adolescent birth rate (ASABR), and rate of change in prevalence. Microsoft Excel spreadsheet was used in analyzing the data. We presented results graphically with a forest plot, simple line and bar graphs, and a map using QGIS. **Results:** The period prevalence of adolescent pregnancy in the Savannah Region was 117.50 childbirths per 1000 women (95% CI: of 102.17 – 131.92). Prevalence among late adolescents was 230 childbirths per 1000 (95% CI: of 165.13-296.01) with a rate of change of +0.8 childbirths per 1000 women per year. Early adolescent pregnancy prevalence was 6.57 (95% CI: 3.46 – 9.68) with a rate of change of +0.4 child births per 1000 women per year. The prevalence in the Bole District was 230 births per 1000 (95% CI; 165-296). **Conclusion:** Adolescent pregnancy prevalence in the Savannah Region exceeds global estimates for Sub-Saharan Africa, with early adolescent pregnancies showing the least reduction over the five years despite interventions implemented. Bole District had the highest prevalence in the region. Targeted interventions and policies are needed to strengthen sexual and reproductive health, particularly in high-burden areas with slower reductions.

KEYWORDS: Adolescent pregnancy, Savannah Region, period prevalence, Age-specific adolescent birth rate

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Introduction

Adolescent pregnancy is a planned or unplanned pregnancy in a girl between the ages of 10 to 19 years [1]. Although global adolescent pregnancy rates have seen notable progress, about a 35% reduction in the global trend as of 2023, approximately 21 million adolescent pregnancies are still reported annually [2]. In developed countries, one in five adolescent girls becomes pregnant before the age of 18, while in low- and middle-income countries (LMICs), this figure rises to at least one in three [2][3]. In Latin America, as of 2015, approximately 2.5 million girls aged 10 to 14 gave birth annually [4]. In Sub-Saharan Africa, the case is not any better [5] [6]. This region has the highest adolescent birth rate, with 97 births per 1,000 women. In 2023, over 6 million childbirths occurred to girls aged 15–19 years, and more than 300,000 births in 10–14 years, the highest numbers globally [2].

In Ghana, the period prevalence of late adolescent pregnancies (15-19 years) over 30 years, was 15.4 childbirths per 1000 (95% CI 13.49 – 17.30) with higher prevalence in rural areas [7]. Savannah Region has one of the lowest prevalence of adolescent pregnancies in Ghana [8]. However, the region's low population density, combined with its youthful demographic, high population growth rate, and the prevalence of certain sociocultural practices among some tribes, invites further review of the facts. It is home to the largest confluence of the Fulani population in Ghana, among who studies have shown high rates of child marriages [9].

Thematic analysis revealed that factors such as early marriage, sexual risk behaviours, a family history of adolescent pregnancy, peer pressure, and limited access to reproductive health services, contribute to the rising incidence of adolescent pregnancies [10]. Adolescent pregnancies have been shown to have a profound effect on the socioeconomic, physical, and mental development of the girls involved, as well as the society, and the nation as a whole. Maternal and perinatal complications are notably more severe in this population [11][12][13]. To emphasize adolescents' reproductive health in most policy initiatives among specific youth age groups, the 10-14 age group was included in the Sustainable Development Goals indicator framework for reproductive health by the United Nations General Assembly in July 2017 [14]. This contributed to the progress made in reducing the prevalence of

adolescent pregnancies globally [15] [16] from 45.7 in 2017 to 41.9 [17]. Nevertheless, there remains some variability in progress across age groups and different populations [2]. For example, countries like Niger and Chad continue to have a very highest prevalence of ABR in late adolescents and about 6% reduction since, 2017. These countries still do not have reliable conclusions about the early adolescent group [17].

Some studies on adolescent pregnancy trends involve long-term data reviews with some researchers focusing on the 15-19 age group to conform to certain standards [18]. These do not show real-time trends and do not consider the early adolescent risk group. For instance, a study in Kenya revealed that approximately one million adolescent pregnancies were missed over 11 years [18]. The lengthy periods of study and the marginalized focus of these studies underscore the need to understand the age-specific prevalence in perspective. This will help trigger the significance of improved data collection across all age groups, and to develop targeted public health policies and interventions to reduce the incidence of adolescent pregnancies.

In Ghana and other similar populations, studies on adolescent pregnancies typically focus on cause-and-effect factors [13][19][20]. Among these socioeconomic and sociocultural factors have shown strong associations [19]. Few studies however examine trends in reduction within the country, specific age groups, and regions, such as the Savannah region [7][21].

This manuscript presents a comprehensive analysis of the trends in adolescent pregnancies among different age groups across the Savannah region and in its various districts. It provides a foundation for understanding the progress in reducing the burden of adolescent pregnancies in the region. The analysis includes the period prevalence, the average rate of change in adolescent pregnancy over the five-year period, and the age-specific adolescent birth rate in the Savannah region.

Methods

Study design

The study utilized a cross-sectional design. Data on all antenatal care (ANC) registrants from all health facilities in the Savannah region of Ghana, as recorded in the DHIMS-2 registry between 2018 and 2022, were included in this study.

Study setting

The study was conducted in the Savannah Region, one of two regions carved out of the Northern Region in 2019 [22]. The region has the largest land area in Ghana covering approximately 15% of the total surface area [22]. The region has the lowest population density in the country and one of the fastest rates of population growth in the country at 3.1% [22]. Approximately 70% of the population are rural [22]. With female populations marginally exceeding the male population, the region is one of the few still with a very slow transition into a youthful population [22]. Most populations in the region are child populations [22]. The region has one of the highest total fertility rates (TFR) among rural populations in the country [22].

The region like any rural-dominated region in the country has subsistence agriculture as the main socio-economic activity. Together with the other two Northern regions, it is categorized as the only region in Ghana with below average Human Development Index (HDI) [23].

Operational definitions

Age-specific birth rate (ASBR): It is the ratio of the total number of live births born to women within a specific age category to the mid-year population of women in the age bracket for a given country, territory, or geographic area, during a specified period, usually multiplied by 1,000.

Average rate of change: It is a measure of how much a function changed per unit, on average, over that interval. It is calculated from the difference in the function over the interval's endpoints expressed as a fraction of the change in time Mathematically;

$$A_x = \frac{\sum(f(b)-f(a))}{\Delta t}$$

Where;

Ax – Average rate of change

f(a) – function of 'a'

F(b) –function of 'b'

t – change in time

Data collection and management

Data of all adolescent antenatal mothers at registration, along with the population of Savannah Region by year, sex, and age categories, from 2018 to 2022 were extracted onto an Excel spreadsheet

and restructured. The data was categorized into two age groups-early adolescent (10-14) and late adolescent (15-19) and further broken down by districts.

Data analysis

The data were analyzed using Microsoft Excel 2018. First, we estimated the risk populations for each year from the DHIMS 2 platform, using the projected population data entered into the system. To determine the proportion of Women in Fertility Age (WIFA), we calculated 24% of the female population. Using projected population growth rates of 10.2% for early adolescents and 9.9% for late adolescents [22], we estimated the risk population for each age group. Next, we calculated the specific Birth Rate (ASBR) per 1,000 adolescent girls in the population at 95% confidence interval. We also determined the period prevalence and the average rate of change in ASBR. The rate of change in ASBR from one year to another was assessed for each district, and an average rate of change was calculated. Variations in trends of ASBR across different districts and age categories were graphically represented with bar and line graphs to illustrate these trends and a map using QGIS.

Ethical consideration

The Savannah Regional Health Directorate (SRHD) of the Ghana Health Services (GHS) granted the access and administrative approval to the dataset. The institution is required by the Public Health Act 2012 to ensure accurate data capture and dissemination of all important public health diseases and events reported on the various surveillance data platforms in the country like the DHIMS -2. No formal ethical approval was required for this study since it aligned to the institution's mandate. Extracted aggregated data from the DHIMS-2 without any patient identification markers was kept on a password-protected personal computer of the lead researcher and only available to the research team of the Savannah region on request.

Results

We found a total of 16,906 adolescent mothers at ANC registration were recorded over the 5 years (2018 – 2022). The period prevalence of adolescent pregnancies was 117.50 childbirths per 1000 women (95% CI of 102.17 – 131.92) as shown in **Figure 1**. Within the districts, adolescent pregnancies in the Savannah region were highest in the Bole District,

230 childbirths per 1000 women (95%CI; 165-296) followed by Central Gonja District with 190 (95% CI; 147-232) childbirths per 1000 women. Sawla-Tuna-Kalba, North Gonja, West Gonja and the East Gonja Districts followed with rates of 109 (95% CI; 99-118), 105 (95% CI; 95-114), 117 (95% CI; 89-145) and 119 (95%CI; 70-168) child births per 1000 women respectively. The North-East Gonja district recorded the least with 69 (95%CI; 49-88) childbirths per 1000 women as shown in **Figure 2**.

We found that among age specific groups, the period prevalence among girls aged 10 – 14 years was 6.57 childbirths per 1,000 women (95% CI: 3.46–9.68) and among girls 15 – 19 years was 230 childbirths per 1,000 women (95% CI of 165. 13 – 296.01). In terms of reduction in the prevalence of adolescent birth ratio (ABR), we found that there was generally a positive reduction in the Savannah region of +1.2 childbirths per 1000 women per year (**Figure 3**). Within the districts approximately 40% (3/7) including, Bole, Central Gonja and East Gonja recorded positive reductions at +25.0, +18.6, and +22.2 childbirths per 1000 women per year respectively. Proportionately, the remaining 60% (4/7) of the districts, North Gonja, North-East Gonja, Sawla-Tuna-Kalba and the West Gonja districts recorded negative reductions at -1.2, -7.8, -0.6, and -3.6 childbirths per 1000 women per year respectively (**Figure 3**).

Introspectively, we also fund that the Bole and Central Gonja Districts recorded positive reductions in both early (+0.6, +2.0) and late (+24.4, +18.4) adolescent pregnancies respectively. Negative reductions were also seen in two districts, West Gonja and North- East Gonja in both early (-1.4, -0.4) and late (-2.2, -7.4) adolescent pregnancies respectively. North Gonja and Sawla-Tuna- Kalba demonstrated a positive reduction in early (+1.0, +0.2) and a negative reduction for late (-2.2, -0.8) adolescent pregnancies respectively. East Gonja however also showed positive reduction for late adolescents (+22.8) and negative reduction for early adolescents (-0.6). Proportionately, about 60% (4/7) of the districts had positive reduction dynamic in the 5-year period among early adolescents, with the least occurring in Sawla-Tuna-Kalba (-0.2) and the most in Central Gonja District (+2.0). Among late adolescents, about 40% (3/7) of the districts had positive reductions, the highest occurred in the Bole

district (+22.4) and the least in the Central Gonja District (+18.4).

Among the age-specific groups, there was a very steady slow trend in reduction among early adolescents in all the years except 2020 where there was about 6-fold increase in the prevalence of ASABR as shown in **Figure 4**. Late adolescents showed a significantly consistent reduction since 2018 with a slight increase in 2019 compared to the reduction observed in early adolescents (**Figure 4**).

Discussion

Savannah region has a high period prevalence of adolescent pregnancy. This is almost consistent with global estimates of 100 per 1000 risk population [23] for Africa. In Ghana, this is above the prevalence of 59 childbirths per every 1000 women estimated by the world bank Gender data in 2022 [17]. This clearly provides a benchmark to justify the conclusion drawn in this report that though it did not consider pregnancies in early adolescents unlike this study, regional variability within the country, could have accounted for the difference. Again, the prevalence in the Savannah region comparative to the findings in a three-year study on regional trends in Nigeria's political zones is low. This study found about 22% increased prevalence in adolescent childbirths [24].

The prevalence of 230 childbirths per 1000 women among late adolescents is more than twice the estimated prevalence for Sub-Saharan Africa. Its however consistent with the findings from Mohammed in 2023 [7]. He stated that late adolescent pregnancies are higher in rural Ghana compared to urban cities. The Savannah region in context is predominantly rural. Furthermore in the Sub-Region, Barron et al in their five-year analysis of public sector data on teen births and pregnancies in the South Africa, also found adolescent pregnancies in late teens to be increase by approximately 18% [25]. In accessing the geographic variations and risk factors for teenage pregnancies in Uganda over a five-year period, Byonanebye et al, also found late adolescent pregnancies demonstrably increased with regional variability [26]. Musinguzi et al on the contrary concluded that prevalence of adolescent pregnancies decreases with increasing age [27]. This study however was conducted among only school-going girls. This could have influenced his finding since most school going girls do not end up pregnant within the time they are in school.

The ASABR among the early adolescent group peaked in 2020 whilst the late adolescent groups peaked in 2019. It can be inferred that the COVID-19 pandemic is largely accountable for the observed increase. Pursuant to this there were concurrent lockdowns which provided the right avenue for the observed situation. Girls who stayed out of school were found to be twice more likely to get pregnant compared to those who graduated before the COVID-19 pandemic [28]. The peaked prevalence in turn can also be attributed to the prioritization of early adolescent age-group into policy initiatives [2]. This could have rendered most pregnancies accounted for due to improved data capture and record keeping.

There was significant variability observed among the districts in terms of prevalence. North-East Gonja and West Gonja are the only districts showing negative progress in both early and late adolescent pregnancies. This may be due to the fact that West Gonja, located in the heart of the regional capital, is heavily affected by migration in and out of the district. Again, the district has the potential to benefit from prioritized interventions, such as improving girl-child education (which has been linked to a reduction in adolescent pregnancies) [27], it is primarily urban. Studies have shown that adolescent pregnancies tend to be lower in urban areas [7]. On the other hand, North-East Gonja is a typically rural district and one of the newly created districts in the country. It lacks a hospital, with only primary healthcare facilities such as a health center and Community-based Health Planning and Services (CHPS) compounds. The district also faces challenges in terms of educational infrastructure. With these characteristics, coupled with the district's smallest population in the Savannah region, the findings are understandable and unlikely to be contested.

Bole, despite having the highest adolescent birth rate (ABR), showed the most significant positive change, particularly among late adolescents. This could be because districts with a higher prevalence tend to demonstrate the most progress and are given the highest priority [24]. The socio-economic characteristics could in part contribute to this finding. The district serves as a major hub for small-scale mining activities which has shown to be a factor in increasing teenage pregnancy in some

communities in the country [29],[30]. Again, being a gateway into the country from La Cote d'Ivoire also provides another recipe for the thriving of this situation. Women are targets of sexual insecurities in the borderlands [24]. This situation is consistent with Gay et al.'s findings, which highlight the impact of community exposure to the mining industry. In addition to tobacco and alcohol use, other behavioral issues linked to adolescence were found to be significant in such communities [31]. Although the prevalence of early adolescent pregnancies is comparatively low, the moral concern of seeing even one child under 15 years who probably may not be capable of making rational decisions pregnant, is unacceptable. Dahmen et al., 2019 in their study on mental health of adolescents, also concluded that early pregnancies have negative effects on mother-child relationships and the psychosocial and mental development of the children, as both mothers and their children are still in the process of development [32].

Limitations

The prevalence recorded in this study could be underestimated because only pregnancies at registration were considered. Abortions, unregistered pregnancies, and deliveries at home or with traditional birth attendants (TBAs) in the region were not included, as these data sources are not accessible on the DHIMS2 platform. Although no discrepancies were found in the data extracted, the study is still subject to the limitations of using secondary data. However, we ensured the data's accuracy by confirming its up-to-date status with the reporting sources.

Conclusion

The period prevalence of adolescent pregnancies in the Savannah region over five years is high above global estimates for developing countries. Prevalence is highest in the Bole district. The prevalence of early adolescent pregnancy in the region has the least remarkable trend to it. Interventions and policies to control the situation should be focused on both age groups in all districts in the region with priority to highly burdened sections with unremarkable reducing trends. Interventions and policies to control the situation should be focused on both age groups in all districts in the region with priority to highly burdened sections with unremarkable reducing trends to their

progress. The age-specific directed approach should be employed.

What is already known about the topic

- A reduction in trend of adolescent birth rate is necessary for achieving reproductive health goal for sustainable development.
- Understanding adolescent birth rate in all age categories is necessary to unify inclusion of adolescents into policy initiatives

What this study adds

- This study found a reducing trend in adolescent birth-rate in the Savannah region from 2018-2022.
- This study also found very slow progress in reducing early adolescent births and supports the need for age-specific targeted reproductive health interventions in the Savannah region with priority to high-burdened districts with slower reductions.

Competing Interest

The Authors of this work declare no competing interest

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Authors' contributions

Ballu Cletus and Kubio Chrysantus conceptualized the study, Kubio Chrysantus extracted the data, Gyasi Ophelia Apau and Ballu Cletus analysis the data. Ballu Cletus drafted the manuscript. MO, Akowuah George, Gyesi Razak Issahaku, Kubio Chrysantus, Bando Delia Akosuah, Gyasi Ophelia Apau and Kenu Ernest reviewed the manuscript. All authors read and approved the final version of the manuscript.

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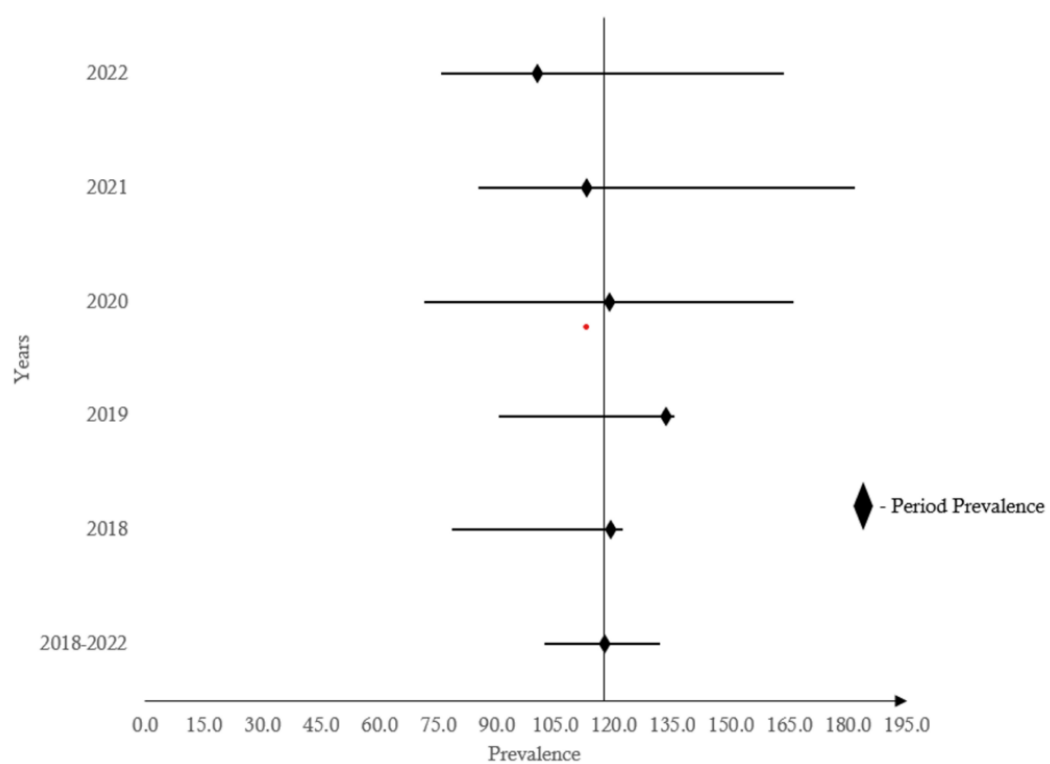


Figure 1: Period prevalence of adolescent births per 1000 women, Savannah Region 2018-2022

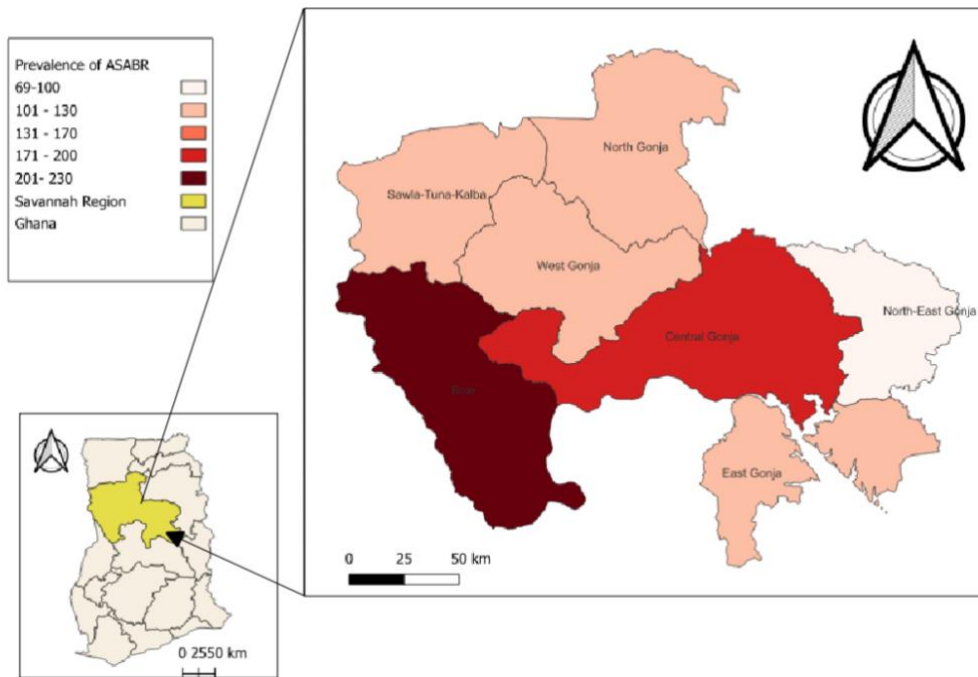


Figure 2: Period prevalence of adolescent pregnancies by district in the Savannah region, Ghana 2018 – 2022

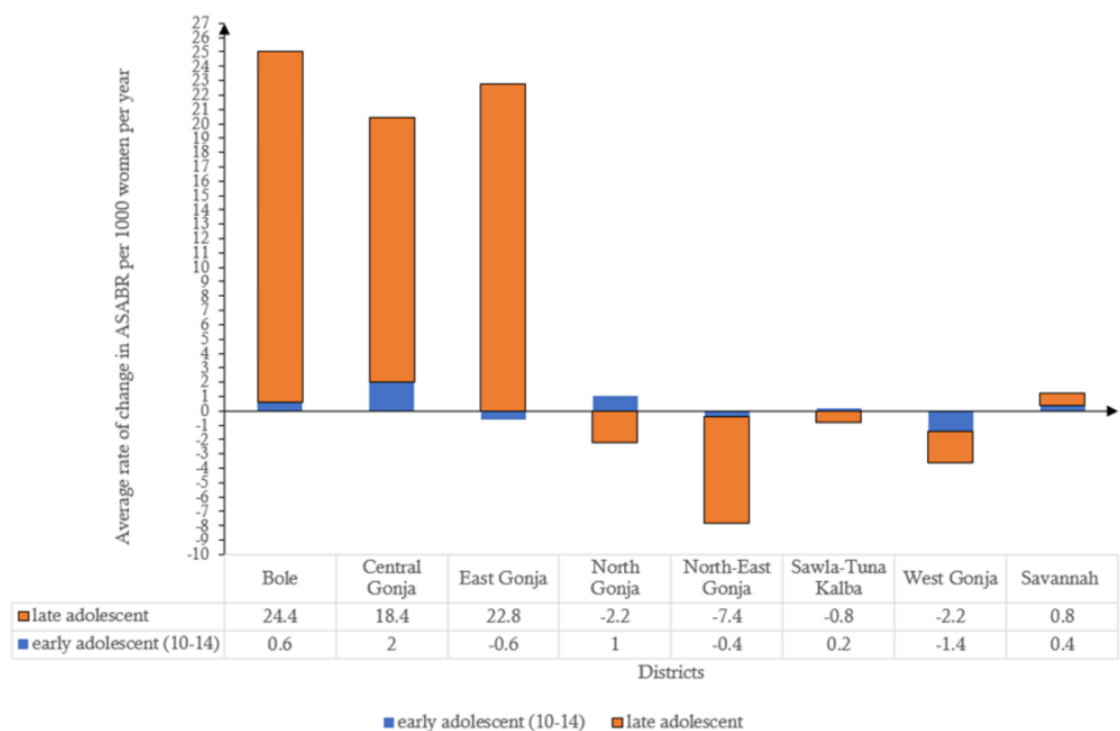


Figure 3: Average rate of change in prevalence of age-specific adolescent birth per 100 women per year by district, Savannah Region, 2018-2022

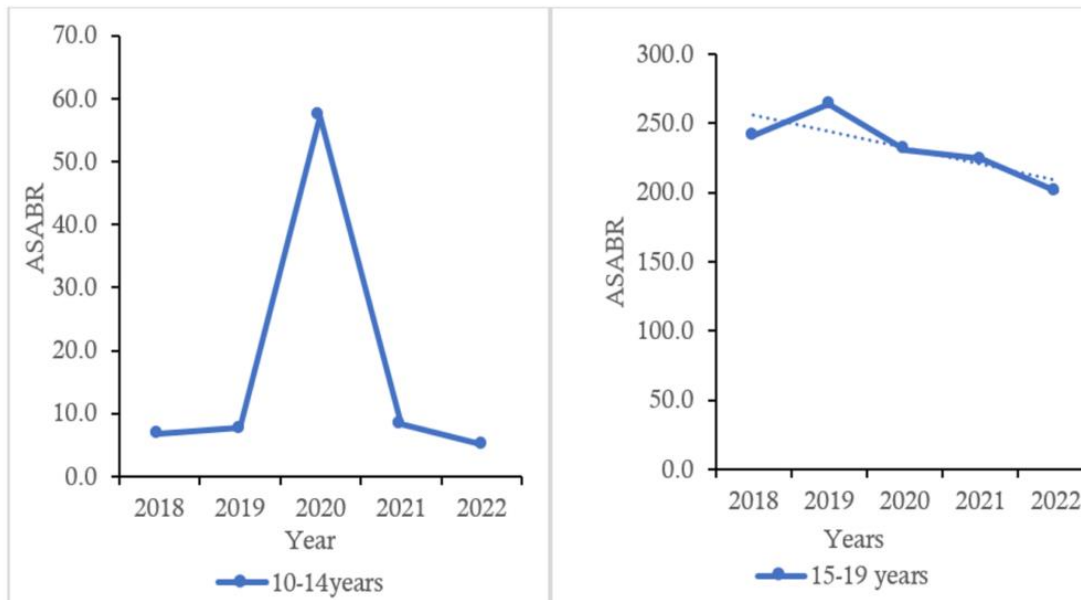


Figure 4: Trend in age-specific adolescent births in early and late adolescents per 1000 women in the Savannah region of Ghana 2018 – 2022