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# Trends on Prevalence of Teenage Pregnancy and Age-specific Fertility Rates in a Caribbean Country: A Call for Regional Intervention

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Authors AI and RL designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors managed the analyses of the study. Author RL managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Introduction:** Adolescents in the Caribbean region continue to experience poor reproductive health outcomes, including high rates of first birth before the age of 20 years. Teenage pregnancies are a worldwide cause of concern. According to the World Health Organization (WHO), about 16 million girls from the ages of 15 to 19 years and about one million girls younger than 15 years of age give birth every year. This can negatively affect their psychosocial development, which in turn leads to poor health outcomes and increased risk of morbidity and of maternal mortality which is the second leading cause of death amongst girls from the ages of 15 to 19 years worldwide. This paper aimed at addressing how patterns of adolescent first births which includes; prevalence and age-specific fertility (ASFR) rates amongst adolescents have changed from 2013-2019 in Saint Vincent and the Grenadines (SVG).

**Methodology:** The study utilized a retrospective population-based study which consists of secondary data derived from the Family Planning Unit of the Ministry of Health and the Population and Demographic Health Survey (DHS) from 2013-2019 which are cross-sectional surveys conducted every year, compiled by the Statistical Office of the Government of SVG. Data analysis

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was done using Statistical Package for Social Sciences, (SPSS) version 23.0.
**Result:** From a baseline prevalence of 17.6% in 2013 in SVG, the prevalence of teenage pregnancy amongst adolescent aged 10-19 years and a reduction to 14.6% by 2019. Amongst adolescents from the ages of 10-14 years old showed negligible reduction from a baseline of 2.5 ASFR per 1000 women in 2014, the ASFR had only reduced to 1.1 by 2018. However, among 15-19 years old showed a steady reduction from a baseline of 67.9 ASFR per 1000 women aged in 2014, the ASFR had reduced to 45.1 by 2018. There was no statistically significant association in trends across regions in the country ($p>0.05$).
**Conclusion:** Teenage pregnancy has still remained a major public health concern, specifically amongst those <15 years of age. This finding gives a clear indication of possible cases of statutory rape due to the minimum age of consent for sexual activity for girls being 15 years (and 16 years for boys) in SVG. Efforts are needed to be geared towards a comprehensive health education and youth friendly reproductive health services, as well as introduce and enforce legislation to provide effective protection from abuse or exploitation.

*Keywords: Teenage pregnancy; caribbean; fertility rates.*

## 1. INTRODUCTION

Teenage pregnancy is considered as an adolescent female who falls within the ages of 13-19 getting pregnant, which is also in concurrence with the United Nations Population Fund (UNFPA) suggestion of the same [1]. Adolescent pregnancy in everyday speech usually refers to pregnant girls that have not reached lawful adulthood, which varies worldwide [1]. This is considered to be a global health issue that affects all citizens [1]. A young female having a baby as a teenager is bound to face higher risks of complications during pregnancy and ultimately maternal death [1]. Teenage mothers also encounter critical social issues such as poverty, lack of access to education, risky behaviors that lead to poor health outcomes, and substandard child welfare [1]. Consequential child bearing and upkeeping costs become financially devastating. Seeking education becomes difficult for the teenage mother due to stigmatization, and this leads to decreased economic opportunities, earnings and maintenance of financial security throughout their lifetime, which in turn ends up perpetuating an intergenerational cycle [1]. In Caribbean countries such as Jamaica, girls are expelled from school during pregnancy and in South American countries such as Chile, pregnant school going girls are pressured to leave school even though official guidelines recommend and should continue to support their education [2]. An estimated total of $12.5 billion was spent for births that resulted from unplanned pregnancies in 2008 [3].

Teenage pregnancies and teenage motherhood are a cause for concern worldwide. Consistent with the World Health Organization (WHO), about 16 million girls aging between 15 and 19 years and about a million girls younger than 15 years give birth per annum [4]. Nowadays, an overwhelming majority of teenage pregnancies occur in low- and middle-income countries characterized by poor health-care services; therefore, complications during pregnancy, birth, and therefore the postpartum phase (e.g., 42 days after birth) are the second leading causes of death amongst girls aging between 15 and 19 years worldwide [4]. In line with the WHO Statistics, the typical global birth rate amongst 15-19 years is 49 births per 1000 girls, whereas country rates range from 1 to 299 births per 1000 girls. Rates were recorded to be highest in Sub-Saharan Africa [4]. The 10 highest-risk countries for teenage motherhood are still Niger, Liberia, Mali, Chad, Afghanistan, Uganda, Malawi, Guinea, Mozambique, and the Central African Republic [4]. In these countries, teenage birth rates (births per 1000 women aged 15-19) ranges from 233 in Niger to 132 within the Central African Republic. In Niger, half of teenage girls (15-19 years) are married. Approximately 25% of teenage girls gave birth between 15 and 19 years [5].

This is essentially because childbearing amongst teenagers is socially desired in some traditional societies and in developing countries especially under the circumstances of early marriage. A substantial proportion of teenage pregnancies and births are intended in developing countries. Nonetheless, still a considerable amount of these pregnancies is unplanned and undesirable, for example in India and Pakistan totaling up to 16% and about 50% or higher in several African countries [6]. In developed countries, by contrast,

teenage birth rates are quite low due to teenage motherhood being considered a public health concern and discouragingly recognized as a societal challenge. Regardless, there are noticeable differences in teenage pregnancy rates between different developed nations. Most teenage mothers (60%) are accrued to the United States [5].

The teenage birth rate of the United States is about four times that of the European Union (EU) average. The highest teenage birth rates are recorded in UK with 27% and high levels are also recorded amongst European Union members such as Bulgaria (33%) and Romania (34%). Others are Ukraine (38%), Macedonia (34%) and Russia (31%) [4]. Low rates of teenage births are reported in the following countries, Japan and Korea (less than 5%), Switzerland (4%), Netherlands (5%), and Sweden (6%). In 2014, Saint Vincent and the Grenadines (SVG) recorded a birth rate of 13.4 per 1000 population with 341 births (19.5%) occurring in the age group 10-19 years [5]. In the same year, SVG recorded an adolescent (15-19 years) birth rate of 63.7 per 1000 [7]. Most births occurred in late adolescence (17-19 years) followed by the middle adolescence (15-17) age group [8].

Countrywide fertility rates amongst adolescents are frequently used as an indicator for children and young people's health. While there has been a reduction in the birth rate globally in recent years, pregnancy amongst teenagers remains a public health concern. Adolescents in Latin America and the Caribbean (LAC) continue to face significant barriers to their sexual and reproductive health, including adolescent pregnancy. Around 15% of all pregnancies in this region occur to women below the age of 20 years [9], with an adolescent fertility rate (15–19 years) of 65 per 1000 in 2014 [10] and an adolescent birth rate (15-19 years) of 48.6 per 1000 in 2018 [7].

Adolescent pregnancy is closely related with a number of poor health outcomes for both mother and child such as infants being born preterm and/or with low birth weight, anemia, preterm labor, urinary tract infections, preeclampsia, high rates of cesarean sections which in turn have been associated with higher maternal mortality rates as well as socio-economic disadvantages for individuals and families [11]. Low socio-economic conditions, risky lifestyle behaviors, poor adherence to prenatal care and biological reproductive immaturity have also been suggested as possible explanations for adverse obstetric and perinatal outcomes in this age group [12]. The associated loss of productivity and negative impacts on development at the national level has led policy-makers to identify it as an important area for intervention. Nurses find it alarming that most pregnant women who are in their adolescence do not undergo ante-natal care for the unborn child nor adhere to proper post pregnancy medical care for themselves [13].

The lack of education deeming their inability to comprehend risks associated with their situation and the following incompliance increases their risk of complications, as factors such as specific health issues like depression, peer pressure, lifestyle and nutritional requirements play important roles during and shortly after pregnancy [14]. On a global scale, perinatal deaths of infants born to mothers below 20 years of age is 50% higher than infants born to mothers in the ages 20-29 years. The WHO postulated that babies born to a teenage mother, are also more likely to die within the first year of birth [6].

For both male and female adolescents' sexual behavior is underpinned by complex socio-economic, educational, cultural, geographical and service-availability factors. Contexts, patterns, and trends may vary markedly for different populations within countries. However, analysis of data disaggregating populations by socio-economic status, education, place of residence and other characteristics that are rarely carried out, posing it difficult to highlight inequalities and identify those groups who may be making poor progress.

Disaggregated data that examines patterns and trends for different population groups is valuable in enabling interventional programs to target those at-risk populations. Therefore, a considerable focus on younger adolescents is important, as both mother and infant may require a specific strategized approach to address pregnancies in this particularly vulnerable group, to prevent them from facing further health disadvantages.

This paper aimed at addressing how patterns of adolescent first births in women have changed from 2013-2019 in SVG. It addresses four questions:

1. How have the percentages of women entering adolescent motherhood in each age group 10-14 and 15-19 years changed since 2013-2019?

2. What is the age-specific fertility rate of adolescent motherhood in each age group 10-14 and 15-19 years from 2013-2019?
3. What region in SVG contributes most to the percentages of women entering adolescent motherhood?
4. What are the forecast estimates to 2025 on prevalence of teenage pregnancy and age-specific fertility rate of adolescent motherhood in each age group 10-14 and 15-19 years in SVG?

The increase of high adolescent fertility and concerns about negative consequences for both families and wider society has led to increased concern amongst governments, non-governmental organizations and the media in this region. Developing effective interventions requires an in-depth understanding of trends and patterns in adolescent births, which involves disaggregation of data by sub-groups and regions, as well as understanding the context in which births are occurring and how this may be changing.

## 2. METHODOLOGY

### 2.1 Study Design, Population and sample

The study utilized a retrospective population-based study which consists of secondary data derived from the Family Planning Unit of the Ministry of Health and the Population and Demographic Health Survey (DHS) from 2013-2019 which are cross-sectional surveys conducted every year, compiled by the Statistical Office Ministry of Finance, Economic Planning, Sustainable development and Information Technology of the Government of SVG Population. This national representative survey involved a multi-stage sampling design up to the household level with enumeration areas distributed by region and type of residence using the most recent national census as its sampling frame.

### 2.2 Study Variables

#### 2.2.1 Outcome and socio-geographic measures

Teenage births and Age-specific fertility rate (ASFR) was the dependent variable. A case of teenage birth was defined as an adolescent with at least one live birth. This definition was adapted from the World Health Organization. ASFR was calculated as a ratio, defined by the United Nations (UN) as the annual number of births occurring during a given year or reference period per 1,000 women of reproductive age classified in single-or five-year age groups.

### 2.3 Independent variable

#### 2.3.1 Year

Survey year was considered as a continuous variable in the analysis to measure the trend because of equal intervals between survey years. Thus, each unit increase in a year variable translates to an actual increase per year.

#### 2.3.2 Age

Respondents were categorized by age into two groups. The two age groups include “10-14” and “15-19” where 15 years and above is considered the legal age of consent in SVG.

#### 2.3.3 Socio-geographic variables

Region refers to the thirteen (13) main island groups: which includes Kingstown, Calliaqua, Marriaqua, Bridgetown, Colonarie, Georgetown, Sandy Bay, Layou, Barrouallie, Chateaubelair, Northern Grenadines and Southern Grenadines. The data was disaggregated and all estimates compared by region, as the sampling frame established by the census division has unique geographical characteristics.

### 2.4 Data Analysis

Data analysis was done using Statistical Package for Social Sciences, (SPSS) version 23.0. Data was presented in this format; mean, frequency and percentage Tables.

The prevalence of teenage births was calculated by dividing the number of adolescents with who experienced at least one pregnancy and resulted in a life birth between the ages of (10-19) and the number of adolescents (females) within the age category (10-19) years multiplied by 100.

The Age Specific Fertility Rate was calculated as:

$$ASFRa = (Ba/Ea) \times 1000$$

Where: Ba = number of births to women in age group in a given year or reference period; and

Ea = number of person-years of exposure in age group during the specified reference period [15].

Population statistics relating to ASFR amongst adolescents are most frequently reported for those aged 15 to 19 years. As such, data was analyzed by age groups 10 to 14 years and 15 to 19 years.

According to the United Nations Department of Economic and Social Affairs/Population Division, for the purposes of this study, ASFR is considered high when the number of births per 1,000 in women aged 10-14 and 15-19 is greater than 80 births per 1,000 women aged 10-14 and 15-19, medium where the ASFR falls between 19 to 80 births and low where the ASFR is less than 19 births per 1,000 women aged 10-14 and 15-19 years of age [15].

A chi-square trend analysis was conducted using IBM Statistical Package for Social Sciences (SPSS) version 23 to determine the trends in prevalence of teenage pregnancy per age group and across regions using the chi-square statistic. We measured the trend between two successive years to highlight which periods had significant changes in prevalence. In addition, we analyzed trends using year and region. Two age group intervals (10-14 & 15-19) were adopted as this categorization alone, provided an adequate number of cases. Autoregressive Integrated Moving Model (ARIMA) which is a class of statistical models for analyzing and forecasting time series data was used for forecasting the prevalence of teenage pregnancy per age group in the future. Data was presented using frequency and percentages, and were visualized using line charts to assess trend across years.

The "Pareto Principle," was coined to elaborate that economic resources are scarce, and we should optimally utilize these scarce resources. This is based on the fact that in any group of things that contribute to a common effect, a relatively few contributors account for the majority of the effect. Once, the few contributors in any group of things are tackled, this will resolve the majority of the effects that contribute to the problem. Different types of charts can be used to illustrate Pareto principle like a bar chart in which the various factors that accrue to an overall effect are arranged in order of the magnitude of their effect. This ordering helps identify the "vital few" factors that warrant the most attention.

The Pareto chart serves as a guide for policy makers to concentrate their efforts on the factors that have the greatest impact. It also serves as evidence to communicate the rationale for focusing on certain areas. Hence, the pareto chart was used to ascertain the various regions that contribute the most burden to the increasing prevalence of teenage pregnancy.

## 3. RESULTS

A total of eleven thousand, five hundred and fifty-nine (11,559) births were recorded between 2013-2019 in SVG, amongst the total births recorded within this time period, 1,881 (16.3%) were adolescents between the ages of 10-19 years.

Chi-square of trend $\chi 2 = 0.466$, df = 1, p-value = 0.525, 95% CI of p-value = (0.515 - 0.535) $\chi 2$= chi-square test statistics, df= degree of freedom, CI= Confidence interval.

Table 1 shows that amongst women aged 10-19 years with at least one birth from 2013-2019 (n = 1881), almost all 1830 (97.3%) were found amongst the age group of 15-19. Despite the small proportion of adolescents captured by the surveys, the proportion of 10-14 and 15-19-years of age reported in the survey has decreased over time from (n = 5) and (n = 301) in 2013 to (n = 306) and (n = 213) in 2019 respectively.

Fig. 2 above shows an overall decrease in the trend of prevalence of teenage pregnancy from 2013-2015 amongst the 15-19 years old age group from a weighted prevalence of 17.3% in 2013 to 14.2% in 2018 and a forecast prevalence of 9.7% in 2025 due to its different impacts over the years. This showed a minimal change of 17.9% decrease in the prevalence of teenage pregnancy within this age-group from 2013-2018 and a forecast estimation of 43.9% decline in 2025.

However, within the age groupings of 10-14 years age group, this decline was not observed within the time period, from a weighted prevalence of 0.3% in 2013 to 0.3% in 2018 and forecast prevalence of 0.5% in 2025. This showed zero percent (0%) change in the prevalence of teenage pregnancy within this age-group from 2013-2018 and a forecast estimation of 66.7% increase in 2025.

Analyses using two age categories showed no statistically significant difference in the trends prevalence of teenage pregnancy previously described ($p>0.05$).

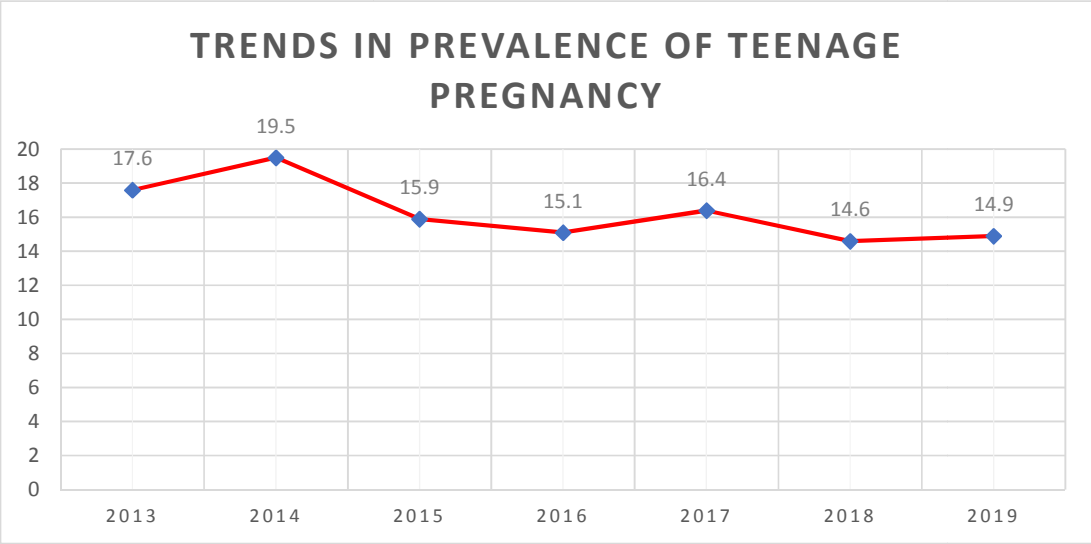


**Fig. 1. Above displays the trend of teenage birth prevalence between 2013-2019 which shows an annual decrease in the prevalence of teenage pregnancy from 2013 to 2019, with a peak prevalence in 2014 (19.5%). The lowest prevalence was noted in 2018 (14.6%); thereafter, the incidence increased slightly in 2019 (14.9%)**

**Table 1. Frequency of teenage births by age groups across years in saint vincent and the grenadines**

| Variable | 2013 | | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n | % | n | % | n | % | n | % | |
| **Age Group (years)** | | | | | | | | | | | | | | | |
| 10-14 | 5 | 1.6 | 12 | 3.5 | 7 | 2.5 | 9 | 3.4 | 10 | 4.0 | 5 | 2.3 | 3 | 1.4 | 51 |
| 15-19 | 301 | 98.3 | 329 | 96.5 | 272 | 97.5 | 255 | 96.6 | 243 | 96.0 | 220 | 97.7 | 210 | 98.6 | 1830 |
| Total | 306 | 100 | 341 | 100 | 279 | 100 | 264 | 100 | 253 | 100 | 225 | 100 | 213 | 100 | 1881 |

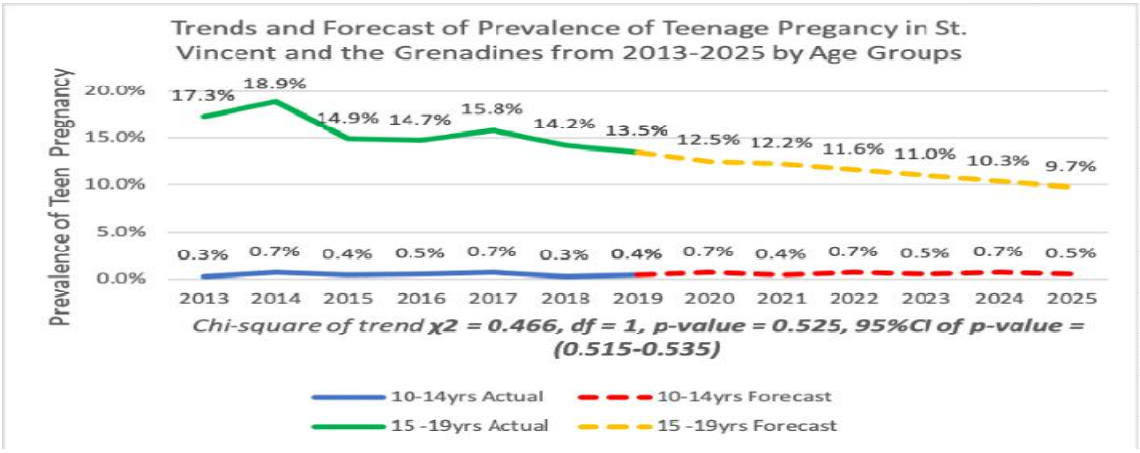


**Fig. 2. Prevalence trends and estimated forecast of teenage pregnancy in SVG from 2013-2025 by Age Groups in Saint Vincent and the Grenadines**

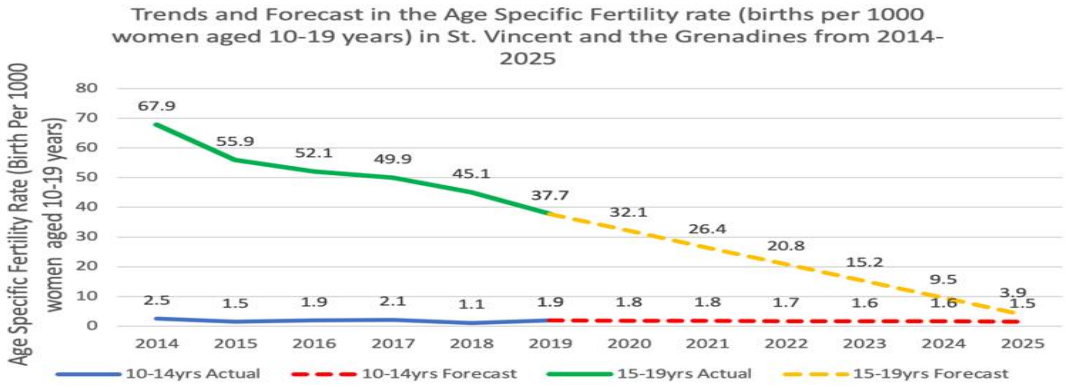


**Fig. 3. Age-specific fertility rate trends and estimated forecast in SVG from 2013-2025 by Age Groups in Saint Vincent and the Grenadines**

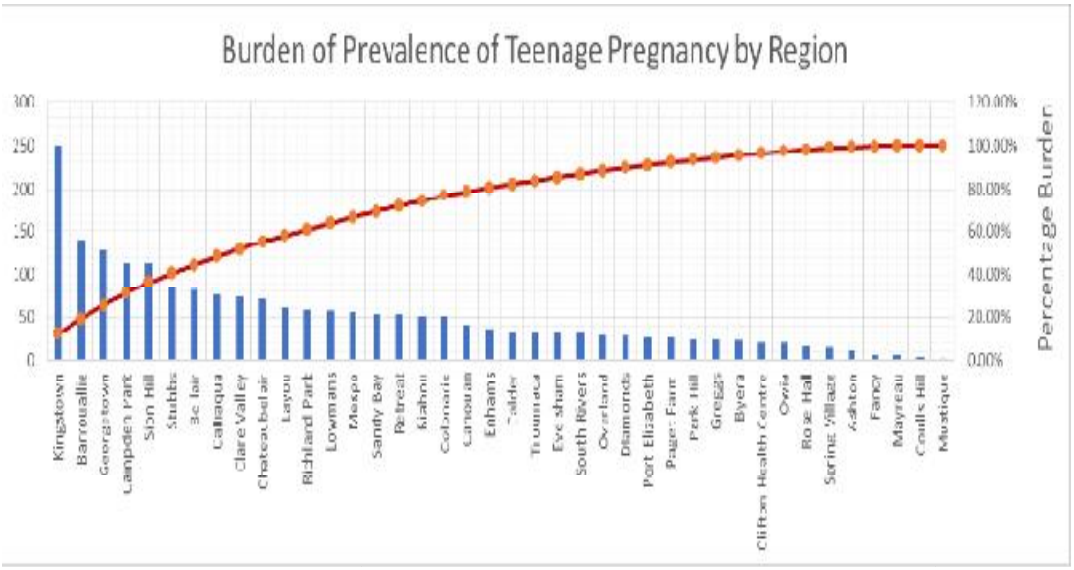


**Fig. 4. Burden of Prevalence of Teenage Pregnancy in Saint Vincent and the Grenadines**

Fig. 3 above shows the chi-square of trend from 2014-2018 and the forecast from 2019-2025 showed an overall decrease in the trend of ASFR from 2014-2018 amongst the 15-19 years old age group from an ASFR of 67.9 in 2013 to 45.1 in 2018 and a forecast ASFR of 3.9 in 2025. This presented a maximal change of 33.5% decrease in the ASFR within this age group from 2014-2018 and a forecast estimation of 94.2% decline in 2025.

However, within the age group of 10-14 years, a negligible decline was observed within the time period, from an ASFR of 2.5 in 2014 to 1.1 in 2018 and forecast ASFR of 1.5 in 2025. This showed maximal change of 56% decrease in the ASFR within this age-group from 2014-2018 and a forecast estimation of 40% decrease in 2025. Analyses using two age categories showed no statistically significant difference in the trends of ASFR previously described ($p>0.05$).

Fig. 4 above displays the burden of prevalence of teenage pregnancy using the pareto chart which shows that, Kingstown, Barrouallie Georgetown, Campden Park, Sion Hill and Stubbs constituted 50% of the total burden of teenage pregnancy.

## 4. DISCUSSION

The study shows declining trends of teenage pregnancy in the 15-19 years age groups, the prevalence amongst adolescents between 10-14 years showed no decrease from 2013-2019.

Despite this decline, the country's prevalence on teenage pregnancy was still high in comparison to other developing countries in the Caribbean. The findings from this investigation are in line with a joint report by PAHO/WHO [16] which puts LAC to be the region with the second highest adolescent pregnancy rate in the world. This was also projected in the forecast estimate.

However, the declining trend of teenage pregnancy amongst young adults aged 15-19 years can likely be attributed to their better use of contraception, as well as their knowledge of and participation in family planning (FP) strategies. The unchanged trend amongst adolescents aged 10-14 years may result from the unique socio-cultural characteristics and in the country, wherein adolescents in this age group have difficulties in accessing Family Planning services. SVG is a predominantly conservative Christian country and one of the possible explanations linked to this finding is that the strong influence of religion practiced at the local level may have affected the health seeking behavior and the implementation of reproductive health programs amongst this very young age group (10-14) years [17]. The law requires that adolescents below the age of 16 require parental consent to access medical treatment, also noting that access to contraceptives and other aspects of sexual and reproductive (SRH) services is restricted even though they are legally permitted to have sex [18].

The study shows declining trends in the ASFR in both categorized age groups from 2013-2018, despite this decline, the country's prevalence on teenage pregnancy was still high compared to other developing countries in the Caribbean. The report by PAHO/WHO [16] states that SVG falls after Dominican Republic, Saint Lucia and Guyana who collectively have the highest adolescent pregnancy rates in the Caribbean region. Possible explanations linked to this finding includes; weekend binge drinking which is a frequent occurrence for teenagers in the region. These social lifestyle factors have been linked to an increased risk of unsafe sex and unwanted pregnancy [19]. Lack of presence of a father Figure presenting as physical and emotional neglect which is frequent in the region leads to a psychological void felt by children who continue to long for a father's nurturing presence. Studies have shown that girls who grow up with paternal Figures in the home are less likely to become teenage mothers [19].

The study also highlighted number of teenage pregnancies across regions using the Pareto Principle chart, which highlighted four regions that constituted 50% of the burden of teenage pregnancy in the country [20]. These regions also included Kingstown, which is the country's capital marked by its urbanization and population [20]. The increased burden in the capital could be linked to its increased social activities compared to other regions which as following are Barrouallie, Georgetown, Campden Park, Sion Hill and Stubbs that also have increased social activity. Due to scarce economic resources which might be unavailable to span across all the regions of the country optimally, cost-effective interventions targeting these four regions resolves 50% of the entire burden of teenage pregnancy in the country [20].

## 5. CONCLUSION AND RECOMMENDA-TIONS

Teenage pregnancy has remained a major public health concern, specifically amongst those age <15 years of age, this give a clear indication of possible cases of statutory rape due to the minimum age of consent for sexual activity for girls being 15 years (and 16 years for boys) in SVG. The Global Strategy for Adolescent Health for 2030 recognized childbirth and pregnancy complications as one of the two leading causes of death amongst 15–19-year-old girls and addressing teenage pregnancy would help to reduce this [21]. By prioritizing teenage pregnancy as a critical public health issue especially of Low Medium Income Countries (LMICs), this study acts as an important contribution to the literature calling for improvement of sexual and reproductive education and healthcare services addressing adolescents in these age groups.

This study highlights the need for early strategic childhood interventions and youth empowerment programs that are effective and efficient in reducing the incidence of unwanted pregnancies in teenagers. Our findings on the effects of early childhood interventions highlight the importance of investing in early care and support in order to reduce the socioeconomic disadvantage associated with teenage pregnancy later in life. Both early childhood interventions and youth empowerment programs combined components at the structural and individual levels, which resonates with many of the current recommendations on health promotion and in public health.

Efforts are needed for both schools and colleges to have an inclusive Comprehensive Health and Sexual Education as a part of their curriculum with accessible youth-friendly reproductive health services. Enact interventions to expand access to skilled antenatal, childbirth, and postnatal care; expand access to basic and comprehensive emergency obstetric care, inform adolescents and community members about the importance of skilled antenatal and childbirth care and ensure that adolescents, families, and communities are well prepared for birth and birth-related emergencies, and be sensitive and responsive to the needs of young mothers and mothers-to-be.

This calls for more elected regional officials to realize policies they have the opportunity to mandate and appropriately implement them according to current evidence-based programming. However, in such a sensitive context, this would require a broad support base which can be achieved with Advocacy programs that inform elected officials about existing policies and acquiring financial resources to prioritize specific health program services. This would therefore lead to investment in youth programs that complement, rather than replace, high quality comprehensive health education and access to contraceptive services. Policy makers should aim to improve school educational curriculum by integrating reproductive and sexual health courses, raise expectations and ambitions for the future, and provide relevant information to young people including social support and decision-making skills. In accordance with the findings of this study, majority of abuse incidents (inclusive of sexual abuse) occur in the 10-14 age group [17]. Therefore, policy makers should also be encouraged to introduce and enforce legislation that provide adolescents with effective protection from abuse or exploitation which has been found in this study.

Consistent measurement of fertility data is also paramount as it is used as an indicator to evaluate and measure progress towards the attainment of the Sustainable Development Goals to “leave no-one behind” and "maintain good health and well-being". Empirical analysis to suggests a direct link between factors associated with teenagers and the occurrence of adolescent pregnancies needs to be conducted in the country to highlight gaps that require intervention.

## 6. STUDY LIMITATIONS

Our study has limitations such as inadequate record validation, which is a common cause of concern across the DHS surveys from most countries. However, the DHS’ survey procedure enables cross-checking through repeated questions during the interview to reduce the effect of this validation issue.

## DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

## ETHICAL APPROVAL And CONSENT

The approval of the study was obtained from the Research Ethics Committee SVG. And parental written consent has been collected and preserved by the author(s).

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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