

## Manuscript Details

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<b>Title</b>	Maternal Health Services Utilisation by Kenyan Adolescent Mothers: Analysis of the Demographic Health Survey 2014
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### Abstract

Background Kenya has one of the highest adolescent fertility rates in East-Africa, estimated at 106 births per 1000 females aged 15-19 years. Utilisation of maternal health services is essential to prevent poor outcomes of pregnancy and childbirth. To ensure optimum planning, particularly in the context of the Sustainable Development Goals, this study assesses the current service utilisation patterns of Kenyan adolescent mothers and the factors that affect this utilisation. Methods Using data from the recently published 2014 Kenya Demographic Health Survey, we collected demographic and utilisation data of all three maternal health services (antenatal care (ANC), skilled birth attendance (SBA) and postnatal care (PNC)) of adolescent mothers aged 15–19 years. We then conducted bivariate and multivariate analyses to test associations between selected demographic and service utilisation variables. Results Our findings showed that half of Kenyan adolescent mothers have had their first birth by the age of 16. Service utilisation rates amongst Kenyan adolescent mothers were 93%, 65%, 92% for ANC, SBA and PNC respectively. Mother's education, religion, ethnicity, place of residence, wealth quintile, mass media exposure, and geographical region were significant predictors for both ANC and SBA utilisation. Education level of partner was significant for ANC utilisation while parity was significant for both SBA and PNC. Conclusions Though there have been improvements in service utilisation in the past decade, more work that includes affordable and youth-friendly care provision, cultural re-orientation, targeted mass-media campaigns and male involvement in care need to be done with emphasis on the most disadvantaged areas.

<b>Keywords</b>	adolescents; maternal and child health; ante-natal care; skilled birth attendance; post-natal care; Kenya
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- Authors' contributions.docx [Author Agreement]
- Response\_letter\_SRHC\_ABT\_et\_al\_2016\_v2.pdf [Response to Reviewers]
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## **Abstract**

### *Background*

Kenya has one of the highest adolescent fertility rates in East-Africa, estimated at 106 births per 1000 females aged 15-19 years. **In addition to promoting safe sexual behaviour, utilisation of maternal health services (MHS) is essential to prevent poor outcomes of pregnancy and childbirth.** To ensure optimum planning, particularly in the context of the Sustainable Development Goals, this study assesses the current service utilisation patterns of Kenyan adolescent mothers and the factors that affect this utilisation.

### *Methods*

Using data from the recently published 2014 Kenya Demographic Health Survey, we collected demographic and utilisation data of all three MHSs (antenatal care (ANC), skilled birth attendance (SBA) and postnatal care (PNC)) of adolescent mothers aged 15–19 years. We then conducted bivariate and multivariate analyses to test associations between selected demographic and service utilisation variables.

### *Results*

Our findings showed that half of Kenyan adolescent mothers have had their first birth by the age of 16. MHS utilisation rates amongst Kenyan adolescent mothers were 93%, 65%, 92% for ANC, SBA and PNC respectively. Mother's education, religion, ethnicity, place of residence, wealth quintile, mass media exposure, and geographical region were significant predictors for both ANC and SBA utilisation. Education level of partner was significant for ANC utilisation while parity was significant for both SBA and PNC.

### *Conclusions*

**Adolescent MHS utilisation is not optimum in Kenya. More work that includes affordable care provision, cultural re-orientation, targeted mass-media campaigns and male involvement in care need to be done with emphasis on the most disadvantaged areas.**

## Background

Despite recent declines, rates of adolescent pregnancy remain high in many countries [1]. As the international community moved towards the start of the era of the Sustainable Development Goals, there were calls for more emphasis to be placed on adolescent girls, who were described as having been “left behind” in the Millennium Development Goals era [2]. **The emphasis on this vulnerable cohort became even more urgent for low- and middle-income countries as evidence emerged that pregnancy and childbirth was the leading cause of death amongst adolescents** [3]. Compared to older women aged 20-24 years, adolescent girls have a higher risk of maternal mortality [4]. For adolescents who survive pregnancy, they are at higher risk of several maternal morbidities including anaemia in pregnancy, postpartum haemorrhage, pre-eclampsia, and other problems of pregnancy [5]. Beyond pregnancy, adolescent girls are similarly at an increased risk of developing highly debilitating obstetric fistula [6].

In Kenya, adolescent fertility rate is currently put at 106 births per 1000 females aged 15-19 years, which is the third highest rate when compared to other countries within the East African region [7]. In response to this situation, there was a renewed commitment towards addressing adolescent pregnancy, marked by the launch of the “Beyond Zero” campaign, by the first lady of Kenya in 2014. One of the objectives of the campaign is to improve “the wellbeing, protection and support to the adolescent girl” [8]. The campaign takes a multi-pronged approach in increasing utilisation of maternal health services (MHS) by all mothers including adolescents. For efforts, such as this to succeed, it is critical to understand MHS utilisation across the entire continuum of care (ante-partum care, intra-partum care and post-partum care). These services have been shown to be effective in decreasing maternal morbidity and mortality of adolescent mothers, as well as improving adolescent quality of life after delivery and health of their babies [9].

In the context of the new Sustainable Development Goals era, there is no up-to-date evidence regarding the factors that influence MHS utilisation by adolescent mothers across the entire continuum of care in Kenya, with the last attempt using data almost a decade old [10]. Our study utilises the most recent large-scale dataset, the 2014 KDHS, to assess adolescent MHS utilisation. Use of such recent data is critical to ensure that policies remain relevant for the specific adolescent generation in question, and will be critical in designing programmes towards reducing maternal morbidity and mortality amongst adolescents in Kenya.

## **Methods**

### *Data source*

This research was based on the publicly available 2014 KDHS dataset, which is based on a survey that was conducted by the Kenya National Bureau of Statistics and its partners from May 2014 to October 2014 [11]. The procedure for data collection of DHS datasets including the 2014 KDHS have been described as being robust [12], and as such deemed sufficient quality for this analysis. KDHS was designed to be a nationally representative household-based survey, in which 40,300 households from 1,612 clusters spread across Kenya, using a two-stage cluster sampling technique. The survey is the first of the KDHS conducted after devolution of central power/governance to 47 newly established counties. Therefore, the 2014 KDHS had over four-fold increase in number of households sampled compared to the 2008-2009 KDHS. This study was based on data collected with the questionnaire for women used during the survey [11].

### *Study population and sample size*

31,079 women aged 15-49 years were interviewed during the 2014 KDHS. 6,078 (about 20%) were female adolescents aged 15-19 years.

Only adolescent girls between the ages of 15 and 19 years old (adolescent reproductive age group), who had delivered at least one child, irrespective of whether the child was alive or not at the time the data was collected in the primary survey were included in this study. 898 (about 15%) of female adolescents between 15 and 19 years met the inclusion criteria. For this study, adolescent mothers were defined as “adolescents who had delivered a child within the five years preceding the survey” [11].

Adolescents who reported being pregnant at the time the data was collected and had not delivered a baby previously were excluded, as they would not have experienced the entire continuum of care. As such, it would be impossible to assess their full spectrum MHS utilisation, which is the focus of our study.

#### *Study variables*

- *Dependent variables*

There were three dependent variables in this study: utilisation of ante-natal care (ANC), delivery care and post-natal care (PNC) referring to care received before, during and after delivery respectively. *In this study, we defined utilisation of these MHSs as at least one use of service provided by a skilled provider (i.e. doctor/midwife/nurse), as defined by the World Health Organization (WHO) [13,14].* As such, care reported as provided by auxiliary nurse, community health workers or traditional birth attendants, relatives/individuals were not classified as skilled care. Classification of utilisation of skilled or unskilled care was based only on the utilisation behaviour reported by the respondent in their most recent childbirth.

- *Independent variables*

We selected ten independent variables from the KDHS dataset that could potentially influence MHS utilisation by adolescents. These included nine categorical variables. These were: adolescent

mother's level of education (No education, primary, secondary, higher (university undergraduate or postgraduate)), education level of her partner (same as for adolescent mother), religion (Roman catholic, Protestant/other Christian, Muslim, no religion), ethnicity (22 major ethnic groups and other minor ones), type of place of residence (urban vs. rural), wealth quintile (poorest, poorer, middle, richer, richest), region of residence (all eight regions), planned pregnancy (wanted last child or not), and mass media exposure (radio, print, or television). Parity was the only discrete variable that we selected for the study.

We did not include 'age at last birth', as the survey only reported age at the time of the survey and age at first birth. We also did not include 'marital status', since all women sampled in the 2014 KDHS were married.

#### *Secondary data collection and analysis*

- *Data collection: reduction and cleaning process*

We reduced the large KDHS dataset to include only the 898 adolescents that met our set inclusion criteria (rows). Of the 4,769 variables (columns), we selected the 133 variables that we deemed relevant to answer our research questions. **Following this, we created four categorical variables from the variables reported in the primary survey for our analysis** (Three dependent variables: personnel providing ANC, personnel providing SBA, personnel providing PNC, and one independent variable: any type of media exposure (radio/print/television combined)).

- *Data analysis*

We used descriptive statistics with percentages to describe the background characteristics of Kenyan adolescent mothers, based on the pre-selected independent variables that we had identified. We then assessed the pattern of MHS utilisation for each of the three services. Where relevant, we compared the patterns of MHS utilisation to WHO global recommendations. For

ANC, in addition to the provider of the service, we assessed trimester of commencing ANC (first, second or third trimester), and the number of ANC sessions per pregnancy identifying those that achieved the four visits recommended for focused ANC [14]. For SBA, similarly in addition to the provider of the service, we reviewed the place of delivery of adolescent mothers (home or hospital), type of delivery (spontaneous vaginal delivery or caesarean) and reason given by adolescent mothers for not delivering in facilities. Finally, for PNC we looked at the provider of the service and the timing of PNC utilisation, as per WHO recommendation [15]. We also assessed one other key component of PNC for adolescent mothers in the six-week period following delivery, in line with the Kenyan government policy of targeted post-natal care within this period [16], which is, discussion with adolescent mother on family planning method of choice.

To identify factors that were associated with MHS utilisation amongst Kenyan adolescents, we employed bivariate and multivariate analyses. We used cross-tabulations and bivariate analysis (Chi square test) to understand the nature of association between the dependent variable (MHS utilisation) and the different pre-selected independent variables. The chi-square statistic for the cross-tabulation allowed estimation of a total Chi-square with a *p*-value. This was used to confirm any significant associations between the independent variables and the dependent variables, based on a benchmark statistical significance level of  $p < 0.05$ .

Subsequently, we used multivariate analysis to demonstrate the strength of association between the dependent variable and the various independent variables that our bivariate analysis showed to be significant. We presented the results with odds ratio, 95% confidence intervals (CI) and *p*-values.



We conducted all analyses with STATA SE version 13.0 (StataCorp, College Station, Texas, USA), and presented all our findings using a mix of summary charts and tables.

### *Ethical issues*

For the original conduct of the 2014 KDHS, ethical approval was obtained from the Kenya Medical Research Institute. The enumerators obtained informed consent and authorisation to anonymously use the data from all survey participants [11].

In our study, we obtained permission to use the 2014 KDHS data from Measure Demographic Health Survey. No further ethical approval was required, as our research involved solely secondary data analysis of a publicly available dataset that does not contain any identifiable information that links to the actual survey participants.

## **Results**

### *Characteristics of adolescent mothers in Kenya*

Kenyan adolescent mothers delivered their first child between the ages of 11 and 19 [Figure 1]. The average age of first birth was about 16 years and 4 months, with almost half of the Kenyan adolescent mother population (437 or 48%) have had their first birth by 16 [Figure 1].

Most Kenyan adolescent mothers (588 or 66%) had only completed primary education. 78 (9%) had received no form of formal education [Table 1]. Amongst their 254 partners who responded, (138 or 54%) had achieved primary education. 32 (13%) had not received any formal education [Table 1]. Most Kenyan adolescent mothers (62%) were Protestant Christians or practised some other form of Christianity, excluding Roman Catholic Christianity, which made up 22% on its own. 13.4% of adolescent mothers were Muslims. Kalenjins (17%), Luos (15%) and Luhyas (13%) were the commonest ethnic groups of adolescent mothers [Table 1]. Almost 70% of adolescent

mothers lived in rural parts of Kenya and about a third of adolescent mothers lived in the Rift valley region (302 (34%).

307 (34%) adolescent mothers were from the poorest quintile, and 190 (21%) from the poorer quintile. The richest quintile only contributed 74 (8%) of Kenyan adolescent mothers [Table 1]. 183 (20%) reported that they had no access to any form of mass media: television, radio or newspaper. In terms of parity, 735 (82%) adolescent mothers reported that they had only one child at the time of the survey. 98% of the population sampled had one or two children already. Almost all adolescent mothers sampled (99%) wanted their last pregnancy before the child was conceived or later after conception [Table 1].

#### *MHS utilisation pattern by Kenyan adolescent mothers*

- *Pattern of antenatal care utilisation*

834 (93%) adolescent mothers utilised ANC at least once during pregnancy. Only 96 (16%) adolescent mothers attended their first ANC visit before the end of the first trimester. Most Kenyan adolescent mothers (536 or 65%) only start ANC in the second trimester [Figure 2].

64 (7%) adolescent mothers had no ANC during pregnancy or the care they had was provided by a traditional birth attendant, community health worker, auxiliary nurse or by relatives at home. 419 (51%) adolescent mothers had four or more visits as required for focused ANC [Figure 3].

- *Pattern of delivery care utilisation*

309 (35%) did not have an SBA at the time of delivery. 307 (35%) adolescent mothers had their babies in their own homes or some other home (relative's or friend's). A large majority (60%) had their babies in some form of public hospital and the remaining 5% delivered in a private hospital.

Most adolescent mothers (94%) delivered through spontaneous vaginal delivery while the remaining 52 (6%) required caesarean.

- *Pattern of post-natal care utilisation*

246 (92%) adolescent mothers had PNC provided by doctors/midwives/nurses. 243 (91%) received the care in a hospital/health centre. PNC check took place within the first day of delivery in 132 (49%) of 268 adolescent mothers. 59 (18%) had PNC check within a week of delivery and the remaining 77 adolescent mothers took longer a week.

Of 243 adolescent mothers, only 69 (29%) had their providers discuss with them about family planning options after delivery.

*Bivariate analysis of adolescent MHS utilisation*

Mother's education, religion, ethnicity, place of residence, wealth quintile, mass media exposure, and geographical region were all significant predictors for both ANC and SBA utilisation. Education level of partner was significant for ANC utilisation alone while parity was significant for both SBA and PNC [Table 2].

*Multivariate analysis of adolescent MHS utilisation*

- *Determinants of adolescent ANC utilisation*

Compared to uneducated adolescent mothers, both adolescent mothers with primary education (CI=1.36-5.99,  $p=0.001$ ) and secondary education (CI=1.22-7.20,  $p=0.006$ ) were about thrice more likely to use ANC. Similarly, compared to partners of uneducated adolescent mothers, partners with basic primary education were 11 (CI=2.68-53.59,  $p<0.001$ ) times more likely to encourage the use of ANC. Those with no religion were approximately five times less likely to use ANC with odds ratio of 0.20 (CI=0.06-0.73,  $p=0.002$ ) compared to Roman Catholics. In terms of ethnicity,

the odds of adolescent mothers from Samburu, Mberere and Rendille ethnic groups using ANC was almost 70% (CI=0.09-0.92,  $p=0.010$ ), 90% (CI=0.02-0.69,  $p=0.001$ ) and 90% (CI=0.01-1.671,  $p=0.013$ ) lower than the adolescent mothers from Kalenjin ethnic group. Urban adolescent mothers were about two (CI=1.01-3.93,  $p=0.037$ ) times more likely to use ANC compared to those who live in rural settings. Adolescent mothers from the richer quintile were about three (CI=1.16-10.34,  $p=0.016$ ) times more likely to use ANC compared to those from the poorest quintile [Table 3]. Adolescent mothers who live in the Rift Valley were almost five times less likely to use ANC compared to those from Coast region with odds ratio of 0.24 (CI=0.06-0.70,  $p=0.005$ ) [Table 3].

- *Determinants of adolescent SBA utilisation*

In terms of level of education, adolescent mothers with only primary education were about three (CI=1.63-4.57,  $p<0.001$ ) times, and those with secondary education were more than six (CI=3.55-11.83,  $p<0.001$ ) times more likely to use SBA compared with Kenyan adolescent mothers without any formal education. Similarly, adolescent mothers who had partners that had secondary education about three (CI=1.16-7.51,  $p=0.011$ ) times more likely to have SBA compared to adolescent mothers who had partners without any formal education. Those with no religion were about three times less likely to utilise SBA with odds ratio of 0.31 (CI=0.12-0.79,  $p=0.005$ ) than Roman Catholics [Table 3].

The odds ratio gradually increased from poorest to richer quintiles as it relates to utilising SBA. Compared to those from the poorest quintile, adolescent mothers from the poorer quintile were about twice (CI=1.12-2.45,  $p=0.008$ ), the middle quintile were more than two times (CI=1.54-3.43,  $p<0.001$ ), the richer more than four times (CI=2.52-7.36,  $p<0.001$ ) and the richest about four times (CI=1.91-7.12,  $p<0.001$ ) more likely to use SBA [Table 3].

For ethnicity, adolescent mothers who hailed from the Kikuyu ethnic group were about three (CI=1.34-8.41,  $p=0.004$ ) times more likely and Luo adolescent mothers were approximately two (CI=1.00-2.96,  $p=0.038$ ) times more likely to use SBA compared with Kalenjin adolescent mothers. Maasai adolescent mothers were about three (CI=0.14-0.67,  $p=0.001$ ) times less likely to use SBA. Urban adolescent mothers were around two and a half (CI=1.64-3.19,  $p<0.001$ ) times more likely to use SBA than rural adolescent mothers. Those who had some media exposure were about twice (CI=1.42-2.82,  $p<0.001$ ) more likely to use SBA than those without any exposure [Table 3].

Adolescent mothers from Rift Valley and Coast regions were both about five times less likely to use SBA compared to those from Central region with odds ratio of 0.19 (CI=0.05-0.56,  $p=0.001$ ) and 0.22 (CI=0.05-0.70,  $p=0.004$ ) respectively. Those from Western region were approximately three times less likely to use SBA compared to those from Central with odds ratio of 0.27 (CI=0.06-0.86,  $p=0.016$ ) [Table 3].

In terms of parity, adolescent mothers who had parity of 'two' and 'three' were about three (CI=0.21-0.45,  $p<0.001$ ) and five (CI=0.05-0.54,  $p<0.001$ ) times less likely to utilise SBA.

- *Determinants of adolescent PNC utilisation*

For parity, adolescent mothers who had parity of 'two' were about three (CI=0.10-0.87,  $p=0.008$ ) times less likely to utilise PNC [Table 3]. No other factors were found to have a significant influence on PNC.

## **Discussion**

Our findings showed that approximately half of Kenyan adolescent mothers have had their first birth by the age of 16. Majority of them and their partners had only attained primary education. Most practise Protestant Christianity or some other form of Christianity, excluding Roman

Catholic Christianity. Kelenjins, Luos and Luhyas were the most common ethnic groups from which adolescent mothers come from and most of them live in the Rift valley region. Kenyan adolescent mothers are mostly of rural origin and from the poorest quintile. We found in our survey that the highest proportion of adolescent mothers come from the mostly rural Rift valley region (34%), followed by Nyanza (20%) and Coast (14%).

We found that MHS utilisation rates amongst Kenyan adolescent mothers were 93%, 65%, 92% for ANC, SBA and PNC respectively. This is an overall improvement compared to previous estimates that were based on the 2008-2009 KDHS which showed utilisation rates of 86% for ANC, 48% for SBA and 86% for PNC [10]. Clearly, there is still a need to understand this persistent under-utilisation of SBA in comparison to utilisation of ANC and PNC.

However, it appears that initiatives such as the free maternity services being implemented by the Kenyan government since 2013 [17] may be contributing to this increased rates of MHS utilisation, especially as it addresses the financial challenges to SBA utilisation that adolescent mothers reported in the 2008-09 KDHS [10]. A 2015 report revealed that the free maternity services initiative had led to a 22% and 17% increase in facility based normal and caesarean section deliveries respectively [18]. Despite the improvements that we have observed, which are corroborated by this report, there is still a 35% home delivery rate amongst Kenyan adolescent mothers. A 100% utilisation rate for all three services amongst adolescents provided by skilled health care workers, is likely to significantly reduce the risk of maternal morbidity and mortality.

In terms of ANC utilisation, our findings revealed that **only half of those who attended ANC achieved the recommended four visits for focused ANC [14]**. Of those who attended ANC at least once, only 16% of Kenyan adolescent mothers would have had their first ANC visit by the end of the first trimester. Most (65%) only start ANC in the second trimester. **Again this is not in line**

with WHO recommendations for focused ANC [14]. The WHO classifies pregnancies amongst adolescents as high-risk and as such recommends close monitoring of pregnant adolescents by a skilled personnel from the first trimester of pregnancy [19]. This should be encouraged for all adolescents, especially as our results show that over 80% of Kenyan adolescent mothers have no previous birth history and may therefore lack knowledge of potential danger signs. In addition, only about half of Kenyan adolescent mothers have four or more ANC visits during the entire period of the pregnancy, which is not in line with WHO recommendation. Thus, there is a need to sensitize adolescents on the critical nature of teen pregnancy and appropriate care in the event that they fall pregnant. In providing this service to this group, emphasis also has to be placed on ensuring adolescent-friendly services that guarantee trust and confidentiality without any judgement or prejudice [20].

For PNC, it is important to interpret the 92% utilisation in context keeping in mind that only 267 adolescent mothers, representing a third of adolescent mothers in the sample, responded to the PNC utilisation question in the KDHS. Our findings showed that only about half of the adolescent mothers had PNC within the first day of delivery, in line with WHO recommendation and Government of Kenya policy [15]. The care that adolescent mothers receive immediately after delivery has proven critical in reducing maternal morbidity and mortality [5]. The post-partum period also offers a unique opportunity for providers to enlighten adolescent mothers on family planning methods that can prevent or space subsequent pregnancies. However, we found that less than a third of Kenyan adolescent mothers get this counsel, despite the government's policy recommendation.

From our research findings, mother's education, ethnicity, religion, type of place of residence, wealth quintile, mass media exposure, and geographical region were significant predictors for both ANC and SBA utilisation. Education level of partner was significant for ANC utilisation alone

while parity was significant for both SBA and PNC. This is partly similar to findings based on the 2008-2009 KDHS [10]. However, two new notable findings were that parity was found to be significant for SBA and PNC utilisation and that religion was significant for ANC and SBA utilisation.

It is entirely conceivable that education of the adolescent mother was a significant factor for ANC and SBA in our study, like in the previous study [10]. Though this empirical evidence suggests that there is an association between education and this outcome of utilisation, the pathway that links both influence and outcome is not entirely clear. However, some authors have recently argued that education enhances both “individual resources” and “individual agency”, (defined as the ability of an individual to act in their own best interest [21]), which are the two primary components of empowerment [22]. In tackling this issue in Kenya, emphasis needs to be placed on promoting education beyond ‘primary level’ amongst adolescent girls rather than allowing them to be “banned” from school because they are pregnant [23]. As our findings have shown about three-quarters of Kenyan adolescent mothers either have no education or have only primary education. In terms of utilisation, those with no education and those with primary education are six times and two times less likely respectively to use SBA than those with secondary education. Similar explanations may be given for the significant effect that the level of education of the adolescent mother’s partner has on ANC utilisation. This ‘proximate literacy’ allows for the partner to also recognise the benefits of MHS utilisation and therefore encourages his partner to use ANC. However, there is a possibility that some ‘deep-rooted cultural beliefs’ (explained below) may be affecting the partners encouragement of the adolescent mother to use SBA, as this was not a significant finding in our analysis, contrary to earlier findings [10].

Like previously concluded [10], ethnicity is a significant predictor of ANC and SBA utilisation by Kenyan adolescent mothers. However, the addition of 10 ethnic groups to the 2014 KDHS,



compared to the 2008-2009 KDHS, which had 12 groups as well as other minor groups, allows for a more inclusive and critically disaggregated data that shows any potential intrinsic differences. For example, Samburu, Mberere and Rendille adolescent mothers were 70% or more less likely to use ANC. A previous study on ANC utilisation in Kwale district, which has many people from the Samburu ethnic group living in it showed that there is general low level ANC utilisation in the reproductive age-group [24]. On the other hand, among the Maasai community, adolescent mothers are about three times less likely to use SBA. A previous qualitative enquiry with men and women of the Maasai tribe identified a plethora of issues that demonstrate the deep-rooted cultural nuances of the tribe including a dislike of Maasai pregnant women mixing with other patients, opportunity cost of women going into hospitals and belief in traditional birth attendants, who have “a spiritual relationship with Eng’ai (the Maasai god)” and “share the ability to give life” [25].

Urban adolescent mothers were about two times, and two and a half times more likely to use ANC and SBA respectively. Similarly, adolescent mothers from Rift Valley and Coast regions were both around five times less likely to use SBA compared to those from Central region. In the Rift valley in particular, health facilities are known to be sparsely distributed requiring inhabitants to travel long distances to access care, sometimes on bad roads that have been reported to jeopardise pregnancy outcomes [26,27]. Another explanation could simply be that the Maasai adolescent mothers, who are mostly rural dwellers and who inhabit the Rift Valley [28] were also shown in our findings to have both low ANC and SBA utilisation.

Poverty was also a significant predictor of ANC and SBA utilisation by Kenyan adolescent mothers. Our findings showed an essentially incremental association from the poorest to the richest quintile. This finding was similarly reported in previous analyses based on KDHS 2008-2009 [10]. This low MHS utilisation in the poorest households may be related to the issue of cost of care

that we had discussed previously, because poor households may be unable to afford the cost of care, especially if that implies that they would need to compromise their basic needs to do so. However, it is difficult to solely associate low utilisation with cost of care, particularly with the uptake of the free maternity services scheme [18]. As such there are likely other factors interacting to produce this pattern. Understanding these would be critical in developing strategies to reduce inequity in the Sustainable Development Goals era. When we conducted this sub-analysis, it became evident that the highest proportion of the adolescent mothers from the poorest quintile (41%) were from the Rift valley, followed by 28% from the Coast region. Similarly, the largest proportion of the poorest quintile (42%) were from the Kalenjin, Maasai and Swahili tribes who have all demonstrated low ANC and SBA utilisation.

Additionally, our analysis showed that media exposure is a significant predictor for both ANC and SBA utilisation. It is not entirely clear how mass media exposure stimulates MHS utilisation in Kenya. It can be interpreted that there is some useful information that adolescent mothers get regarding pregnancy and childbirth through the media. However, there is clear need for a more systematic and targeted mass media approach in reaching out to the population of interest and in ensuring that the portrayal of pregnancy and childbirth in the media is accurate and realistic.

Adolescents mothers with no religion were shown to be five times less likely to use ANC in our study. This is difficult to explain as there is no religious preclusion to care in Kenya. However, it clearly points to the need to engage directly with those who do not affiliate with any specific religion in order to better understand their maternal health needs. Disseminating information on benefits of ANC should in addition to religious bodies also leverage settings of diversity such as schools, markets etc.

Finally, we found that parity was significant for PNC utilisation. Strikingly, higher parity meant lower PNC utilisation. One explanation that we have considered is that due to some 'expert syndrome', adolescents who have had previous pregnancies may believe that they know how to handle themselves.

This study presented findings of the analysis of adolescent MHS utilisation based on the most up-to-date and publicly available large-scale dataset – 2014 KDHS. Findings from our analysis are being published within two years of the conduct of the actual survey, which is more recent compared to previous analysis [10]. It is critical to use recent data to show adolescent MHS utilisation, since they are a dynamic group with changing needs from generation to generation. These are major strengths of this paper.

However, our findings need to be interpreted giving consideration to some limitations that we have identified. Firstly, since the 2014 KDHS is a cross-sectional survey, it is known that there is a problem with 'temporality' with this kind of surveys regarding 'the cause' or 'the effect', which occurred first. As an example, though our results showed that the mother's education is a significant factor for MHS utilisation, it is difficult to establish if she achieved the educational level before or after utilising MHS. **In addition, there is a case for recall bias especially because the participants in the survey were responding to questions for events that happened in the past. Though the effect of this may be minimal since the KDHS is based on data of the most recent delivery during the immediate five years [11].**

Furthermore, we recognise that the respondents in the original survey were the ones who provided the data that was used to classify their care giver as a 'skilled birth attendant' or otherwise. The respondents could have simply described any uniformed individual as a nurse, midwife or doctor, based on their own subjective assessment. However, the individual may not

actually be a 'skilled birth attendant', who according to the WHO, must in addition to being a nurse/midwife or doctor, also be "accredited and have received the pre-requisite training" [13]. Survey participants are not made aware of this information and this may have led to some inaccurate classifications.

## **Conclusions**

Clearly, rates of adolescent MHS utilisation in Kenya are not yet optimum. The target must be on ensuring that every adolescent mother utilise MHS across the entire continuum of care. This study has helped to map the areas of focus in building a constructive and strategic response to adolescent maternal morbidity and mortality in Kenya, early in the Sustainable Development Goals era. Clearly the free maternity services initiative does not mean that inequity in terms of urban rural divide and wealth has been closed, further research may be needed to understand this more. We opine that in addition to efforts to reduce adolescent pregnancy in Kenya, including family planning which helps with primary prevention of pregnancy, attention must be placed on adolescents who are already pregnant, particularly those who live in the most disadvantaged areas. Therefore schemes such as adolescent targeted media education [29] and the mobile clinics under the 'Beyond Zero' campaign in Kenya [8], which should be youth-friendly, need to be scaled-up with emphasis on disadvantaged communities. Such efforts are likely to improve MHS utilisation. Particularly in the post-2015 era, we cannot afford to let adolescent mothers to be "left behind" once again [2].

## **Conflict of interest**

The authors declare that they have no competing interests.

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Figure 1: Age of Kenyan adolescent mothers at first birth

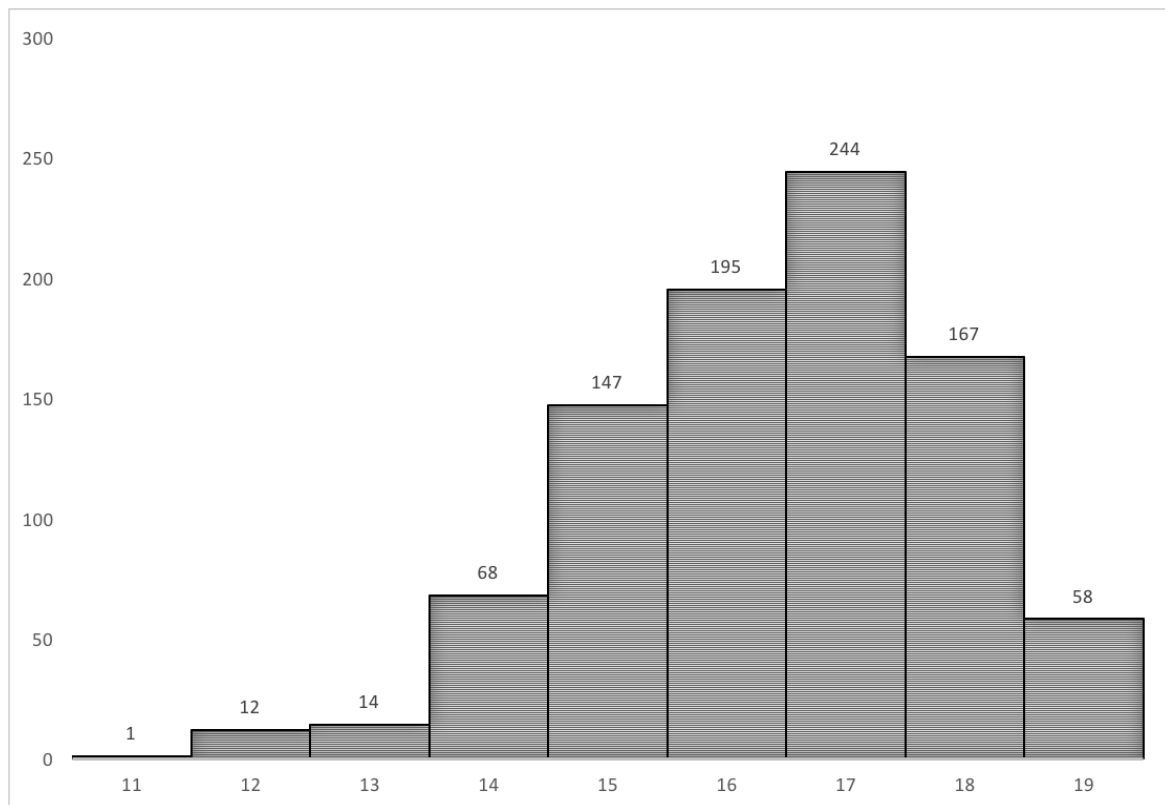


Figure 2: Pregnancy month of first ANC visit for Kenyan adolescent mothers

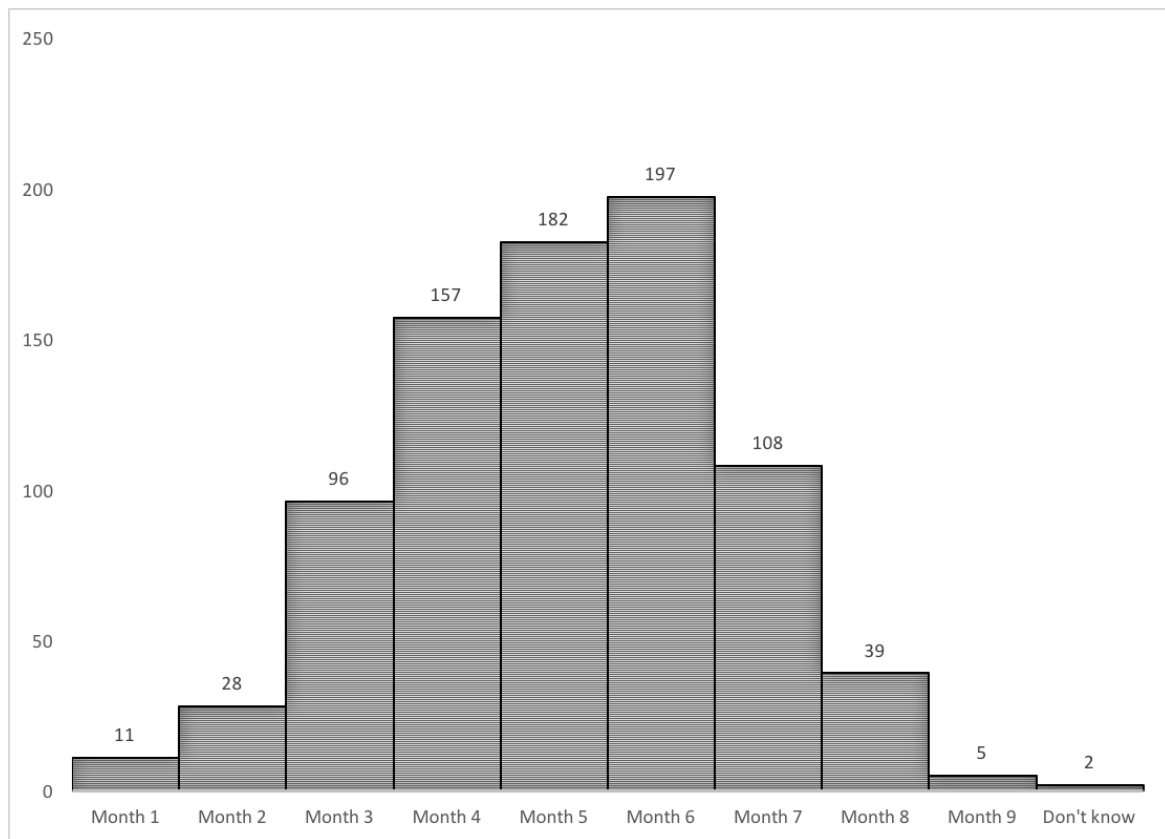
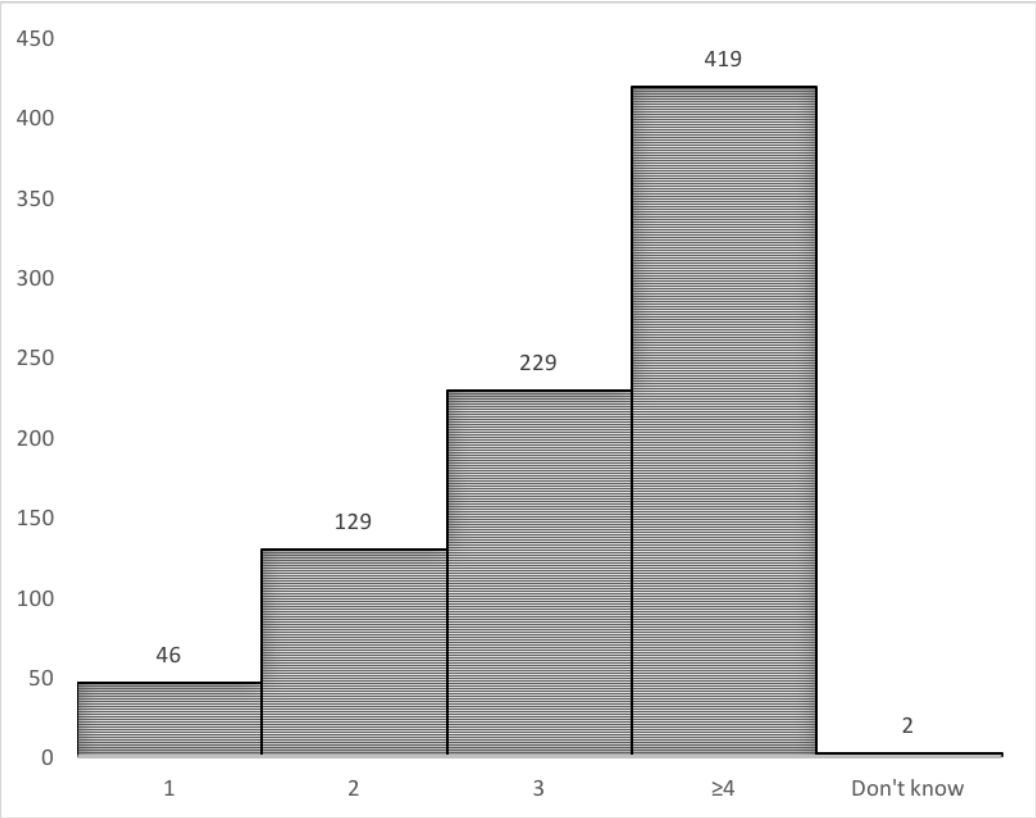




Figure 3: Number of ANC visits attended by Kenyan adolescent mothers



**Table 1: Background characteristics of Kenyan adolescent mothers**

Background characteristics	N = 898	%	Cumulative %
<b>Mother's education</b>			
No education	78	8.7%	8.7%
Primary	588	65.5%	74.2%
Secondary	226	25.2%	99.3%
Higher	5	0.6%	99.9%
<b>Marital status</b>			
Ever married	898	100.0%	100.0%
<b>Religion</b>			
Roman catholic	194	21.6%	21.6%
Protestant/other Christian	559	62.2%	83.9%
Muslim	120	13.4%	97.2%
No religion	25	2.8%	100.0%
<b>Ethnicity</b>			
Embu	3	0.3%	0.3%
Kalenjin	148	16.5%	16.8%
Kamba	58	6.5%	23.3%
Kikuyu	51	5.7%	29.0%
Kisii	62	6.9%	35.9%
Luhya	115	12.8%	48.7%
Luo	137	15.3%	63.9%
(Maasai	41	4.6%	68.5%
Meru	33	3.7%	72.2%
Mijikenda/Swahili	63	7.0%	79.2%
Somali	36	4.0%	83.2%
Taita/Taveta	7	0.8%	84.0%
Turkana	34	3.8%	87.8%
Samburu	24	2.7%	90.4%
Pokomo	25	2.8%	93.2%
Iteso	10	1.1%	94.3%
Boran	6	0.7%	95.0%
Gabbra	3	0.3%	95.3%
Kuria	1	0.1%	95.4%
Orma	3	0.3%	95.8%
Mbere	8	0.9%	96.7%
Rendille	2	0.2%	96.9%
Other	28	3.1%	100.0%
<b>Type of place of residence</b>			
Urban	288	32.1%	32.1%
Rural	610	67.9%	100.0%

<b>Mass media exposure</b>			
No exposure	183	20.4%	20.4%
Any exposure	715	79.6%	100.0%
<b>Wealth quintile</b>			
Poorest	307	34.2%	34.2%
Poorer	190	21.2%	55.3%
Middle	198	22.0%	77.4%
Richer	129	14.4%	91.8%
Richest	74	8.2%	100.0%
<b>Geographical region</b>			
Central	31	3.5%	3.5%
Coast	122	13.6%	17.0%
Northeastern	35	3.9%	20.9%
Eastern	115	12.8%	33.7%
Rift valley	302	33.6%	67.4%
Western	99	11.0%	78.4%
Nyanza	178	19.8%	98.2%
Nairobi	16	1.8%	100.0%
<b>Parity</b>			
1	735	81.8%	81.8%
2	145	16.1%	98.0%
3	17	1.9%	99.9%
4	1	0.1%	100.0%
<b>Wanted last child</b>			
	N = 413		
Wanted then	178	43.1%	43.1%
Wanted later	232	56.2%	99.3%
Wanted no more	3	0.7%	100.0%
<b>Education level of partner*</b>			
	N = 254		
No education	32	12.6%	12.6%
Primary	138	54.3%	66.9%
Secondary	79	31.1%	98.0%
Higher	5	2.0%	100.0%

**Table 2: Differentials of MHS utilisation by adolescent mothers**

Background characteristics	Antenatal care			Delivery			Post-natal care	
	Total (N=898)	Provided by skilled personnel	P value	Total (N=889)	Provided by skilled personnel	P value	Total (N=267)	Provided by skilled personnel
<b>Mother's education</b>								
No education	79	66 (83.5%)	0.009	78	30 (38.5%)	0.000	19	15 (79.0%)
Primary	588	551 (93.7%)		585	368 (62.9%)		172	160 (93.0%)
Secondary	226	212 (93.8%)		222	178 (80.2%)		74	69 (93.0%)
Higher	5	5 (100.0%)		4	4 (100.0%)		2	2 (100.0%)
<b>Religion</b>								
Roman catholic	194	182 (93.8%)	0.007	190	130 (68.4%)	0.056	56	53 (94.6%)
Protestant/other Christian	559	522 (93.4%)		554	366 (66.1%)		168	154 (91.7%)
Muslim	120	111 (92.5%)		120	74 (61.7%)		37	34 (91.9%)
No religion	25	18 (75.0%)		25	10 (40.0%)		6	5 (83.3%)
<b>Ethnicity</b>								
Embu	3	3 (100.0%)	0.000	3	3 (100.0%)	0.000	2	2 (100.0%)
Kalenjin	148	133 (89.9%)		145	91 (62.8%)		40	33 (82.5%)
Kamba	58	56 (96.5%)		57	40 (70.2%)		20	20 (100.0%)
Kikuyu	51	49 (96.1%)		51	43 (84.3%)		20	20 (100.0%)
Kisii	62	59 (95.2%)		61	46 (75.4%)		23	23 (100.0%)
Luhya	115	108 (93.9%)		113	70 (62.0%)		35	30 (85.7%)
Luo	137	131 (95.6%)		136	101 (74.3%)		32	29 (90.6%)
Maasai	41	37 (90.2%)		41	14 (34.1%)		19	17 (89.5%)
Meru	33	32 (97.0%)		33	33 (100.0%)		11	11 (100.0%)
Mijikenda/Swahili	63	63 (100.0%)		63	36 (57.1%)		16	16 (100.0%)
Somali	36	31 (86.1%)		36	23 (63.9%)		7	7 (100.0%)
Taita/Taveta	7	7 (100.0%)		7	6 (85.7%)		1	1 (100.0%)
Turkana	34	32 (94.1%)		33	16 (48.5%)		7	7 (100.0%)
Samburu	24	17 (70.8%)		24	11 (45.8%)		5	5 (100.0%)
Pokomo	25	25 (100.0%)		25	17 (68.0%)		9	9 (100.0%)
Iteso	10	10 (100.0%)		10	6 (60.0%)		1	1 (100.0%)
Boran	6	6 (100.0%)		6	1 (16.7%)		2	1 (50.0%)
Gabbra	3	2 (66.7%)		3	1 (33.3%)		2	1 (50.0%)
Kuria	1	1 (100.0%)		1	1 (100.0%)		0	0 (0.0%)
Orma	3	3 (100.0%)		3	3 (100.0%)		1	1 (100.0%)
Mbere	8	4 (50.0%)		8	3 (37.5%)		3	3 (100.0%)
Rendille	2	2 (50.0%)		2	0 (0.0%)		0	0 (0.0%)
Other	28	24 (85.7%)		28	15 (53.6%)		11	9 (81.8%)
<b>Type of place of residence</b>								
Urban	288	275 (95.5%)	0.036	284	219 (77.1%)	0.000	89	83 (93.3%)

Rural	610	559 (91.6%)		605	361 (59.7%)		178	163 (92.2%)
<b>Mass media exposure</b>								
No exposure	183	162 (88.5%)	0.010	182	95 (52.2%)	0.000	58	52 (89.7%)
Any exposure	715	672 (94.0%)		707	485 (68.6%)		209	194 (92.8%)
<b>Wealth quintile</b>								
Poorest	307	273 (88.9%)	0.019	305	158 (51.8%)	0.000	77	70 (90.9%)
Poorer	190	178 (93.7%)		189	121 (64.0%)		64	56 (87.5%)
Middle	198	188 (94.9%)		194	138 (71.1%)		50	47 (94.0%)
Richer	129	124 (96.1%)		128	105 (82.0%)		52	50 (96.2%)
Richest	74	71 (95.9%)		73	58 (79.5%)		24	23 (95.8%)
<b>Geographical region</b>								
Central	31	31 (100.0%)	0.001	31	27 (87.1%)	0.000	9	9 (100.0%)
Coast	122	118 (96.7%)		122	73 (59.8%)		35	34 (97.1%)
Northeastern	35	31 (88.6%)		34	22 (64.7%)		7	7 (100.0%)
Eastern	115	109 (94.8%)		113	80 (70.8%)		38	35 (92.1%)
Rift valley	302	265 (87.7%)		298	167 (56.0%)		91	82 (90.1%)
Western	99	94 (94.9%)		98	63 (64.3%)		30	25 (83.3%)
Nyanza	178	172 (96.6%)		177	132 (74.6%)		50	47 (94.0%)
Nairobi	16	14 (87.5%)		16	16 (100.0%)		7	7 (100.0%)
<b>Parity</b>								
1	735	686 (93.3%)	0.328	727	513 (70.6%)	0.000	215	203 (94.4%)
2	145	133 (91.7%)		144	61 (42.4%)		47	39 (83.0%)
3	17	14 (82.3%)		17	5 (29.4%)		5	4 (80.0%)
4	1	1 (100.0%)		1	1 (100.0%)		0	0 (0.0%)
<b>Wanted last child*</b>								
	N = 413			N = 413			N = 267	
Wanted then	178	169 (94.9%)	0.582	178	111 (62.4%)	0.478	115	103 (89.6%)
Wanted later	232	215 (92.7%)		232	158 (68.1%)		150	141 (94.0%)
Wanted no more	3	3 (100.0%)		3	2 (66.7%)		2	2 (100.0%)
<b>Education level of partner*</b>								
	N = 254			N = 254			N = 159	
No education	32	24 (76.7%)	0.000	32	14 (43.3%)	0.164	15	12 (80.0%)
Primary	138	134 (97.1%)		138	85 (61.5%)		91	80 (88.0%)
Secondary	79	78 (98.7%)		79	55 (69.6%)		49	45 (91.8%)
Higher	5	5 (100.0%)		5	3 (60.0%)		4	4 (100.0%)

**Table 3: Determinants of MHS utilisation by adolescent mothers**

Background characteristics	Ante-natal care				Delivery			
	Odds ratio	95% CI		P value	Odds ratio	95% CI		P value
		Lower	Higher			Lower	Higher	
<b>Mother's education</b>								
No education	1.00				1.00			
Primary	2.93	1.36	5.99	0.001	2.71	1.63	4.57	0.000
Secondary	2.98	1.22	7.20	0.006	6.47	3.55	11.83	0.000
Higher	-	-	-	-	-	-	-	-
<b>Religion</b>								
Roman catholic	1.00				1.00			
Protestant/other Christian	0.93	0.43	1.87	0.833	0.90	0.62	1.30	0.552
Muslim	0.81	0.30	2.26	0.651	0.74	0.45	1.23	0.222
No religion	0.20	0.06	0.73	0.002	0.31	0.12	0.79	0.005
<b>Ethnicity</b>								
Embu	-				-			
Kalenjin	1.00				1.00			
Kamba	3.16	0.69	29.24	0.117	1.40	0.69	2.89	0.320
Kikuyu	2.76	0.60	25.67	0.171	3.19	1.34	8.41	0.004
Kisii	2.22	0.59	12.36	0.211	1.82	0.89	3.85	0.079
Luhya	1.74	0.64	5.22	0.240	0.97	0.56	1.66	0.894
Luo	2.46	0.87	7.97	0.063	1.71	1.00	2.96	0.038
Maasai	1.04	0.31	4.58	0.943	0.31	0.14	0.67	0.001
Meru	3.61	0.51	156.58	0.194	-	-	-	-
Mijikenda/Swahili	-				0.79	0.42	1.52	0.445
Somali	0.70	0.22	2.65	0.516	1.05	0.46	2.45	0.900
Taita/Taveta	-				3.56	0.41	166.73	0.217
Turkana	1.80	0.39	17.01	0.442	0.56	0.24	1.29	0.131
Samburu	0.27	0.09	0.92	0.010	0.50	0.19	1.32	0.116
Pokomo	-				1.26	0.48	3.61	0.615
Iteso	-				0.89	0.20	4.49	0.862
Boran	-				0.12	0.00	1.11	0.023
Gabbra	0.23	0.01	14.18	0.196	0.30	0.00	5.87	0.298
Kuria	-				-			
Orma	-				-			
Mbere	0.11	0.02	0.69	0.001	0.36	0.05	1.93	0.153
Rendille	0.11	0.01	1.71	0.013	-	-	-	-
Other	0.68	0.19	3.05	0.516	0.81	0.22	2.88	0.720
<b>Type of place of residence</b>								
Rural	1.00				1.00			
Urban	1.93	1.01	3.933	0.037	2.28	1.64	3.19	0.000

<b>Mass media exposure</b>									
No exposure	1.00				1.00				
Any exposure	2.03	1.11	3.60	0.010	2.00	1.42	2.82	0.000	
<b>Wealth quintile</b>									
Poorest	1.00				1.00				
Poorer	1.85	0.90	4.02	0.075	1.66	1.12	2.45	0.008	
Middle	2.34	1.10	5.44	0.019	2.29	1.54	3.43	0.000	
Richer	3.09	1.16	10.34	0.016	4.25	2.52	7.36	0.000	
Richest	2.95	0.88	15.39	0.067	3.60	1.91	7.12	0.000	
<b>Geographical region</b>									
Central	-	-	-	-	1.00				
Coast	1.00	-	-	-	0.22	0.05	0.70	0.004	
Northeastern	0.26	0.05	1.51	0.053	0.27	0.06	1.08	0.036	
Eastern	0.62	0.12	2.68	0.458	0.36	0.09	1.16	0.066	
Rift valley	0.24	0.06	0.70	0.005	0.19	0.05	0.56	0.001	
Western	0.64	0.12	3.06	0.508	0.27	0.06	0.86	0.016	
Nyanza	0.97	0.20	4.20	0.965	0.43	0.11	1.35	0.130	
Nairobi	0.24	0.03	2.89	0.089	-	-	-	-	
<b>Parity</b>									
1	1.00				1.00				
2	0.79	0.40	1.68	0.486	0.31	0.21	0.45	0.000	
3	0.33	0.09	1.87	0.078	0.17	0.05	0.54	0.000	
4	-	-	-	-	-	-	-	-	
<b>Wanted last child</b>									
Wanted then	1.00				1.00				
Wanted later	0.67	0.26	1.65	0.350	1.29	0.84	1.98	0.225	
Wanted no more	-	-	-	-	1.21	0.06	72.26	0.879	
<b>Education level of partner*</b>									
No education	1.00				1.00				
Primary	11.17	2.68	53.59	0.000	2.06	0.88	4.87	0.065	
Secondary	26.00	3.12	1167.66	0.000	2.95	1.16	7.51	0.011	
Higher	-	-	-	-	1.93	0.19	25.61	0.498	

## Highlights

- Half of Kenyan adolescent mothers have had their first birth by the age of 16.
- Utilisation of critical skilled birth attendance remains low amongst adolescents.
- Despite free maternity services, inequality in service utilisation ensues.
- Focus should be on the more disadvantaged poor, uneducated, rural adolescents.