Entry into motherhood among adolescent girls in two informal settlements in Nairobi, Kenya

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Abstract

The contribution of adolescents' fertility to total fertility rates in many sub-Saharan African countries is relatively higher than other regions. In this paper, we draw on data collected from 897 female adolescents aged 15-19 years to investigate patterns and determinants of entry into motherhood in two informal settlements in Nairobi, Kenya. About 15% of these adolescents have had a child. We examine predictors of the timing of childbearing using Kaplan-Meier estimates and Cox regression models. The findings show that marriage, being out of school, and having peer models for risk behaviors are associated with early childbearing among females aged 15-17 years. For adolescents aged 18-19 years, school attendance considerably delays entry into motherhood while marriage hastens its timing. Furthermore, older adolescents with high levels of social controls (parental monitoring or peer models for prosocial behaviors) and individual controls (high religiosity and positive orientation to schooling) are likely to delay childbearing.

Introduction

This article investigates the correlates of the timing of transition into motherhood among adolescent girls in two informal settlements or slums - Korogocho and Viwandani -in Nairobi city, Kenya. Entry into motherhood is an important marker of the transition to adulthood. However, adolescent fertility has been viewed as both a social and policy challenge in many countries in sub-Saharan Africa (SSA). To effectively address this challenge, there is need to understand the factors driving adolescent childbearing, especially in resource-poor settings such as informal settlements.

In many countries in SSA, the contribution of adolescents' fertility to total fertility rates remains higher than in other parts of the world. The proportion of young women who have a child by age 20 ranges from 47% to 75% in this region (Singh, 1998). In fact, much of the high fertility in SSA can be attributed to first birth occurring at very young ages. The timing of the first birth is usually an indicator of future fertility patterns, largely because it determines the length of a woman's childbearing window. In the absence of contraception, a longer window is more likely to result in larger completed family size - one of the long-term demographic effects of adolescent fertility (Wulf and Singh, 1991).

Although childbearing is a key marker of the transition to adulthood and carries parental responsibilities, giving birth during adolescence is likely to lead to poor health outcomes for the young mother and her child. For instance, the risk of maternal and child morbidity and mortality is known to be higher among adolescent mothers. Furthermore, younger mothers have a higher likelihood of having clandestine induced abortions and acquiring HIV and other sexually transmitted infections (Mensch et al., 2005). Patton and colleagues (2009) show that maternal

mortality accounts for nearly 26% of the increased number of deaths in females aged 10-24 years in the African region. The incidence of low birth weight, prematurity, stillbirth and neonatal mortality are known to be higher among children whose mothers are adolescents. Early childbearing is also known to negatively impact on educational and employment prospects, and hence leading to a greater likelihood of poverty (Gupta and Mahy, 2003b, Singh, 1998). In many instances, pregnant females are forced to drop out of school, while for those who are able to continue schooling, the very possible conflict between school and child care responsibilities that women primarily bear results into poor academic performance. Other consequences of early parenthood include marital instability, single parenthood, social ostracism and an increased risk of getting into poverty.

Accordingly, adolescents' fertility has become a source of social and policy concern for many governments and non-governmental organizations. Indeed, the 1994 International Conference on Population and Development (ICPD) paved the way for highlighting the concerns of adolescents' fertility by prioritizing adolescents' reproductive health issues. Since then, there have been an increasing number of studies addressing reproductive health and behavior challenges among adolescents in SSA. Although sexual and reproductive health was excluded from the Millennium Development Goals (MDGs), universal access to reproductive health by 2015 was later set as a goal by governments at the World Summit in 2005 since it was clear that achievement of MDGs largely depended on addressing the sexual and reproductive health challenges especially in high fertility regions (Glasier et al., 2006). Beyond the achievement of the objective of providing reproductive health services for the youth, a better understanding of the adolescent's childbearing is of great importance for policymakers involved in helping the continent to achieve its desirable fertility levels.

In Kenya where the fertility decline is stalling, the proportion of teenagers initiating childbearing was 18% in 2008, with teenagers from poorer households (24%) being more likely to have begun childbearing than those from wealthier households (16%) (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2010). These figures also show considerable differences across educational level (with education versus no education), residence (urban versus rural) and regional divides. Recent research also shows growing gaps in the disparities between the poor versus non-poor within urban areas. However, little attention has been paid to understanding the dimensions and factors driving the fertility patterns among adolescents living in resource-poor urban settings and in particular in informal settlements or slums. In fact, despite the significant proportion of adolescents making up the slum population, little attention has been paid to the challenges they face during their transition to adulthood.

Urban slums are characterized by lack of basic social infrastructure and services; high rates of unemployment, crime, substance abuse; poor schooling facilities; and lack of recreational facilities (African Population and Health Research Center, 2002, Mugisha and Zulu, 2004, Taffa, 2003). These attributes have key implications for the well-being and welfare of adolescents. Indeed, previous studies show that 16% of female adolescents in slums become parents by age 18, meaning that a considerable number are exposed to the risks of teenage pregnancy and delivery because they have not reached physical maturity or physiological development (Beguy et al., 2009b). Consequently, early parenthood becomes a health threat not only for the young women but also their children. These challenges are further compounded by the lack of basic health facilities and the high cost of care which impedes access to obstetric services within slum settings (Izugbara et al., 2009).

Early entry into childbearing among young slum dwellers is a sign of early involvement in unprotected sexual intercourse, which exposes these youth to sexually transmitted infections, including HIV given the relatively high prevalence of HIV/AIDS in slum settlements. Previous studies show that adolescents living in slums are more likely to be sexually active than their counterparts in non-slums parts of the city and other groups outside Nairobi, including the rural poor (Zulu et al., 2002, Zulu et al., 2007). In slum contexts where access to and use of modern contraception is low, early sexual debut automatically lengthens the period of exposure to the risk of pregnancy and childbearing. In Kenya, unmet need for spacing and limiting is known to be higher among younger married women and always decreases monotonically with age. In 2003, it was estimated at 28% among 15-19 year old women and 33% among 20-24 (Ojakaa, 2008) while in 2008, it was estimated at 30% for both 15-19 and 20-24 year olds (Kenya National Bureau of Statistics (KNBS) and ICF Macro, 2010). This high gap between adolescent's fertility preferences and their contraceptive behavior has implications on unintended pregnancies and the prevalence of high-risk births among adolescents.

Factors associated with adolescent fertility

Several studies have been carried out to assess the drivers of adolescent childbearing in different regions of the world. In her global review of adolescent childbearing, Singh (1998) points out that factors associated with adolescent fertility include, among others, cultural practices of early marriage especially in Africa and Asia, as well as cultural tolerance of pre-marital sexual relationships to prove one's fertility before marriage. Further, socio-economic factors such as level of urbanization and level of education have been shown to have an effect on adolescent childbearing in many countries. Adolescents residing in urban areas and those with higher levels

of education are likely to delay their childbearing due to known conflicts between schooling, work and child rearing (Gupta and Mahy, 2003a, Singh, 1998). However, some studies show that education can also be a risk factor for childbearing through its weakening of parental controls especially where young people spend considerable periods of time in school away from parental controls (Zabin and Kiragu, 1998). Parental education is also an important determinant of adolescent childbearing, with daughters of more educated parents being more likely to delay their entry into motherhood (Tambashe and Shapiro, 1996, Lee, 2001).

Family structure is an important determinant of adolescent fertility with adolescents raised in a polygamous household being more likely to initiate sexual activity early compared to those in monogamous households (Tambashe and Shapiro, 1996). Parental survival status is also associated with early childbearing, with orphans being more likely to begin childbearing early (Tambashe and Shapiro, 1996, Cavazos-Rehg et al., 2010). Parent-child communication is an important protective factor against early sex and pregnancy. In a study conducted in Kenya, Magadi et al (2009b) found that adolescents who discussed sexual issues with their boyfriends as opposed to their parents or peers began childbearing earlier. They also noted that adolescents who made autonomous reproductive health decisions had a higher likelihood of childbearing during adolescence, as were those who had strong gender bias.

In general, major factors associated with early adolescent childbearing in developing countries include low education level, unstable family structure, absence of a father figure, low self-esteem, low socioeconomic status, early sexual debut, and experience of physical abuse (Baumgartner et al., 2009, Lion et al., 2009). In this paper, we test whether these factors are also correlated with adolescent entry into motherhood in the two slum settlements.

7

In line with the construct of risk and protective behavior as conceptualized in the Problem Behavior Theory (Jessor, 1991, Jessor, 1993, Jessor, 2008, Jessor et al., 2002, Jessor et al., 2003, Jessor et al., 1995), we also examine psychosocial variables as possible explanatory factors of adolescents' entry into motherhood. The PBT has been proposed by Jessor as a model to explain problem behaviors, including substance use, deviance, and early sexual debut. The PBT posits that problem behaviors are driven by common psychosocial root causes, including contextual attributes and individual characteristics conceptualized as three protective (models protection, controls protection, and support protection) and three risk factors (models risk, opportunity risk, and vulnerability risk). Protective factors are negatively associated with problems behavior while risk factors increase the likelihood of engaging in problem behavior (Jessor, 2008, Jessor et al., 2002, Jessor et al., 1998, Jessor et al., 2003, Jessor et al., 1995). Considering early adolescent childbearing as a problem behavior because of the adverse health, social and economic consequences associated with it, we assume that adolescent's entry into motherhood will be negatively associated with protective factors, and positively associated with risk factors.

Data and Methods

Study Design, Participants and Procedures

This paper draws on data collected under the Transition to Adulthood (TTA) component of the Urbanization, Poverty and Health Dynamics (UPHD) project that the African Population and Health Research Center (APHRC) is conducting in two informal settlements or slums, Korogocho and Viwandani, in Nairobi city. The UPHD is nested in the Nairobi Urban Health and Demographic Surveillance System (NUHDSS) that is implemented by APHRC in the two slums. The TTA is a 3-year prospective study that aims to identify protective and risk factors in

the lives of adolescents growing up in the two informal settlements, and examine how these factors influence key markers of the transition to adulthood (transitions to secondary school, sexual intercourse, marriage, parenthood, independent housing). A detailed description of the data collection procedures for the TTA project and the NUHDSS is provided elsewhere (Beguy et al., 2009a, Beguy et al., 2009b, Kabiru et al., 2010).

During the first wave (November 2007 - June 2008), 4,058 randomly selected young people aged 12-22 were interviewed at their homes (50% males). Although age definitions of adolescents vary from one culture to another, in this study we define it as the age group 15-19 years. We consider individuals aged 20 to 22 to be in their early adulthood. To generate the analytical sample of 15-19 years old girls for this paper, we first omitted 114 observations from the 4,058 successfully interviewed youth because of inconsistent or missing data on age, date of birth and/or age at first event (child, sex, marriage, housing), leaving 3,944 (1,957 females) individuals with valid data. We finally excluded all males and females aged 12-14 and 20-22. The final analytical sample therefore comprised 897 female adolescents aged 15-19 years.

Ethical approval for the study was granted by the Kenya Medical Research Institute's ethical review board. In addition, signed or verbal consent was obtained from all respondents. Parental consent was also sought for respondents aged 12-17 years. The questionnaire was translated and administered in Swahili, Kenya's national language.

Measures

Outcome variable

The outcome variable is based on answers to the following three questions: "…Have you ever given birth?" and if so, "In what month and year did you have your first child", "How old were you when you had your first child?" The outcome variable is the age at which a person makes the transition to first motherhood (uncensored individuals) or age at interview if the event had not occurred as at the time of the survey (censored individuals). A dichotomous variable (coded 1 if the first birth occurred and 0 if not) is used to define the censoring status.

Explanatory variables

Differences in the timing of entry into motherhood may be explained by socio-demographics, psycho-social factors, and other markers of the transition to adulthood. We included measures of these variables as explanatory factors in the regression models.

Socio-demographic characteristics (Table 2) used in the multivariate analysis include study site (Korogocho vs. Viwandani), age in years, educational level, ethnic group, religion, place of birth (born in slum vs. born outside), mother's survival status (mother alive or not), father's survival status (father alive or not), schooling status (in school vs. out of school). Educational attainment is divided into three categories: No education, primary education, secondary education or higher. Also, a variable indicating whether the respondent has ever used contraception was included in the analysis (Yes vs. No). We also include two key markers of the transition to adulthood namely; marital status and independent housing as part of the explanatory variables. Both marital status and independent housing are considered as time-varying variables. Marital status is coded 1 if the individual is married or lives together with a partner and 0 otherwise. Similarly, independent housing is coded 1 an individual owns or rents her house and 0 otherwise. We also included an index computed based on responses to 6 items measuring attitudes towards contraceptives as an explanatory variable.

Protective and risk factors as categorized by Jessor in the PBT were generated using composite scores derived from standardized values of individual items. Cronbach's alpha was used to assess internal consistency of scores for each composite measure (Crocker and Algina, 1986). The alpha reliabilities of the composite measures were acceptable (Cronbach's alpha >0.6) (see Table 1).

Protective factors include social controls protection, individual controls protection, and support protection. The social controls protection index was measured using 14 items related to parental monitoring and perceived peer attitudes towards antisocial behaviors. The individual controls protection includes 6 items related to religiosity, positive attitude towards schooling, resistance to peer pressure, and traditional attitudes towards sexual behavior. Support protection refers to the presence of a supportive environment and was measured using 16 items. The Multiple Pro-Social Behavior Index (MPSBI) is a composite 8-item index constructed measuring involvement in community activities (8 items).

Risk factors include models risk and vulnerability risk. The models risk index was measured using 7 items measuring models for risk behavior in family, peers, and school context. On the other hand, 23 items related to low self-esteem, low perceived life chances, adverse life experiences, and perceived peer pressure to engage in sex were used to measure vulnerability risk. The Multiple Problem Behavior Index (MPBI) is a composite index constructed measuring engagement in delinquent behaviors (4 items).

Analytic approach

All analyses are conducted using Stata 10.1. Event History Analysis (EHA) techniques are employed for analysis, with Kaplan-Meier estimates used to examine the timing of first motherhood and Cox regression models used to investigate the influence of various factors on

entry into motherhood (Allison, 1991, Cleves et al., 2008). To allow age at first motherhood to be censored, we treat it as time-to-event data. Some individuals may not have given birth by the time of survey. Individuals are considered to be at risk from birth until they first become mothers or censored at the time of the survey for those who were still childless. For girls who have yet to reach a particular age and who have not experienced first motherhood, the risk of having a first child at that age is assumed to be the same as that for individuals who have reached that age.

Cox's proportional hazards model are used for the multivariate analysis, since they do not need specification of the form of the distribution of the baseline hazard rate (Blossfeld et al., 1989, Cox, 1972, Cox and Oakes, 1984). These models also allow for use of time-varying covariates, that is characteristics whose status may change over time. When the hazard ratio is greater than one, it means a higher risk of first child in the corresponding category, as compared to the reference category. Conversely, the risk of having first child is lower when the hazard ratio is less than one. The hazard rate in the Cox model is computed as:

$h(t / z_j) = h_0(t).\exp(\beta_j z_j(t))$,

where the regression coefficients are to be estimated from the data. $h_0(t)$ is the baseline hazard function (the hazard when z=0). $Z_j(t)$ is the individual covariates vector and β_j is a vector of the regression parameters that indicate the effects of these covariates, some of them varying with t (hence the term time-varying covariate). The relative hazard are given by $\exp(z_j(t)\beta)$.

We examine variations in the timing of entry into motherhood in two age cohorts: 15-17 year olds (younger cohort) and 18-19 year olds (older cohort). Actually, being an "early" mother among 15-17 year olds could be a different phenomenon than being an "early" mother among 18-19 year olds. Indeed, the explanatory factors are likely to play a very different role in the

younger cohort than in the older cohort. In other terms, what are the correlates of "earliness" of entry into motherhood among the 15-17 year-olds as against those of the 18-19 year olds?

Results

Descriptive Analyses

Descriptive characteristics for the 897 female participants in the analytic sample are displayed in Table 2. About 15% of the 15-19 female adolescents reported having had a child, with older adolescents being more likely than the younger ones to have done so (27% vs. 5%). About 47% of adolescents were living in Korogocho and 53% in Viwandani; the same distribution is observed within the two age groups. Fifty eight percent of all adolescents were born in the slum areas; this percentage is higher among the younger cohort (65% vs. 49%). Most of the adolescents reported having their parents alive: 93% for mother and 78% for father. Similar percentages are observed for the two age groups. Overall, only 1% never attended school (1% for younger cohort and 2% for older cohort), 55% of the respondents have attained primary level of education (59% for younger cohort vs. 50% for older cohort) and 44% have at least secondary level education (40% for younger cohort and 48% for older cohort). At the time of the survey, 52% of the 15-19 female adolescents were attending school; with those from younger cohort being more likely to do so (72% vs. 27%). About 13% of the participants reported having ever been married (4% of younger adolescents vs. 24% of older ones) and 9% had ever owned or rented their residential unit (2% of younger adolescents vs. 16% of older ones).

Overall, most of the individual adolescent characteristics are significantly associated with first motherhood as shown in Table 2. The proportion of adolescents who are primiparous is higher among adolescents born outside of the slums (p<0.01), not enrolled in school (p<0.01), ever

married (p<0.01), ever been residentially independent (p<0.01), without religion (p<0.01), and those who had ever used contraception (p<0.01). The proportion of adolescents who had a child was lowest among those with at least secondary education level (p<0.01). In the younger cohort, all these associations are also statistically significant, except for that between mother's survival, father's survival and first child. In the older cohort, it is only the association between contraceptive use and first child which is not significant. Among the older cohort, contrary to what was observed in the overall sample, the proportion of primiparous adolescents is higher among those who have never used contraception although the association is not statistically significant.

In the following section, we present the results of the EHA. The results enable us to examine the timing of entry into motherhood as well as its associations with possible predictors while controlling for the effects of other important factors, using Kaplan-Meier estimates and Cox regression models.

[Table 2 about here]

Descriptive statistics on first birth among the participants are shown in Table 3. The median age cannot be calculated for the whole sample as it was not yet attained. A quarter of adolescents had their first child by age 18.9. By age 15, 1% of adolescents aged 15-17 and 3% of those aged 18-19 had their first child. By age 18, 21% of the whole sample and 34% of those aged 18-19 were already mothers.

[Table 3 about here]

Multivariate analysis

Results from the Cox models are presented in Table 4, by age cohort. Models 1 and 4 include only the socio-demographic variables. In models 2 and 5, the two other key markers of transition

to adulthood are controlled for, in addition to the socio-demographics. All the variables are controlled for in the models 3 and 6.

Among adolescents aged 15-17 years, all socio-demographic characteristics, with the exception of current school attendance, did not significantly affect the timing of entry into motherhood after controlling for other factors. Hazard ratios (HR) from the full model 3 indicate that adolescents currently attending school are significantly more likely (the HR almost equal to zero) to delay childbearing. Adolescents without education enter into motherhood earlier while those with at least secondary level of education do so at a later age although the ratios are not significant at the 5% level. The significant and negative effective of secondary education only disappears when marriage and residential independence are controlled for in the models.

There is no significant difference in the timing of childbearing based on adolescents' lifetime contraceptive use although findings show that adolescents aged 15-17 years who have ever used contraception were more likely to delay childbearing.

As expected, marriage is significantly associated with entry into motherhood. Results from Model 3 suggest that married adolescents are more than 13 times likely to get their first child earlier that the non-married adolescents. Although those who are residentially independent are also more likely to give birth earlier, the HR is not statistically significant. These effects were also observed in Model 2 that includes only those two variables and the socio-demographics.

As for protective factors, findings from Model 3 indicate that although all the HR corresponding to the protective factors are in the expected direction, i.e. less than 1, none of them is

significantly associated with the timing of making the transition into motherhood. In a model where only the psychosocial variables were controlled for (results not shown here), MPSBI and support protection are significantly associated with entry into motherhood, with both higher scores on these two indices associated with a delay in the timing of first birth. With regard to risk factors, results suggest that models risk is associated with the outcome of interest; adolescents with high level of model risk are more likely to enter into motherhood earlier. Although only marginally significant at 10%, in a model that only controls for psychosocial variables, increasing vulnerability risk is associated with earlier entry into motherhood. There is no significant difference in the timing of entry into motherhood based on attitudes towards contraception.

[Table 4 about here]

For adolescents aged 18-19 years, findings indicate similar associations when it comes to socio-demographics and transition markers. School attendance considerably delays entry into motherhood, while marriage hastens its timing. As with the 15-17 years old, older adolescents with at least a secondary level of education delay their entry into motherhood although the corresponding hazard ratio is not significant at the 5% level. The negative effect of secondary education became insignificant after the introduction of psychosocial variables in the full model (they were highly significant in previous models). No significant difference is observed with regard to the other socio-demographics.

Among the protective factors, social and individual controls protection are significantly associated with timing of entry into motherhood. Adolescents with high levels of these two

factors are likely to delay their entry into motherhood (chances are reduced by 24% and 27% for social control and individual control respectively). None of the risk factors is significantly associated with timing of entry into motherhood in the older cohort although in a model that only controls for psychosocial variables, adolescents with high vulnerability risk are likely to enter into motherhood earlier. As with the younger cohort, there is no significant difference in the timing of childbearing based on attitudes towards contraception.

Discussion

In this paper, we draw on data collected from 15-19 year old adolescents in two resource-poor settings in Nairobi to investigate patterns and determinants of the timing of entry into motherhood. We focus on the association between the timing of childbearing and other key transitions to adult roles, socio-demographic characteristics, and psychosocial variables. This study adds to the growing body of evidence on transition to adult roles among young people in urban informal settlements in sub-Saharan Africa.

Our findings suggest that some female adolescents become mothers at very young ages; 21% of the whole sample and 34% of those aged 18-19 are already mothers by age 18. Given their incomplete physical maturity, these young females are likely to face special risks during pregnancy and delivery, especially in such resource-poor settings characterized by lack of basic health facilities and relatively high cost of health care (Izugbara et al., 2009). In addition, in a context where educational and employment opportunities are scarce, younger mothers are more likely to drop out of school and hence have reduced opportunities for gainful employment. As Miller and Moore (1990) noted in their review of data from the US, "living in poverty is associated with both early sexual activity and early pregnancy. As socioeconomic status

decreases, rates of sexual activity and early pregnancy rise… This effect may operate through a perceived lack of options and desirable alternatives for the future. It may also operate through community norms and supervision practices (p.1030)." Consequently, programs aiming to reduce risky sexual behaviors that could lead to childbearing among adolescents should be introduced very early, and before the onset of sexual activity. Further, these programs must be made in tandem with initiatives to enhance livelihood prospects for those in lower income brackets.

As expected, marriage has a strong relationship with the timing of first birth for both younger and older cohorts, with adolescents who are married or living together with their partners entering into motherhood significantly earlier than those who are not. This is consistent with previous evidence that shows that marriage is a key driver of fertility in sub-Saharan Africa although out-of-wedlock childbearing is increasingly common in the region (Tambashe and Shapiro, 1996). It is apparent that union increases the frequency of fertile sexual intercourse. Consequently, efforts to reduce early childbearing must include initiatives to discourage girls from marrying early. Early childbearing that often stems from early marriage entails potential health risks for the young mother and the child (Zabin and Kiragu, 1998). Early marriage may also limit educational opportunities and may occur when the young person is not fully prepared to take over marital and parental responsibilities (Singh and Samara, 1996). In many cases, early marriage is associated with higher chances of divorce or separation, which may leave the young mother bearing the sole responsibility of raising the child, without any social or family support, either emotionally or financially.

Education was found to be a strong predictor of the timing of childbearing. Specifically, being in school was associated with a delay in the timing of childbearing. Although the observed

association between school enrollment or educational level may be misleading because some girls who are not in school at the time of the survey could have dropped out of school because of pregnancy-related reasons, previous studies do show that in-school youth tend to delay sexual activity (Ajayi et al., 1991, Kabiru et al., 2010). This suggests that even within impoverished communities like slum settlements, education is an important pathway for reducing early childbearing and associated negative reproductive health and socio-economic outcomes. This needs to be further enlightened through, for instance, exploration of the association between school curricula, including sexual and reproductive health education, and reproductive outcomes among girls living in such poor settings. Other studies have also found that adolescents with at least secondary education are less likely to give birth or get pregnant than those with no or little formal education (Quamrun and Hosik, 2008, Magadi and Agwanda, 2009a, Mboup and Saha, 1998). In their analysis of DHS data in eight countries in sub-Saharan Africa, Gupta and Mahy (2003a) found a strong negative influence of education on the probability of childbearing in all countries. In particular, they conclude that ensuring that young girls receive at least a secondary level of education is the most optimal way of delaying childbearing. Our analyses somehow support this argument – adolescents with at least secondary education level enter into motherhood later. It may be not only important to enroll girls in school, but also necessary to retain them in the education system until they complete secondary school. Consequently, policies and programs such as universal primary education should be extended to ensure increased access to and completion of secondary education. However, this may not be done in isolation as the poor job prospects in poor settings such as slums may lower the motivation among young girls to complete secondary school.

Although the hazard ratios are not statistically significant, being residentially independent appears to hasten entry into motherhood for both age cohorts. Given the space constraints that typify the slum settlements in Nairobi, young adults are almost forced to leave their parental home, leaving them highly exposed to risky sexual behaviors that lead to increased risks of early childbearing, especially in an environment where contraceptive use is low (Dodoo et al., 2007, Amuyunzu-Nyamongo and Magadi, 2006). Further investigations are needed to understand the consequences of home leaving among adolescents living is such poor settings.

Overall, our findings provide some support for the theoretical concepts of models (both protection and risk), controls (both individual and social), supports, and vulnerability in the PBT. Among 15-17 year old adolescents, models risk (the presence of models for problem or anti-social behaviors, including early sexual activity) is significantly associated with entry into motherhood, with those having high models risk being more likely to get a first child earlier. This indicates the vulnerability of the younger girls in an environment where indulgence in problem behaviors is common practice. In a recent study, Ndugwa and others (2010) found that models risk is a strong predictor of involvement in problem behavior among 12-19 years old adolescents living in Korogocho and Viwandani slum settlements in Nairobi. In contexts typified by early childbearing, young parenthood may become normative, meaning that young girls become pregnant because many of their peers and family members also begin childbearing early.

Social controls protection, such as parental monitoring and perceived peer disapproval of antisocial behaviors, reduce the likelihood of early entry into motherhood for 18-19 years old female adolescents living in slum settlements. This is consistent with other evidence that shows that parental monitoring often prevents young people from engaging in risky sexual behaviors that could trigger early childbearing (Babalola et al., 2005, Kumi-Kyereme et al., 2007).

Previous findings from Nairobi slums show that it is the father's presence, in particular, which is associated with lower risk of engaging in sexual activity and, hence, lower risk of pregnancy (Ngom et al., 2003). Also, adolescents often identify themselves with peer groups while growing up, allowing the latter to serve as models for appropriate behavior. Adolescents' sexual behavior has been found to be associated with peers' attitudes and behaviors in slum and non-slum communities in Nairobi (Kabiru et al., 2010). In addition, 18-19 years old adolescent girls with strong individual control protection such high religiosity, and positive orientation toward school are likely to delay their first birth. It is possible that highly religious adolescent girls are frequently exposed to moral messages against early sexual debut and pregnancy; and also likely to commit to stand by such teachings given their stronger religious engagement. Moreover, they may often interact within a network of religious peers who serve as models for conventional behaviors. This finding also suggests that adolescents with high educational expectations might choose to delay sexual experience and childbearing to meet those expectations.

Study findings should be interpreted in light of several limitations. First, analysis is based on self-reported information and thus, is subject to self-report bias. For example, there is possible under-reporting of children who died shortly after birth. Also, retrospective recording of timing of first birth, marriage and independent housing may affect the accuracy of reporting. Second, most of the independent variables are time-invariant, thus limiting the possibility of inferring causality. As a result, most of the findings do not infer causation apart from those related to marriage and independent housing. They rather denote association between the independent variables and entry into motherhood. Further, we could not control for another marker of the transition to adulthood, i.e. entry into income generating activity as the related data were not

collected during the Wave 1 of TTA used in this paper. We also lack qualitative information to enlighten the quantitative findings.

These limitations notwithstanding, our findings highlight some key factors that are likely to be important drivers of early entry into motherhood among the two age groups of adolescents living in urban slums. We note that our findings support the need for programs or policies that enhance control protection, buffer or moderate models for risk behavior, keep girls in school, and improve livelihood opportunities among adolescents at high risk of early childbearing.

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Table 1. Description of items used to measure protective and risk factors

	Items	Response Codes
	Social Controls Protection (Cronbach's alpha = 0.83)	
1-9	How much would you say your parents/guardians really know about the following things about you: Where you spend time in the evenings on weekdays? Who you spend time with in the evenings on week days? Where you spend time on weekends? Who you spend time with on weekends? What you do during your free time? How you spend your money? Whether you have or do homework? What TV programs, videos, or films you watch? Who your friends are?	1 (Never know) to 3 (Always know)
10-11	How often does your parent/guardian scold or reprimand you when you do something wrong; for example, if you come home late, don't do your chores, watch too much TV? When you do something wrong, how often does your parent/guardian spank or slap you?	1 (Never) to 5 (Every time)
12	If you are currently in school, how important is it to your friends that you do well in school?	1 (Not too important) to 3 (Very important)
13-14	How do most of your friends feel about someone your age drinking alcohol? How do most of your friends feel about someone your age using marijuana or other drugs?	1 (Strongly disapprove) to 4 (Strongly approve)
	Individual Controls Protection (Cronbach's alpha = 0.76)	
1-6	How important is it to you to rely on religious teaching when you have a problem? How important is it to you to believe in God? How important is it to you to rely on religious beliefs as a guide for day-to-day living? How important is it to be able to turn to prayer when you are facing a personal problem? How important are the following things to you: Finishing secondary school? Going to university?	1 (Not important) to 4 (Very important)
	Support Protection (Cronbach's alpha = 0.83)	
1-4	Since the beginning of this school year how often has your (father/father figure) checked your homework or asked you to make sure you had done it? Since the beginning of this school year, how often have you talked to your (father/father figure) about any progress or problems you were having at school? Since the beginning of this school year how often has your (mother/mother figure) checked your homework or asked you to make sure you had done it? Since the beginning of this school year, how often have you talked to your (mother/mother figure) about any progress or problems you were having at school?	1 (Never) to 5 (Almost every day)
5-10	How often does your father/father figure teach you things you didn't know? How often do you share secrets or private feelings with your father/father figure? How often does your father/father figure try to help you when you need something? How often does your mother/mother figure teach you things you didn't know? How often do you share secrets or private feelings with your mother/mother figure? How often does your mother/mother figure try to help you when you need something?	1 (Never) to 5 (All the time)

1 (Never) to 5 (Almost every day) |
11--16	Please indicate whether you agree or disagree with the following statements: You feel very close to your girlfriend/boyfriend. Your girlfriend/boyfriend always takes the time to talk over your problems with you. When you are with your girlfriend/boyfriend you feel completely able to relax and be yourself. No matter what happens, you know that your girlfriend/boyfriend will always be there for you. You know that your girlfriend /boyfriend has confidence in you. Your girlfriend /boyfriend /partner often lets you know that he/she thinks you are a worthwhile person.	1 (Strongly agree) 4 (Strongly disagree)
	Models Risk (Cronbach's alpha = 0.77)	
1-7	Have any of your brothers or sisters ever had to drop out of school for any reason? Have any of your brothers or sisters ever had premarital sex? Have any of your brothers or sisters ever smoked or do any currently smoke cigarettes? Have any of your brothers or sisters ever drunk or do any currently drink alcohol? Do you know of any close friends who have kissed or been kissed? Do you know of any close friends who have fondled or been fondled? Do you know of any close friends who have had sexual intercourse?	
	Vulnerability Risk (Cronbach's alpha = 0.79)	
1-5	In the last month, has your family/household ever not had enough food to feed everyone? In the past three months has your family/household suffered because your parent(s)/guardian(s) were out of a job? Were you ever kicked out of the home by a parent/guardian? Did your parents ever divorce or separate? Sometimes parents or other adults hurt children. Has a parent or other adult living in your home ever hit you hard enough to cause injury?	1 (Yes), 2 (No)
6-7	How well do you get along with others your age? How well do you live up to what other people expect of you?	1 (Very well) to 4 (Not well at all)
8	What about your ability to do well in school (even if you are not in school currently)?	1(Very able) to 4 (Not able at all)

Table 1. Description of items used to measure protective and risk factors

	Items	Response Codes
9	How attractive do you think you are?	1 (Very attractive) to 4 (Not attractive at all)
10	On the whole, how satisfied are you with yourself?	1 (Very satisfied) to 4 (Not satisfied at all)
11	How much peer pressure is there on people your age to have sex?	1 (None) to 4 (A lot)
12-23	What are the chances that: you will finish primary school? You will join secondary school? You will finish secondary school? You will go to university? You will have a job that pays well? You will be able to own your own home? You will have job that you enjoy doing? You will have happy family life? You will stay in good health most of the time? You will not get HIV/AIDS? You will not be able to move out of this area? You will be respected in your community?	1 (High) 3 (Low)
	Multiple Problem Behavior Index (Cronbach's alpha = 0.69)	
1-4	Delinquent behaviors: How many times have you done any of the following things in the last 4 months: You stayed away from home at least one night without your parent's permission? You started a fight with your peers? You took or tried to take something that belonged to someone else, without their knowledge? You hit or threatened to hit a peer or adult?	0 (Never), 1 (Once), 2 (More than once)
	Multple Pro-Social Behavior Index (Cronbach's alpha = 0.67)	
1-8	Civic participation: Do you belong to a [group]? (Groups: religious group, foot/netball club, Drama group/Dance group/Choir, Anti-AIDS club, Anti-drugs club, Girl guides/boy scouts, Wildlife society, Self-help group)	1 (Yes), 2 (No)
	Attitudes towards contraception (Cronbach's alpha = 0.74)	
1-6	It's smart to use birth control to prevent an unplanned pregnancy. Using birth control is just too much of a hassle. It is a good idea to use condoms to protect against getting AIDS. It's just not right to use birth control. The whole idea of birth control is embarrassing to me. Teenagers who use birth control show they care about themselves and their future	1 (Agreed) 2 (Disagree)

Table 2. Descriptive characteristics of the sample of 15-19 female adolescents by age cohort

Socio-demographics	15-17 years old (N=498)			18-19 years old (N=399)			15-19 years old (N=897)		
	% distribution	% first child		% distribution	% first child		% distribution	% first child	
Total	100.0	4.6		100.0	27.3		100.0	14.7	
Slum of residence									
Korogocho	53.0	4.5		52.4	28.2		52.7	15.0	
Viwandani	47.0	4.7		47.6	26.3		47.3	14.4	
Born in the slum?									
No	35.3	6.8	*	50.6	33.7	***	42.1	21.2	***
Yes	64.7	3.4		49.4	20.8		57.9	10.0	
Mother alive									
No	5.6	10.7		8.8	45.7	**	7.0	30.2	***
Yes	94.4	4.3		91.2	25.5		93.0	13.5	
Father alive									
No	20.9	4.8		23.6	38.3	***	22.1	20.7	***
Yes	79.1	4.6		76.4	23.9		77.9	13.0	
Ever used contraception									
No	95.0	3.6	***	84.5	27.9		90.3	13.7	***
Yes	5.0	24.0		15.5	24.2		9.7	24.1	
Currently in school									
No	28.1	16.4	***	73.2	37.3	***	48.2	30.6	***
Yes	71.9	0.0		26.8	0.0		51.8	0.0	
Education level									
Never attended school	0.8	25.0	***	1.8	42.9	***	1.2	36.4	***
Primary	58.6	7.2		49.6	42.9		54.6	21.6	
Secondary	40.2	0.5		47.9	10.5		43.6	5.4	
Other	0.4	0.0		0.8	33.3		0.6	20.0	
Ever married/lived together									
No	96.2	2.5	***	76.2	11.8	***	87.3	6.1	***
Yes	3.8	57.9		23.8	76.8		12.7	73.7	
Ever rented/owned a house									
No	97.8	3.7	***	83.7	20.4	***	91.5	10.5	***
Yes	2.2	45.5		16.3	63.1		8.5	60.5	

Note: p-value: * p<0.1, **p<0.05; *** p<0.001

Table 3. Descriptive statistics of age at first birth by age cohort

Birth cohort		15-17	18-19	Total
Proportion having a first birth by age	12	0%	0%	0%
	13	0%	1%	0%
	14	1%	1%	1%
	15	1%	3%	2%
	16	2%	4%	3%
	17	8%	16%	13%
	18	-	24%	21%
	19	-	31%	29%
Age at	First quartile	n.a	18.9	19.0
	Median	n.a	na	n.a
	Third quartile	n.a	n.a	n.a
Person years at risk		8164.4	7365.1	15529.5
N		498	399	897
Events		23	109	132

- Note: na=Not attained

Table 4. Hazard ratios of giving first birth among female adolescents by birth cohort (Cox model)

Variables	Hazard ratios (95% Confidence Interval)					
	15-17 years old			18-19 years old		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Socio-demographics						
Age (in years)	1.22 (0.56 - 2.67)	1.20 (0.45 - 3.20)	1.12 (0.21 - 6.08)	0.85 (0.55 - 1.31)	0.73 (0.46 - 1.14)	0.81 (0.51 - 1.29)
Slum residence (ref. Koch)						
Viwandani	0.81 (0.27 - 2.44)	0.24** (0.06 - 0.94)	0.31 (0.04 - 2.41)	0.89 (0.53 - 1.49)	0.92 (0.57 - 1.48)	1.06 (0.67 - 1.70)
Education (ref. primary)						
Never attended	4.95 (0.60 - 41.04)	2.00 (0.42 - 9.42)	4.80 (0.60 - 38.67)	2.06 (0.49 - 8.67)	1.88 (0.61 - 5.79)	2.74 (0.77 - 9.80)
Secondary or higher	0.13* (0.02 - 1.05)	0.29 (0.04 - 2.35)	0.20 (0.01 - 3.61)	0.41*** (0.24 - 0.70)	0.57** (0.35 - 0.94)	0.67 (0.37 - 1.18)
Other	0.30 (0.04 - 2.05)	0.05*** (0.01 - 0.33)	0.21 (0.01 - 4.61)	0.73 (0.10 - 5.17)	0.33 (0.03 - 4.45)	0.42 (0.03 - 5.12)
Currently in school	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)	0.00*** (0.00 - 0.00)
Born in slums	0.64 (0.27 - 1.53)	0.71 (0.25 - 1.97)	0.47 (0.14 - 1.66)	0.68 (0.40 - 1.13)	0.98 (0.58 - 1.67)	0.95 (0.57 - 1.59)
Mother alive	0.56 (0.07 - 4.38)	0.67 (0.13 - 3.40)	0.43 (0.06 - 2.88)	0.67 (0.34 - 1.34)	0.79 (0.39 - 1.58)	0.60 (0.29 - 1.23)
Father alive	1.77 (0.43 - 7.23)	1.87 (0.48 - 7.27)	2.80 (0.39 - 20.16)	0.87 (0.55 - 1.38)	0.98 (0.59 - 1.62)	0.96 (0.58 - 1.59)
Ever used contraception			0.98 (0.13 - 7.64)			0.73 (0.39 - 1.37)
Transition markers						
Married		18.46*** (6.67 - 51.12)	13.72*** (1.99 - 94.40)		8.16*** (5.15 - 12.95)	8.22*** (5.24 - 12.90)
Owned or rented a house		1.44 (0.40 - 5.19)	1.12 (0.15 - 8.28)		1.14 (0.71 - 1.83)	1.09 (0.65 - 1.82)
Psychosocial variables						
MPBI			1.53 (0.86 - 2.72)			1.10 (0.83 - 1.46)
MPSBI			0.64 (0.10 - 4.21)			0.93 (0.46 - 1.88)
Social control protection			0.61 (0.26 - 1.46)			0.76** (0.59 - 1.00)
Individual control protection			1.29 (0.53 - 3.15)			0.73** (0.54 - 0.98)
Social support protection			1.11 (0.39 - 3.14)			1.09 (0.80 - 1.50)
Model risk			2.27** (1.14 - 4.52)			1.03 (0.78 - 1.35)
Vulnerability risk			1.15 (0.27 - 4.92)			1.39 (0.81 - 2.42)
Positive attitudes towards contraception			1.27 (0.41 - 3.87)			0.70 (0.42 - 1.18)
Wald Chi-square	11001.622***	19727.065***	10400.520***	18609.371***	29892.313***	33661.686***
-2Log Likelihood	188.96	162.54	150.16	1122.66	1030.7	1013.24
Subjects (events)	498 (23)	498 (23)	498 (23)	399 (109)	399 (109)	399 (109)
Time at risk	8164.359	8164.359	8164.359	7365.094	7365.094	7365.094

Note: p-value: * p<0.1, **p<0.05; *** p<0.01. Models controlled for ethnicity, religion.