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Hope, the Household Environment, and Sexual Risk Behaviors Among Young Women in Rural South Africa (HPTN 068)

Lauren M Hill[1,*], **Laurie Abler**[1], **Suzanne Maman**[1], **Rhian Twine**[2], **Kathleen Kahn**[2], **Catherine MacPhail**[2,3,4], and **Audrey Pettifor**[5]

[1]Department of Health Behavior, UNC Chapel Hill, Chapel Hill, NC

[2]MRC/Wits Rural Public Health and Health Transitions Research Unit (Agincourt), School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

[3]Wits Reproductive Health and HIV Institute, University of the Witwatersrand, Johannesburg, South Africa

[4]School of Health and Society, University of Wollongong, NSW, Australia

[5]Department of Epidemiology, UNC Chapel Hill, Chapel Hill, NC

Abstract

We assessed the psychological trait of hope as an explanatory mediator in the relationship between the home environment and sexual risk behaviors among 2533 young women in rural South Africa. Hope mediated the relationship between average household age and sexual debut (mediated effect = −0.003, p<.05), and between household consumption and sexual debut (mediated effect = −0.019, p<.05). Both higher average household age (β = 0.01; 95%CI: 0.00, 0.01) and greater household consumption (β = 0.05; 95%CI: 0.02, 0.08) were marginally associated with higher hope. In turn, greater hope was associated with lower odds of sexual debut (aOR= 0.62; 95%CI: 0.52, 0.74). These results provide important preliminary evidence of the role of the home environment in shaping protective psychological assets and healthy sexual behaviors. Continued exploration of the relationship between hope and the home environment may help to explain why young women in this context have a disproportionate risk for HIV.

Keywords

Hope; household; sexual risk; South Africa; young women; HIV

[*]**Please direct all correspondence to:** Lauren M Hill, 324 Rosenau Hall, CB #7440, Chapel Hill, NC 27599, hilllm@email.unc.edu, 919-966-3761.

COMPLIANCE WITH ETHICAL STANDARDS:

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

Conflict of interest:

The authors declare that they have no conflicts of interest.

INTRODUCTION

Adolescence is a critical period when young people experiment and develop patterns of behavior that they will carry into adulthood [1]. In this period of sexual development, young women in South Africa are at especially high risk; the prevalence of HIV among women ages 15–24 is approximately 14% (versus 4% among men) [2]. As young women transition into adulthood, the prevalence of HIV rises to nearly a third among women ages 20–34 [3]. Adolescents' likelihood of engaging in risk behaviors is shaped by the household, school, and other elements of the social environment [4]. In South Africa, household resources and composition may influence young women's sexual behaviors [5]. Household members can act as an important safety net [6,7] because families provide important support to vulnerable youth [8]. Specifically, higher levels of household education and a stable family structure can help create environments that are conducive to young women delaying their sexual debut [9–11]. In contrast, household poverty has been linked to increased risk of HIV [12] and sexual risk behaviors [5]. Further household characteristics that may promote an adverse environment for young women include: a larger household size [13]; more young people in the household and fewer young people enrolled in school [14]; households headed by females and uneven gender distribution in the household [13–15]; and residing apart from a biological parent [15,16].

These observed associations may be explained by the fact that the family and household environment play an important role in shaping young women's psychological development, which in turn relates to behaviors important to HIV [17,18]. Adolescence is not only a critical period with regard to HIV risk, but it is also a time when youth are learning to gauge the impact of their behavior on possible outcomes. Adolescents, especially those who believe their future holds little promise, may feel like they have little reason or *hope* to try to reduce risk even if they do understand the consequences of their behavior [19]. Hope is a type of future expectancy that promotes the consideration of the most desirable future even if the likelihood of that future is improbable [20], motivating individuals to act to achieve a future goal [21]. It is a positive attribute in the developmental process of learning to navigate risks and plan for the future, promoting behavioral self-regulation [22] by aiding in future planning and risk avoidance when confronted with a challenging environment [23,24]. Hope may influence sexual behaviors by motivating people to protect themselves from risk in order to reach desired future goals.

Hope may be influenced by the social environment [20], and is a theorized mediator between the home environment in resource-poor settings and engagement in HIV-risk behaviors [18]. An adverse home environment may diminish hope by negatively affecting how individuals perceive their future opportunities, thus creating a sense of hopelessness [25]. Specifically, household socioeconomic status (SES) is negatively associated with young people's hopelessness [26,27]. In turn, hope may shape young women's sexual behaviors, and therefore their HIV risk [28,29]. While there is evidence that hope may be an important protective factor in the context of care and treatment of people living with HIV [31–36], less is known about how hope may affect the prevention of HIV. Two studies have empirically demonstrated the relationship between hope and HIV-related risk behaviors in resource poor settings [37,38], however these studies were conducted in the US in settings

with relatively low HIV prevalence. No other studies have been conducted to understand the role of hope in a high prevalence setting, such as South Africa, among youth. Given calls for structural interventions to reduce HIV risk [39,40], explanations of how structural elements of the home environment may influence risk behaviors are required. As such, we need evidence of the role of factors such as hope as potential mediators of the relationship between the home environment and sexual risk behaviors in this context. To address this gap in the literature, using data from an HIV prevention conditional cash transfer trial we explored hope as a psychosocial asset in HIV prevention among young women in rural South Africa, as a mediator of the relationship between the home environment and sexual behaviors.

METHODS

This study was conducted in the context of HPTN 068: *Effects of cash transfer for the prevention of HIV in young South African women*, which took place at the South African Medical Research Council and the University of Witwatersrand Agincourt Health and Socio-Demographic Surveillance System (HDSS) site in the rural Agincourt sub-district in Mpumalanga province, South Africa [41]. The study site is located approximately 500 km northeast of Johannesburg. This area is characterized by high rates of poverty, unemployment, and circular labor migration. In 2010 the HIV prevalence in Mpumalanga was 21.8% among adults ages 15–49 [3] and the prevalence in the study area was 5.5% among 15 to 19-year-old women, rising to 27% by ages 20–24, and reaching 46% by ages 35–39 [42]. The parent study was a randomized control intervention trial which provided cash transfers to young women ages 13–20 and their families conditional upon young women's school attendance to reduce the incidence of HIV, HSV-2, and sexual risk behaviors [43]. The present research occurred during the baseline assessment of the parent study prior to the random assignment of the young women to the intervention or control arm.

Sample and procedures

The parent study randomly selected households in which young women ages 13–20 resided using the Agincourt HDSS census data. To be eligible, the young women had to live in the Agincourt HDSS study villages, be currently enrolled in grades 8–11 at a secondary school in the Agincourt HDSS area, be willing to provide consent, have a parent/guardian willing to give consent to the study (if under 18 years), plan to live in the study villages for at least three years, be literate in order to complete the survey, and have the documentation required to open a bank account to receive cash transfers. Only one young woman from each household could be enrolled, with selection priority given to those in grades 9 or 10. If there was more than one young woman in grades 9 or 10 in the same household, one was randomly selected using the ''next birthday'' method. The same method was used to select among multiple young women in grades 8 or 11 if there were none in grade 9 or 10 in the household. For each enrolled young woman, a parent or guardian was also consented, enrolled, and invited to complete a household baseline survey. The young women participated in a separate baseline survey. The household survey included questions about the members of the household, food and non-food consumption and expenditures, loans and transfers, and negative and positive household events. Study interviewers administered the

household surveys to the parent/guardian using a Computer-Assisted Survey Instrument (CASI). The young women's survey included questions related to socio-demographic characteristics, schooling, sex partners and related risk behaviors, gender roles in relationships, friends, and psychological well-being including hope. Due to the sensitive nature of the questions for the young women, the surveys were conducted separately in private locations using an Audio Computer-Assisted Survey Instrument (ACASI). The baseline survey was administered by trained female interviewers between March 2011 and December 2012 in 28 villages in the Agincourt HDSS. Participants had the option to complete the survey in either English or xiTsonga. All 2533 enrolled participants and a parent/guardian completed the baseline survey.

Study measures

Hope—We used a 12-item measure of hope that assesses anticipation of a positive future (e.g., "I know that my life will be better in the future"), motivation for goal achievement (e.g., "I can achieve my dreams if I focus on them"), and the influence of others on hope (e.g. "the important people in my life tell me that I will have a successful life") [44]. Participants rated each statement on a 4 point Likert-type scale, with responses ranging from 1 ("totally disagree") to 4 ("totally agree"). Response values were averaged to create a summary hope score with higher scores indicating more hope (range 1–4, with higher scores indicating greater hope). The Cronbach's alpha for the hope scale was 0.95.

Household demographics—Parents/guardians reported their gender and provided information on household composition, including if at least one biological parent of the young woman resided in the household, the number of household residents, the age and gender of all household members, and the number of youth ages 5–24 in school. We calculated the 'percent youth enrolled in school' from the number of youth in school divided by the total number of youth ages 5–24. Further we averaged the ages of all household residents to create the 'average household age' variable as an indicator of the balance between adults and children in the household.

Household SES—In order to characterize multiple dimensions of household SES that have the potential to affect young women's sexual risk behaviors, as suggested by Wojcicki et al. [45], we measured two aspects of SES: 1) household consumption and 2) parent education. We used a measure of household consumption which accounts for the current monetary value of reported household food and non-food consumption and spending [46,47]. We chose a consumption measure over an asset index because consumption measures are considered better indicators of current income [48]. Household consumption level was measured as the sum of the spending and production value of over 100 listed food and non-food items in South African Rand consumed in the previous 30 days. We used a per capita measure by dividing the household consumption by the number of people in the house, and log-transformed this measure so that the coefficient estimates for household consumption would represent the effect of a relative one percent increase in consumption [49].

Parent/guardian education—Parents/guardians were asked to indicate the highest grade they had finished, ranging from "0" (none) to "15" (completed tertiary schooling). These responses were collapsed into three categories: no education, primary schooling (up to completion of grade 6), and secondary schooling (completion of grade 7 and above) [50].

Young women's sexual behavior—We asked young women to report if they were sexually active (ever having had vaginal or anal sex/never having had vaginal or anal sex). We also asked young women if they had used a condom at last sex to create a measure of "non-condom use."

Analysis

2533 young women who completed the baseline survey were included in analyses pertaining to sexual debut. For analyses specific to the outcome of non-condom use, the 689 sexually active respondents to the question about condom use at last sex were included in analyses pertaining to the outcome of condom use. All statistical analyses were conducted using SAS version 9.4 [51]. Descriptive statistics were used to describe the study sample, including the young women's household environment, sexual risk behaviors, and hope. Next we fit linear regression models to examine the association between the household environment variables and hope. We used logistic regression to test the relationship between hope and each sexual behavior. For comparison with the mediated effect, the total effects (unmediated) were estimated by regressing non-condom use and sexual debut on each household characteristic. We assessed mediation by hope for each of these relationships by estimating the indirect, or mediated effect, using the PROCESS macro v2.16 [52]. In the estimation of all pathways in the mediation analysis we included the young women's age as a control variable. The presence of statistical mediation was determined by assessing the indirect (mediated) effect of each household variable on each sexual behavior variable through the mediator of hope [53]. For each model, indirect effects were calculated as the product of the parameter estimates for path *a* and path *b* and standard errors and bias-corrected bootstrapped confidence intervals for indirect effects were based on 5000 bootstrap resamples [53,54].

The estimated pathways for the mediation analyses are depicted in Figure 1. The *a* path represents the association between each household composition variable and hope. The *b* path represents the association between hope and the sexual risk indicator, controlling for the household composition variable. The *c* path represents the association between the household composition variable and the sexual risk indicator (the total effect with no control for the mediator), and the *c*' path represents the association between each household composition variable and the sexual risk indicator, controlling for hope (the direct effect). The mediated effect or indirect effect, a*b, quantifies the effect of each independent variable on the dependent variable through the mediator of hope [55]. Evidence that a*b is different from zero is consistent with mediation [55].

Ethical Review

The study was approved by the ethical review committees at the University of North Carolina at Chapel Hill and the University of the Witwatersrand in Johannesburg, South Africa. Individual written informed consent was obtained from all study participants. Young

women ages 13–17 completed informed assent and parents/guardians also consented to their daughter's participation in the study, while young women ages 18–20 provided informed consent for their own participation.

RESULTS

Sample characteristics

2533 young women participated in the baseline survey, and are included in analyses pertaining to sexual debut. 689 of these young women reported being sexually active at the time of the baseline survey and are included in analyses pertaining to condom use. Table 1 provides an overview of the sample characteristics for young women and their households. The young women's ages ranged from 13–20 (mean [SD] = 15.7 [1.7]). 27% of the young women had experienced sexual debut. Among the sexually active young women (n=689), 40% had not used a condom at last sex. On average, women reported high levels of hope (mean=3.4, range 1–4). Most young women lived with a biological parent (91.1%). The average household age was 22.6 years old (SD = 7.2). On average, 86% of school-aged youth in the household were enrolled in school (SD = 19%). More than half of the young women lived with a parent/guardian who had completed some secondary school or higher (55.9%), and 20% lived with a parent/guardian with a primary school education or less. The average household consumption per capita over the past month was 500.37 Rand (SD = 904.11), about 24 US Dollars.

Associations between household environment and hope (a path)

The relationships between the household environment variables and hope are presented in the columns corresponding to the *a* path in Table 2 (all young women) and Table 3 (sexually active young women only). In exploring the associations between household composition and hope in the full sample, a higher average household age was associated with greater hope though at a small magnitude. Specifically, a one year gain in average age corresponded to a 0.01 unit gain in young women's hope ($\beta = 0.01$; 95% CI: 0.00, 0.01). Having a biological parent in the household and the proportion of children enrolled in school were not associated with young women's level of hope in the full sample. Among sexually active young women specifically (Table 3), having a biological parent in the household was counterintuitively negatively associated with hope; young women living with a biological parent had on average a 0.21 lower hope score than young women who not living with a biological parent ($\beta = -0.21$; 95% CI: −0.40, −0.02). A higher average household age was associated with greater hope among sexually active young women, though again at a small magnitude. Specifically, a one year gain in average age corresponded to a 0.01 unit gain in young women's hope ($\beta = 0.01$; 95% CI: 0.00, 0.02). The proportion of children enrolled in school were not associated with young women's level of hope among sexually active young women.

Among the tested relationships between the household SES variables and hope, parent/guardian education was not significantly associated with hope in either the full sample or the sexually active sub-sample. Greater household consumption was significantly associated with greater hope in the full sample (Table 2). Specifically, a one percent gain in household

consumption corresponded to a 0.05 unit increase in young women's hope (β = 0.05; 95% CI: 0.02, 0.08). Household consumption was not significantly associated with hope among the sexually active young women.

Association between hope and sexual risk behaviors (b path)

The relationships between hope and each sexual behavior are represented by the reported *b* paths in Tables 2 and 3 for sexual debut and non-condom use, respectively. Women with greater hope had lower odds of having sexually debuted than young women with lower hope, adjusting for age; a one unit gain in hope was associated with 38% lower odds of having sexually debuted (aOR = 0.62; 95% CI 0.52, 0.74). Hope was not significantly associated with non-condom use at last sex.

Associations between household environment and sexual behaviors (c path)

The total effect relationships between the household environment variables and each sexual behavior are represented by the reported *c* paths in Tables 2 and 3 for sexual debut and non-condom use, respectively. Among all relationships tested, only mean household age was significantly associated with sexual debut and non-condom use with a small effect. A higher average household age was associated with slightly lower odds of sexual debut. Specifically, a one year gain in average household age corresponded to 2% lower odds of having had a sexual debut (aOR = 0.98; 95% CI 0.97, 0.99). A one year gain in average household age was also associated with slightly lower odds (3%) of non-condom use (aOR = 0.97; 95% CI 0.95, 0.99).

Mediation by hope

The estimates of the mediated effects are presented in Table 2 (sexual debut) and Table 3 (non-condom use). The relationships between mean household age and sexual debut, and between household consumption and sexual debut were significantly mediated by hope (Table 2). The relationship between mean household age and sexual debut was partially mediated by hope, with the total effect (c path; aOR = 0.98, 95% CI 0.96, 0.99) being roughly the same as the direct effect (c' path; aOR = 0.98, 95% CI 0.97, 0.99). Mediation by hope in the relationship between household consumption and sexual debut was also statistically significant, and the pattern of mediation specifically indicated suppression of the relationship by hope [56]. While the mediated (indirect) effect of household consumption was negative (β=−0.019, p<.05), the direct effect was positive (c'path; aOR = 1.03; 95% CI 0.91, 1.16) and larger than the total effect (c path; aOR = 1.01; 95% CI 0.89, 1.14). None of the relationships between the household environment and non-condom use were significantly mediated by hope (Table 6).

DISCUSSION

We present evidence from a large sample of young women ages 13–20 in Agincourt, South Africa of hope's relationship with the household environment and sexual risk behaviors. The majority of young women in the sample reported high hope for their future, which aligns with previous studies of adolescents in the US [57,58], and in South Africa [27]. Our results show that hope is associated with facets of the household environment. In particular, young

women with greater hope lived in households with a higher average age and in higher SES households (based on household consumption). In general, households in our sample reported low levels of consumption per capita suggesting limited wealth and access to resources. Helping households to improve the resources they have to meet their food and nonfood needs may help young women build hope. Young women with higher hope were also less likely to report having had a sexual debut. The negative association between hope and sexual debut suggests that efforts to help school-attending young women delay initiating sexual activity, an essential strategy to prevent HIV transmission in a key population, could benefit by fostering their hope. There are successful models of school-based [59] and camp-based hope promotion programs for youth which could be adapted to this context [60].

This study lends mixed support to the idea that aspects of the household environment are associated with hope for the future, a relationship that has been described theoretically in the literature [18]. As expected, young women who lived in households that had an older average age – likely an indication of more adult members in the household along with fewer youth – were more likely to report high hope. Previous research suggests that youth are more likely to develop hope when they have stable relationships with supportive adults [61], and that adult supervision has a significant effect on hope [62], indicating potential explanations of the positive relationship we found between average household age and hope. The present study cannot elucidate the reasons why these household characteristics were associated with hope. Qualitative research with young women and their household members would help to identify additional household characteristics which have an important effect on the development of hope, and the processes by which these characteristics act on hope for young women.

We found mixed support for the relationships between the household SES variables and hope. More household consumption, an indicator of wealth, was significantly associated with greater hope. Previous research has demonstrated a positive association between wealth and psychosocial assets like well-being [63,64] and optimism [65], but not with hope [66]. We did not find an association between parent/guardian education and hope. This result was surprising because of the numerous other advantages for children of better educated parents, including improved educational outcomes [67], achievement [68], and health outcomes [69]. This finding may be explained by the fact that due to high levels of unemployment in the study area [70], even with relatively higher levels of education a parent or guardian may still be unemployed. Further, because of the poor quality of schooling under apartheid, a higher level of education may not have the same advantages as educational attainment in other settings [71]. In light of the findings that hope was associated with older average household age but not with the level of parents' education, young women's hope may have been protected just as a result of having more opportunities to interact with important adults instead of being fostered by better educated adults.

Our findings also build on the literature linking hope to sexual behavior. Lower hope was associated with sexual debut, consistent with previous research with young women [15]. However, the relationship between hope and non-condom use for sexually active young women was not confirmed. In some settings greater hope is consistently associated with fewer risk behaviors [38], while in others hope may be related to some risk behaviors but not

others among sexually active youth [37], suggesting that more research is needed to understand how hope is associated with sexual behavior in different settings. Further, to come closer to a causal understanding of these relationships it will be important to explore how hope acts to influence sexual debut and condom use longitudinally.

We found limited support for the relationship between the home environment and sexual risk; only household age was associated with both sexual debut and non-condom use with a very marginal effect size. We found that the relationships between average household age and sexual debut, and between household consumption and sexual debut were mediated by hope. We did not find evidence for the role of hope as a mediator of the relationship between the household environment and non-condom use. Thus we find partial support for hope as an explanatory mechanism through which the household environment shapes young women's sexual risk behavior. Overall, the results of this study provide preliminary evidence of hope as a psychological process linking the household environment and young women's sexual risk.

The fact that we found relatively small associations between the home environment and hope and sexual risk, may be explained by understanding the importance of comparative deprivation in the relationship between household disadvantage and risk. While income and education may be connected to health in an absolute sense through factors such as health-related knowledge and material resources, much of what we think of as the negative health implications of low socioeconomic status are theorized to be attributable to the social and psychological consequences of comparative disadvantage rather than absolute material deprivation [72]. Theorized mechanisms for this effect include stress, a sense of futility, and lower future orientation [72], a trait closely associated with hope. Though there was variation in SES among the families in this study, the residents of the study area are on the whole relatively poor from a national perspective. Though previous studies have found stronger associations between household SES and sexual risk [73,74], our results may indicate that in contexts similar to the study site where poverty is prevalent, it may be important to think about other markers of household or social disadvantage to identify youth most at risk. Given that we did find hope to be strongly associated with sexual debut, future studies should seek to discover what household characteristics are most closely associated with young women's level of hope. This understanding could help to identify markers of disadvantage relevant in this context, and indicate important targets of future intervention.

Limitations

There are important limitations to consider in the interpretation of our results. First, the cross-sectional nature of our analysis limits the ability to make conclusions about the causal relationships between the household environment, hope, and sexual risk behaviors. Second, this study only focused on the household environment and did not measure other aspects of young women's micro- and macro-environments. Future studies should explore other elements of the social environment including peer influence [75] and the school environment [76], which also may prove to have important associations with hope. Third, even though we focused on young women living in an impoverished rural area, this study examined hope among young women who were currently enrolled in secondary school, could open a bank

account, and were living with a parent or guardian. For this reason, our results may not be generalizable to young women not enrolled in school as education may encourage higher levels of hope independent of the household environment, or to some of the most disadvantaged young women in this context. Fourth, high hope scores among the young women in this study may have limited the amount of covariation between hope and non-condom use needed to establish the nature of the association. Finally, young women's reports of their previous sexual behaviors may have been under-reported due to social desirability bias and error in recalling their first sexual experience, though the use of ACASI likely helped to decrease this bias.

Intervention Implications

Our results suggest that intervening to improve hope may help young women delay their sexual debut, and therefore reduce their risk of HIV. There are successful interventions for building hope in other populations which could be adapted to reflect the environment shaping young women's hope in rural South Africa. One intervention was developed for outpatient cancer patients using small-group support to help to rebuild and maintain the patients' hope [77]. In another intervention for US adolescents, a school-based hope curriculum was delivered over five weekly sessions and focused on fostering participants' ability to achieve goals [57]. Though adapting these interventions to the South African context may be a good starting point to promote young women's hope, such interventions may not have lasting efficacy if they do not attempt to foster a protective home environment which our results indicate may be important for promoting and sustaining hope in this population. As we found that hope is associated with the household environment, concurrently intervening on factors beyond the individual level will likely help lead to sustained improvements in hope over time.

To our knowledge, there have not yet been any structural interventions explicitly aiming to change environment-level determinants of hope, though there have been family-level interventions to reduce HIV risk among South African adolescents. Such interventions have attempted to affect parental monitoring and involvement, parent/child communication and relationship quality, and punishment styles [78,79]. Such interventions should be evaluated for their ability to increase young women's hope as a potential explanatory mechanism for the efficacy of these interventions in preventing HIV infection. Developing structural interventions for HIV prevention that specifically aim to promote hope could help lead to lasting changes for young women's risk behaviors.

Conclusion

This study is one of the first to document the association between the home environment and sexual risk behaviors mediated through hope. It presents important etiological evidence of these relationships among young women in South Africa at a crucial age when they are beginning to explore their sexuality and are at high risk of HIV. Our results demonstrate how young women's environments can play a critical role in building protective psychological assets like hope while helping to develop healthy patterns of sexual behavior during the transition into adulthood. Continued exploration of the relationship between hope and the

home environment in rural South Africa has the potential to help explain why young women in this context have a disproportionate risk for HIV.

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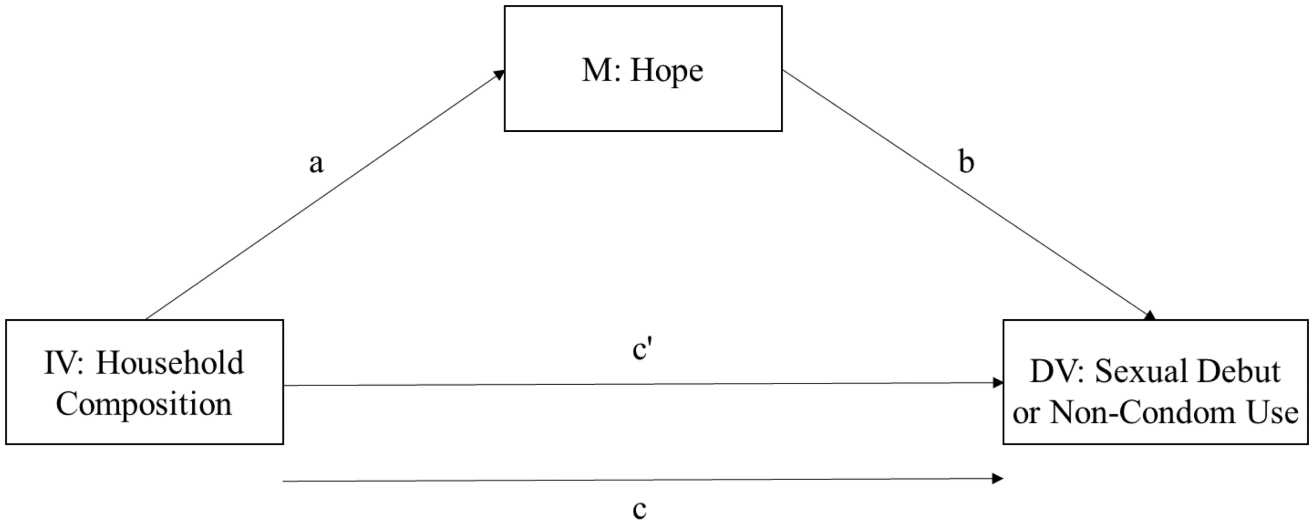

Figure 1. Designation of paths

Path c is the total effect while path c' is the direct effect controlling for the mediated effect. Parameter estimates corresponding to these paths are found in Tables 2 and 3.

Table 1

Characteristics of the young women and their households

Characteristic	No. (%) or Mean ± SD
Socio-demographics	
Age	15.7 ± 1.7
Age, by years	
13	278 (11.0%)
14	495 (19.5%)
15	544 (21.5%)
16	532 (21.0%)
17	382 (15.1%)
18	174 (6.9%)
19	90 (3.6%)
20	38 (1.5%)
Sexual behaviors	
Sexual debut	689 (27.3%)
Sexual debut by age	
13	13 (1.9%)
14	36 (5.2%)
15	100 (14.5%)
16	164 (23.8%)
17	182 (26.4%)
18	109 (15.8%)
19	60 (8.7%)
20	24 (3.5%)
Non-condom use (N=689)	278 (40.3%)
Hope	3.4 ± 0.5
Household Environment Variables	
Biological parent in household	1991 (91.1%)
Average household age	22.6 ± 7.2
Percent enrolled in school	0.86 ± 0.19
Parent/guardian education	
None	618 (24.5%)
Primary or less	495 (19.6%)
At least some secondary or more	1410 (55.9%)
30 day household consumption per capita (Rand)	500.37 ± 904.11

Table 2

Mediation by hope of the relationships between household environment characteristics and sexual debut (N=2533)

Household characteristic IV	**a path β (95% CI) *p-value***	**b path aOR (95% CI) *p-value***	**c path aOR (95% CI) *p-value***	**c' path aOR (95% CI) *p-value***	**Mediated effect β, p-value**
Biological parent in household	**−0.05** (−0.13, 0.03) *p=0.242*		**1.19** (0.85, 1.69) *p=0.324*	**1.21** (0.83, 1.77) *p=0.330*	**0.023** *p=0.237*
Mean household age	**0.01** (0.00, 0.01)*** *p<.0001*		**0.98** (0.96, 0.99)* *p=0.002*	**0.98** (0.97, 0.99)* *p=0.004*	**−0.003*** *p=0.002*
% Children enrolled in school	**−0.06** (−0.17, 0.05) *p=0.253*		**0.84** (0.51, 1.38) *p=0.486*	**0.78** (0.47, 1.30) *p=0.354*	**0.031** *p=0.254*
Parent/Guardian education					
No education (ref)	--	**0.62** (0.52, 0.74)*** *p<.0001*	--	--	--
Through Grd 6	**−0.02** (−0.08, 0.05) *p=0.510*		**1.08** (0.81, 1.45) *p=0.600*	**1.08** (0.80, 1.44) *p=0.622*	**0.004** *p=0.752*
Grd 7 or above	**0.01** (−0.04, 0.07) *p=0.877*		**1.21** (0.96, 1.54) *p=0.136*	**1.20** (0.95, 1.52) *p=0.136*	**−0.002** *p=0.923*
Household consumption	**0.05** (0.02, 0.08)* *p=0.003*		**1.01** (0.89, 1.14) *p= 0.904*	**1.03** (0.91, 1.16) *p=0.673*	**−0.019*** *p=0.011*

Note: All models control for age.

* *p*<.05,

** *p*<.001,

*** *p*<.0001

Table 3

Mediation by hope of the relationships between household environment characteristics and non-condom use (N=689)

Household characteristic IV	**a path β (95% CI) *p-value***	**b path aOR (95% CI) *p-value***	**c path aOR (95% CI) *p-value***	**c' path aOR (95% CI) *p-value***	**Mediated effect β, p-value**
Biological parent in household	**−0.21** (−0.40, −0.02) * *p=0.034*		**1.48** (0.77, 2.86) *p=0.241*	**1.46** (0.76, 2.84) *p=0.224*	**0.013** *p=0.669*
Mean household age	**0.01** (0.00, 0.02) * *p=0.002*		**0.97** (0.95, 0.99) * *p=0.011*	**0.97** (0.95, 0.99) * *p=0.012*	**0.000** *p=0.995*
% Children enrolled in school	**−0.18** (−0.43, 0.06) *p=0.133*		**1.93** (0.87, 4.32) *p=0.111*	**1.93** (0.86, 4.30) *p=0.110*	**0.005** *p=0.859*
Parent/Guardian education		**0.97** (0.76, 1.23) *p=0.777*			
No education (ref)	--		--	--	--
Through Grd 6	**−0.05** (−0.19, 0.08) *p=0.439*		**1.05** (0.66, 1.65) *p=0.993*	**1.04** (0.66, 1.64) *p=0.982*	**0.002** *p=0.849*
Grd 7 or above	**−0.04** (−0.16, 0.07) *p=0.451*		**1.09** (0.75, 1.57) *p=0.728*	**1.09** (0.75, 1.57) *p=0.715*	**0.000** *p=0.965*
Household consumption	**0.06** (0.00, 0.12) *p=0.056*		**1.09** (0.89, 1.33) *p=0.405*	**1.09** (0.90, 1.34) *p=0.395*	**−0.003** *p=0.767*

Note: All models control for age.

* $p<.05$,

** $p<.001$,

*** $p<.0001$