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Reaching Urban Female Adolescents at Key Points of Sexual and Reproductive Health Transitions: Evidence from a Longitudinal Study from Kenya

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Abstract

Urban areas include large numbers of adolescents (ages 15-19) and young adults (ages 20-24) who may have unmet sexual and reproductive health (SRH) needs. Worldwide, adolescents contribute 11% of births, many of which are in low and middle-income countries. This study uses recently collected longitudinal data from urban Kenyan women to examine the association between targeted intervention activities and adolescents' SRH transitions. The focus was on a female adolescent (15-19) sample and their transition to first sex and first pregnancy/birth. Multinomial logistic regression methods were used to examine whether exposure to program activities was associated with delays in transitions. Overall, a high percentage of adolescents were exposed to television activities with family planning messages. About a third were exposed to community events, program posters, or the Shujaaz comic book that included themes related to relationships and positive health outcomes using recognizable characters. Multivariate analyses found that exposure to the Shujaaz comic book was associated with remaining sexually inexperienced and never pregnant at end line. Future programs for urban adolescents should implement interventions that test novel media strategies, like the Shujaaz comic book, that may be more interesting for young people. Innovative strategies are needed to reach female adolescents in urban settings. (*Afr J Reprod Health* 2018; 22[1]: 47-59).

Keywords: Urban; Kenya; Sexual Initiation; Pregnancy; Adolescents

Résumé

Les Zones urbaines comprennent un grand nombre d'adolescents (15-19 ans) et de jeunes adultes (20-24 ans) qui peuvent avoir des besoins de la santé sexuelle et de la reproduction non satisfaite (SSR). Dans le monde entier, les adolescents représentent 11% des naissances, dont beaucoup se trouvent dans les pays à revenu faible et moyen. Cette étude utilise des données longitudinales recueillies récemment auprès de femmes kényanes vivant en milieu urbain pour étudier l'association entre les activités d'intervention ciblées et les transitions SSR des adolescents. L'accent a été mis sur un échantillon d'adolescentes (15-19 ans) et leur transition vers le premier rapport sexuel et la première grossesse / naissance. Des méthodes de régression logistique multinomiale ont été utilisées pour déterminer si l'exposition aux activités du programme était associée à des retards dans les transitions. Dans l'ensemble, un pourcentage élevé d'adolescents ont été exposés à des activités de télévision avec des messages de planification familiale. Environ un tiers ont été exposés à des événements communautaires, à des affiches des programmes ou à la bande dessinée de Shujaaz qui comprenaient des thèmes liés aux relations et aux résultats positifs en matière de santé, à l'aide des caractères reconnaissables. Les analyses multivariées ont révélé que l'exposition à la bande dessinée de Shujaaz était associée au fait de rester sexuellement inexpérimentée et de ne jamais avoir été enceinte en fin de vie. Les futurs programmes pour les adolescents urbains devraient mettre en œuvre des interventions qui testent des nouvelles stratégies médiatiques, comme la bande dessinée de Shujaaz, qui pourraient être plus intéressantes pour les jeunes. Des stratégies innovantes sont nécessaires pour atteindre les adolescentes en milieu urbain. (*Afr J Reprod Health* 2018; 22[1]: 47-59).

Mots-clés: Urbain, Kenya, Initiation Sexuelle, Grossesse, Adolescents

Introduction

With rapid urbanization in many sub-Saharan African countries, there are growing numbers of young people living in cities; these young people often have unmet sexual and reproductive health (SRH) needs because

of social barriers to their accessing SRH services¹⁻³. Addressing the SRH needs of urban young people is a pressing issue given that adolescents, ages 15-19, contribute 11% of births worldwide and 95% of adolescent births are in low and middle income countries^{4,5}. Early transition to first sex is associated

with greater lifetime risks of sexually transmitted infections, including HIV, and early and premarital pregnancies⁶⁻¹⁷; each of these can have long-term implications on young people's health and well-being¹⁸.

In Kenya, the site of this study, the 2009 census reported that about 32% of the population lived in urban areas¹⁹ and about 70% of the Kenya urban population lived in slum areas with poor access to clean water and sanitation²⁰. Young people often move to urban areas after leaving or completing secondary school which results in large proportions of urban populations in the reproductive years²¹. In Kenya, nearly one-quarter of the urban population was between 15 and 24 with about 10% and 13% of the urban population in the age groups 15-19 and 20-24, respectively¹⁹. The reproductive health outcomes of young people in Kenya indicated gaps in young people's sexual behaviors and contraceptive use. Young people in Kenya begin childbearing early; a quarter of women gave birth by age 18 and nearly half by age 20²². Nearly half of pregnancies to women under age 20 in Kenya were considered unintended (wanted to delay or not wanted)²². Finally, a recent study among urban youth in Kenya demonstrated that 72% of female youth (15-24) had ever had sex; three quarters reported that first sex was premarital and only 17% used a modern method at first sex²³. Young people in Kenya (urban and rural) engaged in premarital or non-marital sex that is unprotected are at risk of unintended pregnancies and possibly unsafe abortions.

Reviews of SRH programs for young people have demonstrated that there are no magic bullets to meet young people's SRH needs²⁴⁻²⁸. In a recent review, Chandra-Mouli and colleagues demonstrated that numerous ineffective programs for young people are in place and greater attention needed to be paid to implementing evidence-based programs in an effective manner²⁹. The authors showed that many evidence-based programs for young people had low coverage or inadequate dosage; this led to no effects on SRH behaviors²⁹. Program strategies for young people that tended to get high coverage included mass media and school-based programs²⁹. Mass media programs were often undertaken through the television, radio, and print media. These programs were more effective when linked to other services such as peer education, school-based programming, and service delivery³⁰. Prior research demonstrated that mass media programs with messages targeted to specific audiences, particularly in the print media,

were more effective than programs with non-targeted messages³¹⁻³². With increased use of social media and local radio and television stations, it has become more feasible to target messages to young people³³, particularly in urban settings.

There is increasing evidence that multiple component programs that address demand for services through mass media and/or school-based programming as well as structural barriers (access and quality) to contraceptives or condoms were more effective for young people than single component programs^{3,26,28,30,34}. However, there is a lack of SRH program evaluations focused on specific adolescent target groups including those under age 18 and urban poor adolescents^{26,28}. This study begins to fill this gap by examining the association between intervention activities focused on increasing family planning (FP) use in urban settings in Kenya on adolescent SRH transitions.

Theoretical considerations

Adolescents and young adults are at an important time in their life when many key SRH transitions, including sexual initiation and first birth, are taking place. Numerous behavior changes theories as well as the diffusion of innovations model identify mass media as an effective strategy to affect knowledge and awareness of an innovation whereas interpersonal communication is considered more effective at getting individuals to try out and adopt a new behavior³⁵⁻³⁷. Using data from Peru, Valente³⁷ demonstrated that mass media and interpersonal communication may work in different ways depending on the stage of behavior change (i.e., knowledge, persuasion, decision, implementation, and confirmation). For example, mass media is important for raising knowledge and awareness of FP among women in the early stages, however, as people move into the later stages (decision and implementation) information seeking is common, particularly through interpersonal communication channels³⁷. Of note is that Valente³⁷ demonstrated that one of the key factors that predicts a person's stage of change is age, indicating the importance of life cycle to both the stages of change as well as the information sources experienced.

This study examines SRH transitions among a cohort of adolescent girls aged 15-19 at the beginning of the study period followed for four years. Many of the youngest girls have not yet made the SRH transitions and thus may still be in the knowledge or awareness stage. Others in the sample

(i.e., the older adolescents) may have already transitioned (implementation stage) or be considering transition (persuasion or decision stages). The older adolescents may have different information needs than their younger and less experienced counterparts. Notably, over the four-year follow-up period, many of these young people will transition to a new stage as it relates to first sex or first birth; this is an interesting time to examine information sources and how these are associated with SRH transitions.

Description of the program

In 2010, the Bill & Melinda Gates Foundation (BMGF) supported the Kenya Urban Reproductive Health Initiative program; the program is called Tupange or “Let’s Plan” in Swahili. This program focused on increasing modern contraceptive use in five urban sites of Kenya: Nairobi, Mombasa, Kisumu, Machakos, and Kakamega. The program undertook comprehensive supply and demand-side interventions to address latent FP needs in these settings.

Starting in 2012, the Tupange program expanded upon and prioritized program activities for young people (adolescents 15-19 and young adults 20-24). Implementation of media-based activities for young people was led by a Tupange consortium partner, Well Told Story, that has been implementing targeted media to young people since 2010. Specific activities developed by Well Told Story include: incorporating information on FP, relationships, planning for your future, and making good decisions that will improve the quality of life into their existing Shujaaz comic book and providing relevant messages on their Jongo Love radio program. Well Told Story, using Tupange and other funds, supports the Shujaaz comic book and the Jongo Love radio program; both initiatives target youth in Kenya. These media programs (print and radio) were designed based on the Health Belief Model and the Theory of Reasoned Action³⁸. The Well Told Story programs recognize that young people need to perceive their risks of negative outcomes before changing their behaviors. The programs involve role models that encourage positive attitudes and behaviors³⁸. Between 2010 and 2014, Well Told Story distributed nationally 25.9 million Shujaaz comic books free through newspapers and at kiosks that sell phone credit. The Shujaaz comic book is an award-winning comic book where locally-designed Shujaaz characters use local language and slang to discuss a variety of topics for young people, some of the subjects focus on

relationships and male responsibility in relationships; these themes relate to the Tupange program objectives. During this same period, 537 Jongo Love radio shows were aired with about a quarter of the content focused on FP-related topics. The Jongo Love program is a multi-episode radio drama series set in an urban slum in Kenya featuring the complex lives and relationships that residents have and relates this to the reproductive choices young people make. Notably, the Shujaaz and Jongo Love programming were designed to be interlocked with characters and storylines that exist across both media; this is a novel component of these programs. Some of the themes of Shujaaz and Jongo Love include sexual and reproductive health behaviors as well as other risk-taking behaviors (smoking and alcohol use), responsible financial behavior, entrepreneurship, agriculture, working hard to earn your own money, and citizenship and democracy.

Additional activities undertaken as part of the Tupange multi-component program included reaching young people through community health volunteers (CHV); specific community events to reach young people; and developing factsheets or leaflets for young people. Tupange CHV were all aged 18 and older, were based in the communities where they reside, were attached to a public health facility, and were selected by community members to serve as health volunteers. The CHV made up the first cadre in the health workforce. Monitoring data from the Tupange program illustrate that about 11-12% of clients who were counseled and received services from CHV were adolescents ages 15-19 while 60-65% of these CHV clients were ages 20-29.

Other community-level activities reached young people where they congregate. For example, FP was promoted at community theaters, soccer matches, the Miss Tupange beauty pageant, and bicycle races. During these events, a Tupange project worker or CHV, usually dressed in Tupange gear, presented on the benefits of FP either through acting out a play or through question and answers over a loud speaker or in smaller group discussions. These activities also addressed common myths about FP. Finally, to help adolescents and young adults better understand their risks and rights as well as to help providers counsel young people, the Tupange program developed specific factsheets (or leaflets) for young people that focused on attitudes and behavior change regarding healthy life choices and FP. These were distributed by CHV, at community events, and at health facilities.

Methods

Study population

While the Tupange program was initiated, the Measurement, Learning & Evaluation (MLE) project received funding from BMGF to evaluate the Tupange program. The MLE project designed a longitudinal evaluation to estimate the impact of Tupange activities on modern contraceptive use and other related outcomes. The baseline survey (2010) collected data from a representative sample of women ages 15-49 in each of the five intervention cities (Nairobi, Mombasa, Kisumu, Machakos, and Kakamega) using a two-stage sampling design. In the first stage, a representative sample of clusters was selected based on the 2009 census sampling frame. The number of clusters selected was based on the population distribution across the cities and the expected response rate to result in a total sample size close to 10,000 to examine impact of the program at four-year follow-up. Across the five cities, a total of 438 clusters were selected; in Nairobi, 142 clusters were selected, and 74 clusters were selected in each of the other four cities. Two selected clusters (one in Nairobi and one in Kisumu) were destroyed by the time of the survey; these two clusters were dropped from the study without replacement. In the second stage, following listing and mapping of households, a random sample of 30 households was selected and all women ages 15-49 who spent the previous night in the house were eligible for baseline interview. Women interviewed at baseline were interviewed again at two-year and four-year follow-ups. This paper focuses on the four-year follow-up (2014) that sought to interview all women who were usual members of the household, had a complete interview at baseline, and were still residing in one of the study cities.

A total of 581 women ages 15-19 at baseline were interviewed again at end line four years later. This is the sample included in this analysis (see Table 1). Many adolescents interviewed at baseline (n=658; 63%) were not found at end line. Urban Kenyan women are extremely mobile and even in the full sample, approximately half had moved place of residence in the four-year follow-up. Based on the full baseline sample of women, by end line, 13% had moved out of a study city, about 5% refused to participate, about 2% died, 17.5% were not found at end line, and less than 1 percent were dropped due to inconsistencies between baseline and end line

suggesting mis-matched women. From the bivariate table shown (Table 1), adolescents included in this analysis and interviewed at both time periods tended to be poorer, less likely to be married, and more likely to be in-school at baseline; many of these young people had not yet made the key SRH transitions at baseline and thus following them over time provides rich information on the timing of these transitions. (More information on attrition is presented below in the results section.) Sampling weights were used for descriptive analyses to adjust for non-response. Multivariate analyses were performed with and without weights and the results were similar; the final models presented did not include weights since the focus of this analysis was on the relationship between the variables rather than trying to generalize to all adolescents in the study cities. The implications of loss to follow-up are discussed in the limitations section.

All women willing to be interviewed provided verbal consent to participate at each round of data collection. An interviewer conducted the interview using a paper-and-pencil survey. The questionnaire included sections on background demographic characteristics, fertility experience, FP use, fertility preferences, marriage and sexual behaviors, couple communication, and media exposure. Similar questionnaires were used at baseline and end line, however, the end line questionnaire included questions specific to the Tupange intervention activities.

Variables

The first dependent variable, transition to first sex, was based on the question asked at baseline and end line to all women about their age at first sexual experience. One response option was "never had sex." At baseline, more than half of the full sample of adolescents had never had sex. Comparing the baseline to end line responses, the transition to first sex variable was created as: never had sex by end line; transitioned to first sex between baseline and end line; already had sex at baseline; and inconsistent reporting (see Table 2). The second outcome variable is transition to first pregnancy or birth and was coded as: never had a pregnancy/birth; had first pregnancy/birth between baseline and end line; already had pregnancy/birth at baseline, and inconsistent. Women who were currently pregnant were coded as yes to pregnancy/birth in this analysis. Because only a small number had inconsistent reports

on either of the outcomes, these women were dropped from the subsequent analyses.

At end line, each respondent was asked about her exposure to various Tupange-related program activities (see Table 3). Women were asked about general media exposure to FP in the last three months on the radio and television. Because the television program that Tupange used as part of their intervention was discontinued in 2012, a general television variable was included as a descriptive variable; this variable was not included in the multivariate analyses since it only accounted for exposure in the last three months. The general radio variable is presented for descriptive purposes, but the analysis focused on exposure in the last year to the Tupange-supported Jongo Love radio program. The remaining exposure variables were specific to Tupange and most, except for the Shujaaz comic book, asked about exposure in the last year. Each of these variables was coded one if the woman reported affirmatively and zero otherwise. Table 3 shows exposure to the community events separately; because of low exposure to these activities, for the multivariate analyses, a variable that captures whether the woman attended any of these events in the last year was included. The analysis also included a supply-side variable which assessed if the women lived within 1.5 kilometers of a facility where Tupange worked (activities at facilities included ensuring commodity security, undertaking training on FP of all staff, and improving the quality of care).

The analysis also controlled for baseline demographic factors. These included age, city of residence, household wealth, whether the woman was a student at baseline, education level, religiosity, and religion (see Table 1). The models also included baseline access to health information on the television, radio, or through print media, and household ownership of a television or radio. Some of the control variables were re-coded for the final multivariate analyses to avoid small categories.

Analysis methods

Univariate and multivariate analyses of the transition outcomes are presented. Multinomial logistic regression coefficients and standard errors are presented to demonstrate if program factors were associated with the transition to first sex and first pregnancy or birth, controlling for demographic factors. Since each outcome includes three categories, multinomial logistic regression was used

to present the various comparisons; coefficients and standard errors from these models are presented. All descriptive analyses were weighted while all multivariate analyses presented were unweighted, but the coefficients and standard errors were corrected for the clustered survey design using Stata version 14.

Results

Table 1 presents the baseline descriptive characteristics of the adolescents surveyed at both time points. As mentioned earlier, the analysis sample was somewhat younger, more educated, and more likely to be students than the full baseline sample. In addition, the richest adolescents were less likely to be interviewed. To better understand the attrition in the sample, a logistic regression was performed comparing those adolescents who were interviewed at end line and those who were not. In the multivariate analysis (not shown), the same variables were significant as in the bivariate analysis. However, when an interaction between student status and each of the wealth groups was added, the effect was only significant for being a student in the highest wealth group; the richest students were less likely to be surveyed which is likely a reflection of these young people attending boarding school and not being available at the time of the interview. The majority (54%) of the adolescents were from Nairobi and about a third from Mombasa; this is expected given that these are the largest cities in Kenya. In the unweighted sample, the number of adolescents per city was more balanced.

Table 3 presents the percentage of adolescents exposed to each program component. Around 70% of adolescents reported exposure to any FP message on the television or radio in the last three months. More than a third of adolescents reported hearing about FP in the last year at a community event; the most common of which were caravan road shows (23%), public entertainment events (11%), community meetings (9%), and theater (8%). About a third of adolescents reported ever seeing the Shujaaz comic book. Adolescents also reported exposure in the last year to the other Tupange print media on FP including the Tupange poster (27%) and Tupange leaflet (19%). About 14% of adolescents reported exposure in the last year to CHV. Finally, only 8.5% of adolescents reported hearing the Jongo Love radio program in the last year.

Table 2 presents the distributions of the two outcome variables. Among adolescent girls surveyed

Table 1: Baseline Characteristics of All Adolescents Ages 15-19 Surveyed in 2010 and by End line Interview Status in 2014, Kenya Cities, MLE

Baseline characteristics	Full Baseline Sample %	End line interview status		N
		Not Interviewed %	Analysis sample Interviewed %	
Age: 15	15.34	13.76	17.61	105
16	11.77	10.07	14.22	98
17	16.33	15.17	18.00	111
18	29.31	31.36	26.35	142
19	27.25	29.63	23.82	125
Education:				
None	6.04	8.45	2.57	21
Primary	46.47	46.35	46.64	280
Secondary	42.11	41.71	42.69	257
Higher	5.38	3.49	8.10*	23
Religion:				
Catholic	22.01	23.46	19.94	135
Other Christian	52.96	53.59	52.05	367
Muslim	22.71	21.27	24.77	70
None/other	2.22	1.59	3.14	6
Missing	0.10	0.10	0.10	3
City:				
Nairobi	60.86	65.93	53.56	117
Mombasa	27.92	23.79	33.86	110
Kisumu	7.48	7.15	7.96	119
Machakos	1.87	1.41	2.54	152
Kakamega	1.87	1.72	2.09**	83
Religiosity:				
Somewhat/not religious	50.45	52.12	48.10	278
Strongly religious	49.44	47.83	51.75	299
Missing	0.10	0.06	0.16	2
Student status:				
Student	39.04	29.46	52.83	317
Not student	60.96	70.54	47.17***	264
Household wealth quintile:				
Poorest	20.03	19.28	21.11	167
Poor	17.31	14.08	21.96	146
Middle	17.46	20.03	13.77	87
Rich	19.38	17.01	22.79	115
Richest	25.82	29.61	20.37*	66
Gets health info from radio	65.53	67.47	62.74	416
Gets health info from television	55.59	54.38	57.34	285
Gets health info from print	14.75	12.65	17.78	126
Household owns radio	76.15	74.94	77.88	468
Household owns television	66.23	67.31	64.68	295
Unweighted number of women	1239	658	581	581

*p<0.05; **p<0.10; ***p<0.001 indicates significant differences between interviewed and not interviewed distributions. ^aHousehold wealth quintile based on cross-city wealth; all percentages are weighted using baseline weights to permit comparison between interviewed and not interviewed; all n's are unweighted

at both time periods, about 37% had already initiated sexual activity at baseline. Most adolescents were sexually inexperienced at baseline; more than a third of adolescents (36.5%) transitioned to first sex in the four-year follow-up period. Overall, 26% of adolescents ages 15-19 at baseline remained sexually inexperienced at end line. The transition to first pregnancy or birth demonstrated that a third of the

adolescent sample had their first pregnancy or birth in the four-year follow-up period and another 18% had already had a first pregnancy or birth at baseline. Overall, 50% of the adolescent sample remained never pregnant/birth by end line.

Table 4 presents the multinomial logistic regression coefficients and standard errors for the analysis of the sexual transition outcome variable. In

Table 2: Percentage of Adolescents Surveyed at Baseline (2010) and End line (2014) by Transitions in Sexual and Reproductive Health Behaviors, Kenya Cities, MLE

	Percentage	Unweighted N (n=581)
Transition in sexual experience		
Stayed sexually inexperienced (never had sex)	25.99	116
Transitioned to first sex	36.52	218
Was sexually experienced at baseline	37.48	246
Inconsistent	0.01	1
Transition in pregnancy experience		
Stayed never pregnant	49.52	249
Transitioned to pregnancy/birth	32.36	197
Already had first pregnancy/birth at baseline	18.10	134
Inconsistent	0.02	1

Note: all percentages are shown using end line weights.

Table 3: Percentage of Adolescents Surveyed at Baseline (2010) and Endlin (2014) by Exposure to Key Tupange Activities as Reported at End line, Kenya Cities, MLE

	Percentage	Unweighted N (n=581)
Intervention Exposure		
Radio with FP message (general) in last 3 months	69.77	427
TV with FP message (general) in last 3 months	71.42	342
Saw Tupange leaflet on FP (last year)	18.61	87
Saw Tupange poster on FP (last year)	27.40	162
Saw Tupange print media - leaflet or poster on FP (last year)	29.65	186
Saw Shujaaz comic book (ever)	34.73	181
Heard Jongo Love radio program (last year)	8.45	54
Met with a community health volunteer (CHV) (last year)	13.67	95
Heard information about FP at any community events (last year)	38.75	246
Caravan road shows	22.80	171
Community events/meetings	8.90	56
Public entertainment event	11.49	79
Community drama/puppet shows	8.47	49
Football competitions	2.63	20
Beauty contests	4.00	16
Boda boda events	0.56	11
Baraza (community action day)	5.54	34
Participated in Tupange meeting (last year)	11.78	67
Tupange health facility within 1.5 kilometers	77.81	388

Note: all percentages are shown using end line weights.

the comparison between adolescents who never had sex by end line compared to those who transitioned from never sexually active to sexually experienced between baseline and end line (Model 1), exposure to the Shujaaz comic book was associated with being more likely to remain in the never had sex category, controlling for the demographic factors. Two of the other program exposure variables were significant in this transition comparison: exposure to community events and exposure to community health volunteers (CHV). Notably, these two exposure variables were negative and significant suggesting that adolescent

girls who were exposed to these components were less likely to never have sex, that is, exposure was associated with being more likely to transition to first sex over the follow-up period. Given that these variables were measuring exposure in the last year, these effects may reflect program exposure post-sexual transition and possibly targeting by CHV of women who they expect had become sexually experienced (i.e., have a partner). These counter-intuitive scenarios are discussed in greater depth in the discussion section, however, it is notable that with the data available, it is not possible to tease apart the

Table 4: Multinomial Logistic Regression Coefficients and Standard Errors for Analysis of Transition to First Sex between Baseline (2010) and End line (2014), Kenya Cities, MLE

	Model 1 Never had sex vs. Became sexually experienced		Model 2 Already sexually experienced vs. Became sexually experienced		Model 3 Already sexually experienced vs. Never had sex	
	B	SE	β	SE	β	SE
Saw Shujaaz comic book	0.60*	(0.29)	-0.36	(0.27)	-0.97**	(0.31)
Heard Jongo Love radio program	0.68	(0.45)	0.18	(0.41)	-0.50	(0.52)
Saw Tupange print media	-0.18	(0.31)	-0.01	(0.27)	0.17	(0.36)
Heard info. at comm. events	-0.55+	(0.29)	0.87***	(0.27)	1.41***	(0.34)
Met with CHV	-1.00*	(0.42)	0.02	(0.33)	1.02*	(0.46)
Participated in Tupange mtg.	-0.00	(0.49)	-0.11	(0.42)	-0.11	(0.59)
Tupange facility within 1.5 km.	-0.06	(0.28)	0.40	(0.28)	0.46	(0.34)
Age	-0.26*	(0.10)	0.82***	(0.10)	1.08***	(0.14)
Education (none/primary – ref.)						
Secondary	0.40	(0.52)	1.12+	(0.68)	0.72	(0.71)
Higher	0.05	(0.54)	0.30	(0.71)	0.26	(0.75)
Religion (Christian/none/other. – ref.)						
Catholic	-0.75*	(0.33)	0.39	(0.29)	1.14	(0.38)
Muslim	0.54	(0.39)	-0.61	(0.44)	-1.15	(0.50)
City – (Kakamega – ref.)						
Nairobi	0.25	(0.55)	-0.19	(0.43)	-0.44	(0.62)
Mombasa	0.64	(0.56)	-0.09	(0.46)	-0.73	(0.64)
Kisumu	0.21	(0.55)	0.76+	(0.42)	0.55	(0.62)
Machakos	0.49	(0.51)	-1.12**	(0.43)	-1.60**	(0.59)
Religiosity (Strongly religious – ref.)						
Somewhat/not religious	0.28	(0.26)	-0.28	(0.25)	-0.56+	(0.32)
Student status (not student – ref.)						
Student	0.42	(0.33)	-1.59***	(0.28)	-2.01***	(0.36)
Wealth quintile (poorest – ref.)						
Poor	0.47	(0.40)	-0.40	(0.36)	-0.87+	(0.48)
Middle	0.14	(0.57)	0.17	(0.46)	0.03	(0.64)
Rich	0.18	(0.61)	0.27	(0.48)	0.09	(0.71)
Richest	0.10	(0.64)	-0.56	(0.54)	-0.65	(0.72)
Gets health info from radio	-0.23	(0.27)	0.19	(0.31)	0.42	(0.39)
Gets health info from television	-0.15	(0.31)	-0.51	(0.32)	-0.36	(0.38)
Gets health info from print	0.02	(0.30)	0.06	(0.36)	0.04	(0.39)
Household owns radio	-0.01	(0.40)	-0.03	(0.35)	-0.01	(0.46)
Household owns television	0.51	(0.44)	-0.44	(0.31)	-0.95+	(0.49)

+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001.

timing of exposure and timing of behavior change.

Model 2 presents the comparison between girls who were sexually experienced at baseline and those who became sexually experienced between baseline and end line. The only program factor significant was exposure to community events in the last year; women who were exposed to community events were more likely to be sexually experienced at baseline. Finally, comparing women who were sexually experienced at baseline to those who never had sex by end line (Model 3), adolescent women who ever saw the Shujaaz comic book were less likely to be sexually experienced at baseline (i.e., more likely to have never had sex) than those who did

not see the comic book. As shown earlier, women who met with CHV and who participated in community events were more likely to be sexually experienced at baseline than remain in the never had sex group. The demographic factors were in the expected directions in the models presented in Tables 4-5.

Table 5 presents the outcome for transition to first pregnancy/birth. Model 1 demonstrated that ever exposure to Shujaaz was associated with remaining in the no pregnancy/birth category as compared to transitioning to first pregnancy/child and community events and CHV exposure were associated with the two comparisons with the addition of exposure to

Table 5: Multinomial Logistic Regression Coefficients and Standard Errors for Analysis of Transition to First Pregnancy/Birth between Baseline (2010) and Endline (2014), Kenya

	Model 1 Never birth/pregnancy vs. Had first birth/pregnancy		Model 2 Already had first birth/pregnancy vs. Had first birth/pregnancy		Model 3 Already had first birth/pregnancy vs. Never birth/pregnancy	
	B	SE	β	SE	β	SE
Saw Shujaaz comic book	0.92***	(0.25)	0.01	(0.51)	-0.91+	(0.49)
Heard Jongo Love radio program	0.26	(0.40)	-0.02	(0.72)	-0.28	(0.71)
Saw Tupange print media	-0.14	(0.25)	0.08	(0.35)	0.22	(0.36)
Heard info. at comm. events	-0.52*	(0.24)	0.18	(0.35)	0.70+	(0.37)
Met with CHV	-0.59+	(0.32)	0.50	(0.37)	1.09*	(0.46)
Participated in Tupange mtg.	-0.32	(0.38)	0.56	(0.43)	0.88+	(0.49)
Tupange facility within 1.5 km.	-0.09	(0.24)	-0.15	(0.34)	-0.06	(0.36)
Age	-0.41***	(0.09)	0.84***	(0.15)	1.26***	(0.15)
Education (none/primary – ref.)						
Secondary	0.06	(0.63)	0.34	(0.93)	0.29	(0.97)
Higher	0.91	(0.65)	0.14	(0.95)	-0.77	(1.04)
Religion (Christian/none/other. – ref.)						
Catholic	0.19	(0.27)	0.07	(0.38)	-0.13	(0.40)
Muslim	0.58	(0.40)	0.56	(0.53)	-0.02	(0.58)
City – (Kakamega – ref.)						
Nairobi	0.25	(0.40)	-1.09*	(0.52)	-1.35*	(0.55)
Mombasa	0.58	(0.41)	-1.37*	(0.54)	-1.94***	(0.57)
Kisumu	0.26	(0.41)	0.89	(0.56)	0.35	(0.55)
Machakos	0.78*	(0.39)	-1.79***	(0.56)	-2.56***	(0.56)
Religiosity (Strongly religious – ref.)						
Somewhat/not religious	-0.22	(0.24)	-0.39	(0.30)	-0.17	(0.33)
Student status (not student – ref.)						
Student	0.45+	(0.26)	-2.73***	(0.53)	-3.18***	(0.51)
Wealth quintile (poorest – ref.)						
Poor	0.14	(0.28)	-0.51	(0.40)	-0.65	(0.44)
Middle	-0.10	(0.38)	0.42	(0.59)	0.52	(0.59)
Rich	0.23	(0.41)	-0.09	(0.70)	-0.32	(0.70)
Richest	0.58	(0.48)	-1.32	(0.86)	-1.89*	(0.88)
Gets health info from radio	-0.15	(0.27)	-0.10	(0.36)	0.05	(0.39)
Gets health info from television	-0.18	(0.27)	-0.81*	(0.38)	-0.63	(0.40)
Gets health info from print	-0.14	(0.26)	-0.78+	(0.43)	-0.65	(0.47)
Household owns radio	0.20	(0.28)	-0.36	(0.38)	-0.56	(0.42)
Household owns television	0.41	(0.29)	0.10	(0.46)	-0.31	(0.48)

+ p<0.1; * p<0.05; ** p<0.01; *** p<0.001.

Tupange meetings being associated with already having a pregnancy/birth at baseline than remaining without a pregnancy/birth (Model 3).

There was an additional analysis that is not shown but worth mentioning. Fixed effect regression models that examined modern method use among women (i.e., using each woman as her own control) showed that in the adolescent sample (ages 15-19), those adolescents exposed to the Shujaaz comic book ($\beta=0.11$; SE=0.05; p-value 0.039), exposed to a CHV ($\beta=0.16$; SE=0.09; p-value=0.073), exposed to a community event ($\beta=0.08$; SE=0.04; p-value=0.075), and living within 1.5 kilometers of a Tupange facility ($\beta=0.15$; SE=0.04; p-value=0.000) were significantly more likely to be using modern FP at end line. These findings are likely related to the similar associations

found between program exposure and the transitions to first sex and first birth.

Discussion

This paper examines the association between Tupange program elements and adolescent SRH transitions in urban Kenya. Ever being exposed to the Shujaaz comic book was associated with delayed first sex and delayed first pregnancy/birth. Notably, with funding from several donors, the Shujaaz comic book reached many people through national distribution; this resulted in about one third of urban adolescents reporting ever seeing or hearing about the Shujaaz comic book. This comic book, with themes about male responsibility, teen pregnancy,

relationships, risk-taking behaviors, responsible financial behavior, entrepreneurship, agriculture, working hard to earn your own money, and citizenship and democracy is reaching the youngest girls who need information and education and is associated with delayed SRH transitions.

Exposure in the last year to CHV and community events was associated with being more likely to transition to first sex and first birth. This unexpected finding is likely a consequence of the timing of exposure and the transitions. Theories of behavior change, and prior research demonstrate that when people are in the decision or implementation phases of the stages of change (or diffusion of innovations) they are more likely to seek out interpersonal communication networks to act on the behavior³⁷. Therefore, as young people become sexually experienced or pregnant (or consider making these transitions) they may be more in need of or seek out information from CHV or at community events where FP information and services are offered. A limitation of this analysis is that it is not possible to tease out whether exposure or the transition came first but the results that women who were already sexually experienced at baseline were more likely to have been exposed to a CHV and a community event suggest that these events are reaching the older and more experienced adolescents. Finally, since CHV are age 18 and older, this may also be a reason they are approaching their older and more experienced peers.

The Shujaaz comic book that was familiar to about a third of the young people surveyed was a targeted media approach that seemed to be attractive to urban youth. The comic covered themes that were relevant to young people while at the same time it used slang and language that young people are comfortable with. Prior research suggests that targeted print media is more effective than more generalized print media where the messages are not specific to a health behavior or to a target population^{31,31}; this is a strength of the Shujaaz program.

Recent studies recommend the need for multi-faceted and structural interventions for young people^{3,26,27,34} as well as programs that are implemented with high coverage to meet project aims²⁷. The Tupange program included facility-based (supply-side) activities to make facilities more accessible to youth as well as demand creation activities to encourage adolescents to use FP once they are sexually active. As expected, activities with low coverage among adolescents (e.g., some of the

youth-specific community events; and the Jongu Love radio program) were not associated with SRH transitions. Perhaps over time, with increased intensity of the radio program and community events, these would lead to greater associations with transitions.

This study is not without limitations. First is the inability to find many the adolescents at end line, especially those who were out of school, richer and in school, and those already in union at baseline; these adolescents were more mobile and harder to find. In the full longitudinal sample, approximately half of the women who were found (in all age groups) had moved from their baseline location; this suggests high mobility (within and across cities) of women in these Kenyan cities. Second, was the small final adolescent analysis sample that made it difficult to control for the potential endogeneity of the exposure variables. With a larger sample size, it may have been possible to perform instrumental variable analyses, permitting discussion of causal relationships rather than just associations. Previous research has demonstrated that in the case of weak statistical identification, as found here, not correcting for endogeneity may be the best option^{39,40}. Future analyses should collect longitudinal data from a larger sample of urban adolescents and perhaps follow them annually to avoid high loss to follow-up as experienced in this study. Third, with the data available it was not possible to examine more closely the timing of exposure and transitions. Finally, there was no possibility of having a control or comparison group since the program activities were rolled out at the full-city level. Each of these limitations meant that that the results presented were focused on associations rather than causal effects.

Ethics, Consent, and Permission

All study procedures were approved by the Institutional Review Board at the University of North Carolina at Chapel Hill and the Kenya Medical Research Institute Ethical Review Committee. All participants provided verbal consent to participate in the study.

Conclusions

Despite these limitations, this study demonstrated that it is possible to target and reach adolescents with SRH programs in urban areas. Future programs for urban youth should consider implementing high coverage, multi-faceted activities that implement targeted media sources, like the Shujaaz comic book.

While previous evaluations have shown effects of radio, television, and multi-media activities on SRH of young people⁴¹⁻⁴⁴, these may not be the most compelling or convincing for urban adolescents. Qualitative data collection is required to ascertain exactly what it was about the Shujaaz comic book that led to the associations found. However, perhaps because of the character development, continuous storyline, and ease of sharing amongst friends without need for a radio or television, this engaged young people in new and innovative ways that were associated with delayed SRH behaviors.

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Contribution of Authors

ISS conceived of the topic, performed the analyses, and wrote the first draft of the paper; LMC provided inputs into the analysis, the Kenya context, and reviewed all versions of the paper; DKG provided methodological guidance and inputs into the modeling approach and reviewed all versions of the paper. All authors approved the final manuscript.

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