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Understanding your body matters: Effects of an entertainment-education serial radio drama on fertility awareness in Rwanda

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Given widespread misunderstanding of pregnancy risk, awareness of one's fertility has the potential to influence sexual and reproductive health behaviors. This mixed-methods study examined the impact of a serial radio drama in Rwanda, *Impano n'Impamba*, on fertility awareness and other factors related to family planning uptake by comparing listeners and non-listeners in a nationally representative household survey (n = 1477) and analyzing in-depth interviews with 32 listeners. Listeners had higher fertility awareness than non-listeners for key concepts, including the menstrual cycle, onset of fertility, and postpartum pregnancy risk. Qualitative interviews suggest discussion groups provided an invaluable opportunity to ask questions to a knowledgeable facilitator and clarify the fertility awareness information. No significant differences in modern family planning use or intention to use were found between listeners and non-listeners, but listeners reported greater supportive norms, self-efficacy, and discussion of family planning. Qualitative interviews suggest that increased discussion about family planning occurred because the drama emboldened people to talk about uncomfortable and taboo topics. Post-broadcast, listeners of *Impano n'Impamba* had greater fertility awareness then non-listeners and were more likely to experience intermediate outcomes related to family planning such as perception of positive family planning norms, a feeling of self-efficacy, and increased communication with others related to family planning. The study provides lessons for future interventions with the aim of increasing fertility awareness to improve sexual and reproductive health.

Many women around the world want to delay and space their births but are not using modern family-planning methods. Along with social opposition and fear of side effects or other health concerns, one of the top reasons for not using family planning is a misunderstanding of pregnancy risk (Sedgh, Ashford, & Hussain, 2016). Globally 24% of married women report non-use of modern methods because of infrequent sex, yet nearly half reported sexual activity in the last 3 months (Sedgh et al., 2016). Women may associate limited sex with low risk of pregnancy, yet pregnancy depends not simply on frequency, but when during the menstrual cycle women have unprotected sex. Studies suggest that women and men lack awareness of fundamental facts associated with the biology of pregnancy (Agrawal, Fatma, & Singh, 2007, IRH, 2013a, 2013b; Sommer, 2010; Uddin & ABDUL MANNAN, 2008). Given the widespread misunderstanding women and men have of pregnancy risk, improved awareness of fertility and reproductive physiology could influence sexual and reproductive health behaviors and outcomes, including family planning use (Toth, 2011).

Research has shown that several factors are associated with an individual's decision to use family planning, such as perceived supportive norms, positive attitudes, perceived safety and efficacy of methods, and self-efficacy to access and use family planning (Babalola, John, Ajao, & Speizer, 2015). These intermediate factors may lead first to intent and then ultimately family planning use, depending on health system factors (such as service availability, method availability, and service quality) and reproductive empowerment and skills (Paek, Lee, Salmon, & Witte, 2008). A less explored concept is fertility awareness. The Fertility Awareness for Community Transformation (FACT) Project sought to foster an environment where women and men can take actions to protect their reproductive health throughout the life-course by testing strategies to increase fertility awareness. The FACT Project defines fertility awareness as: *Actionable information about female and male fertility throughout the life course, and an understanding of how this knowledge applies to one's own circumstances and needs. It can include basic information about the menstrual cycle, how pregnancy occurs, the likelihood of pregnancy from unprotected intercourse at different times during the cycle and at different life stages; and how family planning methods work with the body to prevent pregnancy.*

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Unmet Need for Family Planning in Rwanda

Unmet need for family planning is 20% among married women in Rwanda (NISR, 2015). While the modern contraceptive prevalence rate (mCPR) grew swiftly from 6% to 25% between 2005 and 2010, progress has slowed since (Ayad & Rathavuth Hong, 2009). In 2015, use of modern contraception had only grown to 28% for all women ages 15–49 (48% for married women) (NISR, 2015). According to women in Rwanda, the prevailing challenges are less about geographic access to services and more about perceived lack of pregnancy risk and attitudinal resistance (Brunie, Tolley, Ngabo, Wesson, & Chen, 2013). Lack of fertility awareness, particularly one's ability to accurately assess pregnancy risk, is widespread. Only 12% of women can correctly identify the days halfway between two periods as the time when pregnancy is most likely (NISR, 2015) .

The Role of Entertainment-Education

Entertainment-education (EE) interventions can influence health behaviors like family planning as well as intermediate variables in the behavior change pathway like social norms, attitudes, self-efficacy, and communication (Limaye, Rimal, Brown, & Mkandawire, 2013). EE approaches have been used in a variety of public health and development programs (Heong et al., 2008). These approaches go beyond information dissemination and engage the emotional and human interest motivations that dictate our choices (Dr. MARTINE BOUMAN, 2017). The narrative approach of a serial radio drama allows listeners to develop relationships with the characters as they model growth over time in response to positive and negative influences. The social learning theory demonstrates that people learn from role models, and so modeling is a central part of radio dramas using the Sabido methodology, a theory-based approach to social and behavior change communication. The stories include "positive," "negative," and "transitional" characters. The "transitional" character is the one most likely to encourage behavior change.

Intervention Description: Impano n'Impamba

Recognizing that education on puberty, reproduction, and pregnancy is weak, inaccurate, or non-existent in many contexts, the FACT Project used an EE approach through radio to improve fertility awareness and increase family planning use among women and men in Rwanda in order to reduce unintended pregnancies.

Impano n'Impamba, which translates in Kinyarwanda to "A gift for today that will last a long time," was a 104-episode serial radio drama broadcast nationally between October 2014 and November 2015. The radio drama was a collaboration among multiple organizations seeking to influence different health outcomes. Four interweaving storylines set in fictional villages across Rwanda were used to address issues of gender-based violence, adolescent reproductive health, nutrition, maternal and child health, and family planning. The radio drama was developed by Population Media Center, a non-profit organization that has been developing evidence-based serial radio and TV dramas for over 15 years.

With *Impano n'Impamba*, the FACT Project sought to test the hypothesis that greater fertility awareness improves family planning use. Two of the four transitional characters in

Table 1. Summaries of *Impano n'Impamba* storylines focused on fertility and family planning

	Ketia	Bacyenga
Profile	Ketia is a materialistic and impulsive teenager who attends a prestigious secondary school. Convinced by her boyfriend, Rukuba, she begins having sex and experimenting with alcohol. They do not use protection, despite the advice of her best friend Sandra, president of the Fertility Awareness Club, and her stepmother Afisa, a health researcher. Neglecting her studies, Ketia fails her national examination and must repeat her third year. When she and Rukuba are discovered having a drunken tryst in a public bathroom, they flee and are injured. In the hospital, Ketia learns she has a sexually transmitted infection and that Rukuba has had multiple partners including prostitutes. She ends the relationship, commits herself to her studies, joins the Fertility Awareness Club where shares her story as a lesson for other girls. Rukuba, meanwhile, continues to have promiscuous, unprotected sex, and is diagnosed with HIV.	Bacyenga is a young man of 25 eager to marry his girlfriend Rosine and start a family. He believes having many children means prosperity and a strong public standing. Rosine is surprised to find herself pregnant after the wedding, and she proceeds to become pregnant again soon after the birth of the first child. Frustrated with Bacyenga's preoccupation with his siblings, she asks, "If you cannot take care of me and just one child, how are we going to survive when we have two?" A health worker advises Bacyenga to visit a health clinic to learn about fertility and family planning, but he sees no reason to limit the number of children. Rosine returns to live with her parents, the child falls ill and requires a costly hospitalization, and his business begins to fail. Only then does Bacyenga begin to understand the value of respecting his family's needs and the importance of planning for pregnancy together.
Fertility Awareness Application	• Signs of onset of fertility for boys and girls • Menstrual hygiene management • Definition of the menstrual cycle • When during the cycle a woman is fertile	• Definition of the menstrual cycle • When during the cycle a woman is fertile

Impano n'Impamba reflected information about fertility and family planning in their storylines: Ketia, an unmarried adolescent girl and Bacyenga, a newly married man (Table 1). IRH provided an orientation to script writers which covered the key fertility awareness information expected to be integrated into the radio drama (Table 4). IRH also conducted periodic reviews of the scripts offering suggestions about how to strengthen fertility awareness information in the storylines or epilogues.

Primary outcomes of interest included fertility awareness, family planning use and intention to use family planning among non-users. Secondary factors related to family planning use were assessed such as knowledge, attitudes, social norms, and communication. While the primary audience for the fertility awareness information was men and women aged 15–35, the effects of the serial radio drama on all men and women of reproductive age was also of interest. This paper will examine the impact *Impano n'Impamba* had on fertility awareness, family planning use, and intermediate factors related to family planning use (e.g. social norms, attitudes, self-efficacy, and communication) by comparing listeners and non-listeners of the radio drama.

Methods

A mixed-methods (qualitative and quantitative) approach was used to evaluate the impact of the fertility awareness information in the radio drama. Qualitative data were collected both during and after the *Impano n'Impamba* broadcast. During the broadcast, community discussion groups were created and conversations facilitated about the events in the radio drama, while post broadcast individual interviews with listeners were held. A quantitative household survey was conducted immediately after the conclusion of the broadcast (Table 2).

Community Discussion Groups

Throughout the broadcast, nine discussion groups were created from existing community groups across Rwanda. Members listened to the radio drama and discussed it monthly, and membership of the discussion groups was consistent (Table 2). Group leaders facilitated the discussion, and note takers provided a detailed record using a pre-formatted guide. Both facilitators and note-takers were trained on fertility awareness and family planning content, and were supported by IRH through the provision of materials and occasional staff visits. The primary objective of the listener groups was to monitor the relevance and acceptability of fertility awareness information in the radio drama and adjust the storylines as necessary. Due to a reduction in the expected number of episodes and delays in forming listener groups, most discussions occurred too late in the broadcast to make any major changes to the scripts. However, they still provided detailed information about which concepts were particularly relevant or confusing to listeners, and offered listeners an important venue for dialogue and critical reflection of the information.

Qualitative Interviews with Listeners

At the end of the broadcast, 32 in-depth interviews were conducted in two districts in Rwanda (Table 2). Interview participants were listeners between the ages of 18 and 35, and were evenly split between men and women and married and unmarried individuals. A small subset of interviews was conducted with individuals who had participated in monthly community discussions about *Impano n'Impamba* to qualify differences between listeners who were part of a regular community discussion group and listeners who were not. Interview guides were designed to supplement the household survey and provide in-depth insights into the acceptability, relevance, utility, and understanding of the fertility awareness information in *Impano n'Impamba*.

All interviews were audio-recorded, transcribed and translated into English. Qualitative thematic content analysis techniques were used to analyze the data. All transcripts from in-depth interviews were read and initially coded based on questions in the interview guide and emerging themes with the qualitative data analysis software, Dedoose. Primary coding reports were extracted and further analyzed. Emergent sub-themes were codified and applied to data in coding reports. A framework was developed in order to summarize findings within each broad theme.

Household Survey

A household survey with a nationally representative sample of 1477 women and men of reproductive age (women 15–49 years of age and men 15–59 years of age) was conducted in 50 villages from 21 districts in Rwanda about all of the topics incorporated into *Impano n'Impamba* after the conclusion of the radio drama (Table 2). Survey methodology and instruments were modeled from the Demographic Health Survey.

A multistage random sampling method was used to select survey participants. First, 50 out of 416 sectors in Rwanda were randomly selected. Then, within each sector, a simple random sampling method was used to identify an umudugudu (smaller administrative units or villages, average of 36 umudugudu per sector) as a cluster within a cluster. A systematic sampling method was used to identify the households to include. Within the umudugudu, 26 households were targeted for visits, with a goal to sample 30 individuals. Every eligible household member in selected households present on the day of data collection was interviewed until the goal of 30 individuals was reached.

The structured questionnaire included questions on socio-demographic characteristics and household composition, fertility awareness, family planning, marriage and children, pregnancy, sexual activity, HIV/AIDS and other sexually transmitted infections, and gender equality and gender-based violence. The questionnaire also included an exposure module to determine listenership of *Impano n'Impamba*. Fertility awareness questions assessed knowledge of the menstrual cycle, fertile days during the menstrual cycle, male fertility, postpartum fertility, and signs of fertility onset.

Data were entered manually and cleaned, and analyses were conducted using SPSS 22 (IBM Corporation). To ascertain the effects of listenership on key outcomes, binary and multivariate logistic regression analyses were performed. The multivariate

Table 2. Methods to evaluate the impact of the fertility awareness information in *Impano n'Impamba*

Method	Time	Objectives	Sample Size	Districts
Observation and note-taking at community discussion groups about *Impano n'Impamba*	March 2015–September 2015	Monitor the relevance and acceptability of the fertility awareness information	9 community groups with 11 members each that met monthly	Gasabo, Gatsibo, Bugesera, Karongi, Rusizi/Mibilizi, Rulindo, Ruhango
Qualitative interviews with *Impano n'Impamba* listeners	November–December 2015	Assess relevance and understanding of the fertility awareness information in *Impano n'Impamba*, and describe how listeners enacted the messages from the radio drama into their lives. Qualify differences between listeners who were part of a regular community discussion group about *Impano n'Impamba* and listeners who were not. Identify which radio drama storylines and messages that listeners reported to be the most meaningful and why.	32 in-depth interviews (8 individuals were part of regular community group discussions)	Gasabo and Bugesera
Nationally representative household survey	December 2015–January 2016	Assess differences in knowledge, attitudes, and behaviors between listeners and non-listeners about topics incorporated into *Impano n'Impamba*.	1477 men and women from 50 villages ages 15 and above	Bugesera, Burera, Gasabo, Gatsibo, Huye, Kamonyi, Kayonza, Kicukiro, Kirehe, Muhanga, Musanze, Ngoma, Nyabihu, Nyagatare, Nyamagabe, Nyanza, Nyarugenge, Nyaruguru, Rubavu, Ruhango, Rulindo

models controlled for the potential effects of sex, age, marital status, education, and children on the association between exposure to the drama and key outcomes. Where chi-square test results indicated an association between a particular indicator and wealth, province, residence (urban vs. rural), or religion, then that demographic variable was controlled for in the model as well. Results are presented as odds ratios.

The effect of listenership on fertility awareness, family planning uptake, and intermediate factors related to family planning use (e.g. social norms, attitudes, self-efficacy, and communication) was examined. We defined *Impano n'Impamba* listenership as listening to at least one episode per week, or being able to name at least one character from the radio drama. Listeners were further classified as "standard listeners" if they listened at least once a week but were unable to name any characters, and "engaged listeners" if they could name at least one character from *Impano n'Impamba*.

Ethical Approval and Informed Consent

The household survey and qualitative interviews were approved by the Georgetown University Institutional Review Board and the Rwanda National Ethics Committee or Research, Ethics, and Consultancy Committee at the University of Rwanda College of Medicine and Health Sciences. Written informed consent was obtained from all study participants prior to data collection.

Results

Listenership

Among household survey participants, 18% were defined as *Impano n'Impamba* listeners. In some of the analyses below, we differentiate the listeners into two groups: standard listeners who listened weekly but could not name a character (13%) and engaged listeners who could spontaneously name at least one character (5%).

Qualitative interviews suggested that while some listeners concentrated solely on the radio drama during its broadcast, many people listened passively while multitasking. This reality of radio broadcasts may help to explain why many individuals who listened regularly were unable to recall specific details such as character names. One unmarried, female listener said, *"Most of the time when it aired [Sunday] morning, I was cleaning or doing other activities related to hygiene, preparing myself to go to church services."*

Socio-Demographic Characteristics of Listeners

The demographic characteristics of all survey participants disaggregated by listenership are shown in Table 3. Sex, marital status, wealth, and having children were significantly associated with listenership. While all listeners were more likely than non-listeners to be of moderate wealth (second, middle, and fourth quintiles), standard listeners were more likely to be male and married, compared with engaged listeners, who were more likely to be female, unmarried, and without children.

Fertility Awareness Among Listeners and Non-Listeners

Descriptive findings of eight questions used to assess fertility awareness in the household survey, along with the response that indicates correct knowledge, and the percentage answering correctly are shown in Table 4. The majority of participants, regardless of listenership, knew that first menstruation is a sign that a girl is now fertile (82%), and that there are certain days when a woman is more likely to become pregnant (78%). Approximately 60% knew that first ejaculation is a sign that a boy is now fertile, and that women can get pregnant while breastfeeding. Knowledge of the menstrual cycle and male fertility was lower. While one-third knew that the first day of bleeding is the first day of the menstrual cycle, and that a man can possibly get a woman pregnant anytime he has unprotected sex, only 18% knew that a woman is most likely to become pregnant during several days halfway between two periods.

Results from multivariate analyses on fertility awareness controlling for demographic factors are presented in Tables 5 and 6. The odds ratios for standard and engaged listeners compared to non-listeners for all fertility awareness concepts are shown in Table 5, and full regression results for the questions where listenership was a significant predictor of fertility awareness are shown in Table 6. Listeners had higher fertility awareness than non-listeners, and these differences were statistically significant for four of eight key concepts when controlling for demographic variables (Table 5). Engaged listeners had 1.7 higher odds of knowing the first day of the menstrual cycle, 2.5 higher odds of knowing first ejaculation is a sign of fertility in boys, and 1.7 higher odds of knowing women can still get pregnant while breastfeeding. While few differences were seen when comparing standard listeners to non-listeners, both standard and engaged listeners had higher odds of knowing menstruation is a sign of fertility in girls, 1.7 and 3.2 respectively. Sex, age, and education were the most consistent predictors of fertility awareness for these four concepts (Table 6). Women, older individuals, and those with more education had higher odds of correct knowledge, while the impact of marital status, province, and religion varied by concept.

Understanding Fertility Awareness Information

In the qualitative interviews, many listeners mentioned the fertility awareness concepts they learned from *Impano n'Impamba*, including new information on puberty and male and female fertility from Ketia's story. One unmarried female recalled, "*Leah told Sandra that during puberty a young lady who has her periods… is able to get pregnant. She is also experiencing many other body changes and she is at risk [for pregnancy]."* Another said, "*[The radio drama] told us that boys who have reached puberty can impregnate [a girl] anytime they have unprotected sex."*

In some instances, listeners were able to apply the information they learned from *Impano n'Impamba* to their lives. One listener shared knowledge from the radio drama with her neighbor who did not know she could be fertile.

> *"There is a woman in my neighborhood with a one-year-old baby… [who] does not want another child soon. I asked her why she was sure that she can't get pregnant, and she told me that her periods had not yet returned. [Impano n'Impamba] told us… you can get pregnant during the fertile days preceding the return of your period. I remembered and told her that she can get pregnant before she has her period again."*—Unmarried female, community discussion group participant

Despite being broadcast in the radio drama, there were some fertility awareness concepts that listeners found to be confusing, in particular the menstrual cycle and the timing of the return of fertility after giving birth. One married female expressed confusion about both. *"A woman's menstrual cycle is still complicated to me. I don't understand it well. I also don't understand those things of breastfeeding mothers."* A married male listener was confused about postpartum fertility, saying *"Two or three months [after giving birth] if she has her period again she can also get pregnant…I hear people saying it can be six or eight months. I am not very sure."*

Some listeners had incomplete fertility awareness knowledge, for example knowing that there are certain days during the menstrual cycle when pregnancy is more likely, but uncertain about when those days occur.

> *"If you do not know your menstrual cycle or how your body functions a man can tell you a lie that if you have sex…you will not get pregnant…I heard in Ketia's story that a man can impregnate a woman whenever she is in her fertile*

Table 3. Demographic characteristics of listeners and non-listeners

		Survey participants disaggregated by listenership			
	All survey participants $N = 1477$ *n* (%)	Non-listeners $N = 1208$ *n* (%)	Standard listeners $N = 188$ *n* (%)	Engaged listeners $N = 79$ *n* (%)	Pearson chi-square test results
Sex	723 (49.0)	546 (45.2)	146 (77.7)	30 (38.0)	$\chi2$ (2) = 72.6, $p < .001$
Male	754 (51.0)	662 (54.8)	42 (22.3)	49 (62.0)	
Female					
Age	596 (40.4)	485 (40.1)	66 (35.1)	43 (54.4)	$\chi2$ (4) = 8.9, $p = .064$
15–24	428 (29.0)	353 (29.2)	59 (31.4)	16 (20.3)	
25–34	453 (30.7)	370 (30.6)	63 (33.5)	20 (25.3)	
35+					
Marital status	646 (43.7)	523 (43.3)	74 (39.4)	47 (59.5)	$\chi2$ (2) = 9.5, $p = .009$
Single	831 (56.3)	685 (56.7)	114 (60.6)	32 (40.5)	
Married/widowed/ divorced					
Education	155 (10.5)	132 (10.9)	20 (10.6)	3 (3.8)	$\chi2$ (6) = 7.1, $p = .309$
None	829 (56.1)	671 (55.5)	106 (56.4)	51 (64.6)	
Primary	433 (29.3)	356 (29.5)	52 (27.7)	24 (30.4)	
Secondary	60 (4.1)	49 (4.1)	10 (5.3)	1 (1.3)	
Higher					
Residence	353 (23.9)	298 (24.7)	38 (20.2)	16 (20.3)	$\chi2$ (2) = 2.4, $p = .305$
Urban	1124 (76.1)	910 (75.3)	150 (79.8)	63 (79.7)	
Rural					
Province	328 (22.2)	287 (23.0)	30 (16.0)	20 (25.3)	–
East	395 (26.7)	338 (28.0)	43 (22.9)	13 (16.5)	
Kigali City	283 (19.2)	228 (18.9)	41 (21.8)	14 (17.7)	
North	378 (25.6)	291 (24.1)	57 (30.3)	29 (36.7)	
South	93 (6.3)	73 (6.0)	17 (9.0)	3 (3.8)	
West					
Wealth	262 (17.7)	233 (19.3)	20 (10.6)	8 (10.1)	$\chi2$ (8) = 29.9, $p < .001$
Lowest	300 (20.3)	240 (19.9)	39 (20.7)	21 (26.6)	
Second	289 (19.6)	225 (18.6)	46 (24.5)	18 (22.8)	
Middle	306 (20.7)	231 (19.1)	53 (28.2)	22 (27.8)	
Fourth	320 (21.7)	279 (23.1)	30 (16.0)	10 (12.7)	
Highest					
Have children	832 (56.3)	691 (57.2)	108 (57.4)	33 (41.8)	$\chi2$ (2) = 7.3, $p = .026$
Yes	645 (43.7)	517 (42.8)	80 (42.6)	46 (58.2)	
No					
Religion	603 (40.8)	483 (40.0)	81 (43.1)	9 (49.4)	–
Catholic	220 (14.9)	181 (15.0)	30 (16.0)	9 (11.4)	
Protestant	550 (37.2)	452 (37.4)	69 (36.7)	27 (34.2)	
Christian (not Protestant)	75 (5.1)	64 (5.3)	7 (3.7)	4 (5.1)	
Muslim	29 (2.0)	28 (2.3)	1 (0.5)	0 (0.0)	
Other					

period. The question is to know this period." -Unmarried female

Community discussion groups provided an opportunity for participants to ask questions to a knowledgeable facilitator and clarify some of the information that was confusing. A comment from one unmarried female who participated in a discussion group exemplified the benefits of activities that elicit critical reflection, *"We shared ideas, and we ended with discussion… you could say: 'For me, I don't understand well on that point. Is it like that? Is it really correct?'"* Another described how discussion was able to clarify incorrect information about when fertile days occur during the menstrual cycle. *"When [the facilitator] explained to us a woman's menstrual cycle, some group members were saying that fertile days are the*

Table 4. Correct fertility awareness among household survey participants, by listenership

Fertility awareness question	Correct response	All survey participants	Survey participants disaggregated by listenership		
		All $N = 1477$ n (%)	Non-listeners $N = 1208$ n (%)	Standard listeners $N = 188$ n (%)	Engaged listeners $N = 79$ n (%)
What is the best sign that a girl is now able to become pregnant?	First menstruation/period/ bleeding	1208 (81.8)	978 (81.0)	156 (83.0)	73 (92.4)
What is the typical length of a woman's menstrual cycle?	About a month/26–32 days	708 (47.9)	581 (48.1)	82 (43.6)	45 (57.0)
What is the first day of a woman's menstrual cycle?	First day of her period/ bleeding	537 (36.4)	448 (37.1)	53 (28.2)	36 (45.6)
From one period to the next, are there certain days when a woman is more likely to become pregnant?	Yes	1150 (77.9)	935 (77.4)	151 (80.3)	63 (79.7)
Are the days when a woman is more likely to become pregnant: just before her period begins, during her period, right after her period has ended, or several days halfway between two periods?	About halfway between two periods	269 (18.2)	223 (18.5)	29 (15.4)	17 (21.5)
True or false: A man can possibly get a woman pregnant anytime he has unprotected sex.	True	516 (34.9)	417 (34.5)	69 (36.7)	28 (35.4)
What is the best sign that a boy is able to get a girl or a woman pregnant?	First ejaculation/wet dream	933 (63.2)	741 (61.3)	130 (69.1)	62 (78.5)
True or false: While breastfeeding, a woman can get pregnant again even before her period/bleeding returns.	True	949 (64.3)	763 (63.2)	127 (67.6)	57 (72.2)

four [days] in the middle and we asked him further questions. I then asked him to tell us those fertile days, and this is when he told us that you consider days in the middle for a regular cycle."

Family Planning Use Among Listeners and Non-Listeners

Family planning use and intentions, along with other factors associated with an individual's decision to use family planning, are shown in Table 7 for household survey participants. Overall current modern contraceptive use was 37% (39% among men and 34% among women). Among those not currently using a method, 52% reported plans to use a modern method in the near or distant future (61% among men and 44% among women). Listeners were not more likely than non-listeners to be using family planning or have an intention to use family planning in the future (Table 8).

[*Table 7: Descriptive findings on family planning use and related indicators among household survey participants*]

Table 5. Association between listenership and fertility awareness (binary logistic regression analysis)

	Non-listeners	Standard listeners	Engaged listeners
First menstruation is best sign a girl is now fertile.	<reference>	1.7 (1.1–2.6)*	3.2 (1.3–7.7)**
The typical length of a menstrual cycle is about a month.	<reference>	1.1 (0.8 to 1.6)	1.5 (0.9 to 2.5)
The first day of the menstrual cycle is the first day of bleeding.	<reference>	0.8 (0.6–1.2)	1.7 (1.0–2.7)*
There are certain days when a woman is more likely to become pregnant.	<reference>	1.6 (1.0–2.4)*	1.2 (0.6–2.2)
The days when a woman is more likely to become pregnant occur about halfway between two periods.	<reference>	1.2 (0.7–1.8)	1.2 (0.7–2.2)
A man can possibly get a woman pregnant anytime he has unprotected sex.	<reference>	1.1 (0.8–1.5)	1.1 (0.7–1.7)
First ejaculation is the best sign a boy is now fertile.	<reference>	1.3 (0.9–1.8)	2.5 (1.4–4.5)**
Breastfeeding women can get pregnant even before the period returns.	<reference>	1.1 (0.8–1.5)	1.7 (1.0–2.9)*

*$p < .05$, **$p < .01$, ***$p < .001$, ORs adjusted for demographic variables

Table 6. Full binary logistic regression results for fertility awareness indicators with listenership as a significant predictor

	First menstruation is best sign a girl is now fertile.	The first day of the menstrual cycle is the first day of bleeding.	First ejaculation is the best sign a boy is now fertile.	Breastfeeding women can get pregnant even before the period returns.
Listenership	<reference>	<reference>	<reference>	<reference>
Non-Listener	1.7 (1.1 – 2.6)*	0.8 (0.6–1.2)	1.3 (0.9–1.8)	1.1 (0.8–1.5)
Regular listener	3.2 (1.3 – 7.7)*	1.7 (1.0–2.7)*	2.5 (1.4–4.5)**	1.7 (1.0–2.9)*
Engaged listener				
Sex	< reference>	<reference>	<reference>	<reference>
Male	4.5 (3.3–6.3)***	2.1 (1.7–2.7)***	0.9 (0.7–1.1)	0.8 (0.6–1.0)*
Female				
Age	<reference>	<reference>	<reference>	<reference>
1 –24	1.1 (0.7–1.8)	1.3 (0.9–1.9)	1.6 (1.1–2.3)*	1.5 (1.1–2.2)*
25–34	2.2 (1.3–3.9)**	1.5 (1.0–2.3)*	2.2 (1.4–3.3)***	1.8 (1.2–2.6)**
35+				
Marital status	<reference>	<reference>	<reference>	<reference>
Single	1.6 (0.9–2.9)	1.2 (0.8–1.9)	0.9 (0.6–1.4)	1.7 (1.1–2.6)*
Married				
Education	<reference>	<reference>	<reference>	<reference>
None	1.5 (1.0–2.4)	0.8 (0.5–1.1)	1.1 (0.8–1.6)	1.5 (1.1–2.2)*
Primary	2.7 (1.6–4.7)***	1.7 (1.1–2.5)*	3.1 (2.0–4.8)***	2.2 (1.4–3.4)***
Secondary	2.1 (0.9–4.8)	2.8 (1.5–5.4)**	2.4 (1.1–4.9)*	2.3 (1.1–4.6)*
Higher education				
Children	<reference>	<reference>	<reference>	<reference>
No children	0.9 (0.5–1.5)	1.5 (1.0–2.4)	1.2 (0.7–1.8)	1.1 (0.7–1.7)
Children				
Wealth	n/a	n/a	<reference>	n/a
Lowest			1.1 (0.8–1.5)	
Second			1.4 (1.0–2.1)	
Middle			1.3 (0.9–1.9)	
Fourth			1.5 (0.9–2.5)	
Highest				
Residence	n/a	n/a	<reference>	n/a
Rural			1.0 (0.7–1.5)	
Urban				
Province	n/a	n/a	<reference>	<reference>
West			1.6 (1.0–2.7)	1.9 (1.1–3.0)*
East			1.7 (0.9–2.9)	1.8 (1.1–2.9)*
Kigali			1.8 (1.1–2.9)*	1.6 (1.0–2.6)
North			2.5 (1.5–4.1)***	2.3 (1.4–3.7)**
South				
Religion	<reference>	n/a	n/a	n/a
Catholic	1.8 (1.1–2.9)*			
Protestant	0.8 (0.6–1.1)			
Christian	0.8 (0.4–1.5)			
Muslim	0.7 (0.3–1.5)			
Other				

*$p < .05$, **$p < .01$, ***$p < .001$

Table 7. Descriptive findings on family planning use and related indicators among household survey participants

		All survey participants	Survey participants disaggregated by listenership		
		All *N* = 1477 *n* (%)	Non-listeners *N* = 1208 *n* (%)	Standard listeners *N* = 188 *n* (%)	Engaged listeners *N* = 79 *n* (%)
Family planning use	Currently using a family planning method	626 (42.4)	509 (42.1)	87 (46.3)	30 (38.0)
	Currently using a modern family planning method	540 (36.6)	437 (36.2)	75 (39.9)	28 (35.4)
Intention to use family planning	Plans to use a method to delay or avoid pregnancy in the near or distant future[1]	491 (57.7)	390 (55.8)	70 (69.3)	30 (61.2)
Awareness of family planning methods	Able to spontaneously name at least one method of family planning	1382 (93.7)	1122 (92.9)	184 (97.9)	76 (96.2)
Perceived supportive norms	Believe that many married couples in my community use family planning	1110 (75.2)	898 (74.3)	150 (79.8)	61 (77.2)
	Believe that many unmarried men in my community use family planning	681 (46.1)	533 (44.1)	113 (60.1)	34 (43.0)
	Believe that many unmarried women in my community use family planning	633 (42.9)	498 (41.2)	104 (55.3)	31 (39.2)
	Believe that people who are important to me approve of me using family planning[2]	418 (66.8)	329 (64.6)	71 (81.6)	18 (60.0)
Positive attitudes about family planning	Believe that a couple has the right to determine the number of children they will have	1395 (94.4)	1134 (93.9)	185 (98.4)	75 (94.9)
Self-efficacy to access and use family planning	Believe that it is possible to control family size by using family planning	1336 (90.5)	1086 (89.9)	182 (96.8)	68 (86.1)
	Knowledge of a place where you can get a method of family planning	1385 (93.8)	1127 (93.3)	179 (95.2)	78 (98.7)
	Agrees or strongly agrees with the following statement: I am confident that I can access a family planning method if I want to plan or prevent a pregnancy	1390 (94.2)	1133 (93.8)	181 (96.3)	74 (93.7)
Reproductive empowerment and skills	Discussed family planning with partner in the past 3 months[3]	503 (64.7)	405 (63.9)	76 (67.9)	22 (71.0)
	Discussed family planning with family, friends, or neighbors in the past 3 months	423 (28.6)	332 (27.5)	62 (33.0)	29 (36.7)
	Discussed fertile days during the menstrual cycle with anyone in the past 3 months	356 (24.1)	285 (23.6)	43 (22.9)	28 (35.4)

Table 8. Association between listenership and family planning (binary logistic regression analysis)

	Listeners compared to non-listeners		
	Women	Men	Women + Men
Currently using a modern family planning method	1.4 (0.7–2.6)	1.1 (0.7–1.6)	1.18 (0.9–1.6)
Plans to use a modern method to delay or avoid pregnancy in the near or distant future	1.7 (1.0–3.0)	1.3 (0.8–2.2)	1.42 (1.0–2.1)
Able to spontaneously name at least one method of family planning	7.3 (1.7–31.8)**	12.5 (2.9–53.1)***	3.8 (1.7–8.6)***
Believe that many married couples in my community use family planning	1.4 (0.8–2.6)	1.5 (1.0–2.3)	1.4 (1.0–2.0)*
Believe that many unmarried men in my community use family planning	1.5 (0.9–2.4)	1.5 (1.0–2.1)*	1.3 (1.0–1.8)*
Believe that many unmarried women in my community use family planning	1.3 (0.8 – 2.0)	1.4 (1.0 – 2.0)	1.4 (1.0–1.8)*
Believe that people who are important to me approve of me using family planning	1.4 (0.6–3.4)	1.4 (0.7–2.5)	1.4 (0.8–2.2)
Believe that it is possible to control family size by using family planning	1.0 (0.5–1.9)	2.5 (0.8–7.3)	1.3 (0.8–2.3)
Believe that a couple has the right to determine the number of children they will have	2.4 (0.8–6.7)	1.4 (0.4–5.1)	1.9 (0.9–4.3)
Knowledge of a place where you can get a method of family planning	2.9 (0.7–12.5)	2.2 (0.9–4.9)	2.2 (1.1–4.4)*
Agrees or strongly agrees with the following statement: I am confident that I can access a family planning method if I want to plan or prevent a pregnancy	0.9 (0.6–1.5)	1.4 (1.0–2.1)*	1.1 (0.9–1.5)
Discussed family planning with partner in the past 3 months	2.7 (1.1–6.3)*	0.9 (0.6–1.5)	1.2 (0.8–1.8)
Discussed family planning with family, friends, or neighbors in the past 3 months	2.3 (1.4–3.8)**	1.4 (1.0–2.1)	1.6 (1.2–2.1)**
Discussed fertile days during the menstrual cycle with anyone in the past 3 months	1.8 (1.1–2.9)*	1.0 (0.6–1.6)	1.3 (0.9–1.7)

*$p < .05$, **$p < .01$, ***$p < .001$, ORs adjusted for demographic variables, reference category was non-listeners

Family Planning Related Indicators: Awareness, Norms, Self-Efficacy, and Communication

The odds ratios for listeners compared to non-listeners for all outcomes of social norms, attitudes, self-efficacy, and communication are shown in Table 8. Due to sample size restrictions and low variation for many of these indicators, we were unable to examine engaged and standard listeners separately. Listeners had higher odds of awareness of family planning methods, perceived supportive norms, self-efficacy, and discussion about family planning. Listeners had 3.8 higher odds of being able to name at least one method of family planning; 1.3–1.6 higher odds of believing that many married couples, unmarried men, and unmarried women in their communities use family planning; 2.2 higher odds of knowing a place to get a method family planning, and 1.6 higher odds of discussing family planning with family, friends, or neighbors. A comparison of the odds ratios for listeners and non-listeners disaggregated by sex shows female listeners had 2.7 higher odds of discussing family planning with a partner, 2.3 higher odds of discussing family planning with others, and 1.8 higher odds of discussing fertile days, whereas there were no significant differences between male listeners and non-listeners related to partner communication and discussion of fertile days.

Qualitative interviews suggest that increased discussion about family planning may have occurred because the radio drama emboldened people to have conversations about uncomfortable and taboo topics. One married female talked about how she brought up what she learned about fertile days with her husband.

> "I talk to my husband about knowing the fertile period… [The radio drama] encouraged me very much; before I used to be ashamed…since I acquired information about reproductive health I got more and more encouraged to talk and plan. We were in bed. I was in my fertile period. I became bold and told him that if we had sex I could get pregnant and we could fail to space our pregnancies."

Bacyenga's story in particular was a lesson to listeners on the importance of discussing family planning and the desired number of children with your partner. One married female describes how her husband changed his mind after listening to *Impano n'Impamba* and having a discussion. *"My husband was against [family planning]…He used to tell me: 'I want you just to produce children, that is why I married you.'… He was changed by listening to those things in the Impano n'Impamba radio drama and by what we discussed together."* An unmarried male was inspired by Bacyenga's story to communicate in the future. *"If I marry, it will be better to discuss [family planning] with my partner beforehand. We will discuss and decide together…which [method] we can use."*

Discussion

Given widespread misunderstanding of pregnancy risk, the FACT Project sought to improve fertility awareness by integrating

actionable information in the serial radio drama, *Impano n'Impamba*, and assess differences between listeners and non-listeners on key outcomes. Listeners had higher fertility awareness, particularly related to signs of fertility onset, postpartum fertility, and the beginning of the menstrual cycle. Listenership was not as strong a predictor of fertility awareness as some socio-demographic characteristics, specifically sex, age, and education. Listeners were more likely to report knowledge of family planning methods, supportive norms, self-efficacy to obtain a method, and discussing family planning with others. There were no differences between listeners and non-listeners for modern contraceptive use. Yet, the mCPR among all women of reproductive age in the sample population (34%) was higher than the mCPR reported in the 2015 RDHS (28%) (NISR, 2015).

Our analysis found that the strongest differences between listeners and non-listeners were related to knowledge (fertility awareness and family planning methods) and inter-personal communication. A systematic review of EE interventions found their effect on health knowledge was slightly stronger than on attitudes, intention, and behaviors (Shen & Han, 2014). This suggests EE approaches may be a good way to disseminate information about fertility and pregnancy risk but may be less likely to affect behavior changes such as contraceptive use. Previous research on EE has also found that it can stimulate inter-personal discussion of topics from the drama (Frank et al., 2012; Moyer-Gusé & Nabi, 2011) which can be an important mediating factor in behavior change (Jeong, Tan, Brennan, Gibson, & Hornik, 2015; Southwell & Yzer, 2009).

Studies have shown that stronger outcome effects are seen when listeners are exposed to multiple episodes over a period of time so they encounter the health messages repeatedly (Shen & Han, 2014). The FACT Project sought to convey eight different messages related to fertility awareness, in addition to information about family planning. Exposure to the messages could help explain why listeners were more likely to have correct knowledge of some, but not all of the fertility awareness concepts. Even though standard and engaged listeners heard the radio drama regularly, some fertility awareness concepts were more clearly and frequently integrated into the episodes than others. In Ketia's story, the signs of fertility onset for boys and girls were mentioned multiple times, as were messages around menstruation management. Messages explaining when during the menstrual cycle fertile days occur were mentioned less frequently. If listeners missed an episode, they might have missed key information. The FACT Project provided technical assistance to script writers through an orientation on fertility awareness and periodic script review, but no technical staff was part of the script writing team. This lack of in-house technical expertise in the topic area points to the need for strong capacity building activities for creative staff to ensure accurate information is integrated from the beginning. We would have liked to understand better how the frequency of individual messages related to fertility awareness and further strengthen our exposure analysis. However, this was not feasible considering the data available.

The dilution of certain fertility awareness messages may also be due to the competing priorities of multiple organizations supporting the radio drama. *Impano n'Impamba* had several behavior change objectives which can be beneficial to guaranteeing listener interest in dynamic storylines. However, clear communication and buy-in from all partners and creative staff is required for coordination of storylines to meet the multiple objectives. Considering the consolidation of donor resources for global health and trend toward integration, this implementation scenario is not unique. Future radio dramas with the aim of increasing fertility awareness will need to consider which messages are central to the desired behavior change, focus on conveying these clearly and frequently, and monitor the frequency of these messages.

Individual exposure to the fertility awareness messages is important, and may have varied based on how people listened to the radio drama. While the literature provides no clear or consistent definition of listenership, definitions are primarily based on frequency, and range from having listened yesterday to listening daily, weekly, or monthly. Defining listenership was crucial to our analysis, and we found differences between individuals who could name at least one character and those who could not, even though both groups reported listening to the radio drama at the same frequency. Our in-depth interviews suggest that many people listened to *Impano n'Impamba* passively while completing other tasks, and this was particularly true of men. Fully understanding all of the fertility awareness concepts may have required closer listening.

Since accurate information about fertility may contradict widespread cultural beliefs, listeners may not initially be receptive to the new information, such as postpartum pregnancy risk. Additional efforts may be needed to reinforce critical reflection and discussion that allow for reexamination of common beliefs. Our experience with *Impano n'Impamba* found that interpersonal discussion and communication in the community discussion groups with a knowledgeable facilitator was invaluable in clarifying information in the radio drama. Discussion groups and other transmedia elements may need to be combined with longer narrative-based storytelling interventions to increase fertility awareness and change behavior related to family planning use. *Impano n'Impamba* was limited by an insufficient budget for transmedia and community engagement elements, but future radio dramas should not underestimate their importance.

The difference in fertility awareness and other intermediate factors that could influence family planning use signal transformation along the behavior change continuum toward uptake. Increasing family planning use in countries like Rwanda where mCPR is already high requires addressing cultural and attitudinal resistance to family planning. This change happens over time and must address community-level norms that influence behavior. This may be best achieved through multi-pronged interventions, of which radio is one component.

Limitations

This study has two key limitations. First, we had no baseline comparison for the household survey and had to rely on a comparison between listeners and non-listeners, as determined through self-reported data. It is possible there are alternative explanations for the observed differences between listeners and non-listeners besides radio drama listenership. An experimental study design

would have allowed us to establish causality and attribute differences in fertility awareness and family planning indicators to *Impano n'Impamba*. Secondly, while the sample size was calculated to be nationally representative of Rwanda, by focusing specifically on engaged listeners who listened to the radio drama frequently and could name at least one character spontaneously, the size of our group of interest was small, only 5% of the total sample. This limited our ability to conduct some statistical analyses, particularly when there was little variation in responses.

Conclusion

Compared to non-listeners, listeners of *Impano n'Impamba* had greater fertility awareness and other intermediate factors related to family planning uptake such as perception of positive family planning norms, self-efficacy, and communication. However, no differences were found in family planning use. The study provides lessons for future interventions with the aim of increasing fertility awareness to improve sexual and reproductive health behaviors. The first is that exposure to messages, both at the intervention and individual levels, is important. Interventions with the aim of increasing fertility awareness will need to consider which messages are central to the desired behavior change and focus on conveying these clearly and frequently. Additionally, evaluations of radio interventions should carefully consider how listenership is defined. Secondly, increases in fertility awareness and other intermediate factors related to family planning (e.g. as perception of positive family planning norms, self-efficacy, and communication) may be best achieved through multi-pronged interventions of which radio is one of several components. The importance of transmedia and community engagement elements should not be underestimated.

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Notes

1. Asked only of participants not currently using a family planning method. N = 849 for all, 699 for non-listeners, 101 for standard listeners, and 49 for engaged listeners.
2. Asked only of participants currently using a family planning method. N = 626 for all, 509 for non-listeners, 87 for standard listeners, and 30 for engaged listeners.
3. Asked only of married participants. N = 777 for all, 634 for non-listeners, 112 for standard listeners, and 31 for engaged listeners.

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