PATHFINDER INTERNATIONAL

Research and Evaluation WORKING PAPER

# The Effect of Reproductive Health Communication Interventions on Age at Marriage and First Birth in Rural Bihar, India: A retrospective study

Elkan E. Daniel, MD, MPH
Rema Nanda, Ed.D.

January 2012

Pathfinder INTERNATIONAL
a global leader in reproductive health

# The Effect of Reproductive Health Communication Interventions on Age at Marriage and First Birth in Rural Bihar, India: A retrospective study

**Elkan E. Daniel, MD, MPH**
**Rema Nanda, Ed.D.**
Pathfinder International/India
Mastipur, Bodh Gaya, Bihar, India

*Corresponding author, e-mail: rnanda@pathfind.org

**Pathfinder International Research and Evaluation Working Paper Series**

The purpose of the Working Paper Series is to disseminate work in progress by Pathfinder International staff on critical issues of population, reproductive health, and development.

Unless otherwise indicated, working papers may be quoted and cited without permission of the author(s), provided the source is clearly referenced as a working paper. Full responsibility for the content of the paper remains with the author(s). Comments from readers are welcomed and should be sent directly to the corresponding author.



**Pathfinder International**

Pathfinder International places reproductive health services at the center of our work around the world, providing women, men, and adolescents access to a range of quality health services—from contraception and maternal care to the prevention and care of sexually transmitted infections. Pathfinder strives to halt the spread of HIV and AIDS, strengthen access to family planning, advocate for sound reproductive health policies, and, through all of our work, improve the rights and lives of the people we serve.

Pathfinder International/Headquarters
9 Galen Street, Suite 217
Watertown, MA 02472 USA
Tel: 617-924-7200
Fax: 617-924-3833
www.pathfinder.org

**Acknowledgements**

The authors received helpful comments from Manoj Kumar, Patricia David and Callie Simon; Elizabeth Oliveras and Laura Subramanian also reviewed data analyses and tables. PRACHAR Phases 1 and 2 were funded by the David and Lucile Packard Foundation. The views expressed are those of the authors and do not reflect the opinions of Pathfinder International or the Packard Foundation.

**Table of Contents**

**Summary**

**Background** Early marriage of girls and early childbearing are widespread in India and adversely affect familial, social, economic, and health outcomes. The PRACHAR project in rural Bihar attempts to increase age at marriage and first birth through communication interventions, including reproductive and sexual health education of 15-19 year olds.

**Methods** In 2008, about five years after project interventions began, a random sample of 307 females and 306 males who participated in the ARSH education activity was interviewed to record their history of marriage, contraceptive use, and dates of birth of children. Similar data were also collected from 306 females and 306 males of comparable ages randomly selected from a comparison area. Life table techniques and proportional hazard and logistic regressions were used for data analysis.

**Results** Among the intervention group, the median age at marriage for females was 2.6 years higher (22.0 vs. 19.4) and for males was 2.8 years higher (24.1 vs. 21.3) than in the comparison group. When schooling and caste differences were taken into account, the adjusted relative risk of marriage by the time of the survey among females was 44 % lower and among males 26% lower for those exposed to the intervention than among their comparison counterparts.

For women in the intervention group, the unadjusted life table estimate of median age at first birth was 23.1 years of age, 1.5 years higher than age at first birth in the comparison group (21.6 years). This results in an average interval between marriage and first birth of 1.1 years in the intervention group - half as long – as the marriage to first birth interval in the comparison group, which was 2.2 years. Taking differences in age at marriage, education, and caste into account, the likelihood of having a first birth by the time of the survey was 39% lower among female respondents in the intervention group than in the comparison group.

The odds of contraceptive use reported by female respondents both before and after first birth were 5 times higher in the intervention group than in the comparison group. The odds of contraceptive use by male respondents before first birth were 3.6 times higher and after first birth 6.8 times higher in the intervention than in the comparison group.

**Interpretation** Culturally appropriate, community-based communication programs that target unmarried adolescents and the people who influence their decisions can increase women's age at marriage and age at first birth and increase contraceptive use among newly-married and low parity couples.

## Introduction

Worldwide, between 20% and 70% of women enter into marriage by age 18, before they are legally adults. Early marriage is most prevalent in Sub-Saharan Africa and South Asia (especially in India and Bangladesh) [1]. In India about 46% of women are married by age 18, the legal age of marriage [2]. In the Northern states where about 40% of the country's 1.2 billion people live, the situation is more serious. For example, in Bihar, 64% women were married by age 18 [3]. The situation in rural areas of Bihar is more serious, with about 70% of women being married by age 18 in Bihar and Jharkhand [3]. In rural India where over 70% of the country's population lives, the median age of women at marriage, first intercourse, and first birth are 16.1, 17.0, and 19.3 years, respectively [3].

Early marriage and childbearing limit women's opportunities for human capital and life skills development, with negative familial, social, economic, and health impact. In India, as compared to women who marry after 18, women married before age 18 were significantly more likely to (a) not use contraception before the first pregnancy, (b) have three or more pregnancies, (c) have pregnancy intervals of less than 24 months, (d) have two or more unwanted pregnancies, and (e) have pregnancy terminations, including abortion [2]. These childbearing practices may have adverse consequences on the health of both women and their children [3-8]. Early and repeated childbearing also exacerbate the problems of population momentum, a serious factor affecting population growth in India [9-10].

The PRACHAR project in rural Bihar designed behavior change communication (BCC) interventions to enhance the knowledge and understanding of reproductive health issues among young males and females and to promote a positive attitude towards family planning [11]. The word "PRACHAR" in Hindi means: "to let people know" or "to disseminate." The project has shown that providing reproductive health information to young couples, their families, and the community can lead to increases in contraceptive use by young couples who are recently married but have not yet had a child or have had only one child. The project did not provide any supplies of contraceptives or any other health products but it did attempt to facilitate access to government and private health facilities and outlets. Over a period of two years, contraceptive use increased from less than 5% to over 20% in the intervention communities while there was no noticeable increase in contraceptive use in neighboring comparison communities [12].

One component of PRACHAR is to provide reproductive health (RH) education to unmarried adolescent girls and boys (aged 15-19 years) through a 3-day long training program with an aim to increase knowledge and understanding of RH issues, the importance of delayed childbearing and spacing of pregnancies, and sources of services. The participants are also taught communication skills to negotiate with partners and guardians in order to achieve their reproductive goals. The purpose of this paper is to examine the effects of PRACHAR interventions on participants of the adolescent reproductive and sexual health (ARSH) education program.

## The PRACHAR project

Between 2002 and 2006, the PRACHAR Project[1] undertook a constellation of communication activities to promote change in the reproductive behavior of adolescents in 17 administrative blocks (or sub-districts) of three districts in Bihar: Nalanda, Nawada, and Patna. Bihar is the most socioeconomically disadvantaged state in India. These areas are typical of Bihar districts and are within 2-4 hours by bus or car from the city of Patna, the state capital. The population in these districts is poor, has little education, and belongs almost exclusively to scheduled and backward castes. The main economy in the districts is agriculture. The intervention activities reached about 650,000 people, including approximately 110,000 unmarried adolescents, newlyweds, young married women under age 25 and their husbands [11, 12].

PRACHAR's mission was three-fold: to increase girls' age at marriage, delay the first birth after marriage until the age of 21, and ensure spacing of at least three years between the first and second births [13]. The

[1] The PRACHAR project was implemented by Pathfinder International with funding from the David and Lucille Packard Foundation.

PRACHAR interventions aimed to increase the awareness, knowledge, and understanding of RH issues related to timing and spacing of pregnancies among PRACHAR's audience of adolescents, young couples, their guardians (parents and in-laws), and influential community members through interpersonal and group communications. Information was given to these audiences through targeted channels. In addition to the ARSH education for adolescent boys and girls mentioned above, newlywed couples were given "infotainment" parties; young married women were routinely visited by female workers who provided information about the benefits of delaying childbearing and spacing of pregnancies; and meetings were held with young married males, parents and in-laws, and influential community members. RH information was disseminated through wall paintings, street theater, posters, and leaflets. These community mobilization activities fostered an enabling social environment conducive to the acceptance of innovative ideas about healthy and prosperous families, which are consistent with the marriage and pregnancy timing messages promoted by PRACHAR. Community mobilization was done in order to gain support for ARSH education for the adolescents.

### *The adolescent training on reproductive health*

Young girls and boys lack basic knowledge of the biology of reproduction, and it is not taught systematically in educational institutions in Bihar. Although there are some efforts to teach sexuality and reproduction in secondary schools, there is opposition to it from parents and communities. Moreover, in Bihar secondary school enrollment, especially of girls, is still low. The education of adolescents through the PRACHAR program provides essential reproductive health information and addresses key issues of concern to young people at their particular stage of life.

Three local non-governmental training organizations organized the education sessions, which were given five hours a day for three days. These sessions were organized separately for girls and boys in groups of 30. Two trainers conducted each session; in the sessions for girls both were female; and one male and one female conducted the sessions for boys. The trainers were trained by Pathfinder staff using the organization's Reproductive Health Guide for Educators of 15-19 Year Olds (Adolescents). Specific health messages are selected from a broad menu including the basic structure and functions of male and female reproductive systems; the menstrual cycle and hygiene; nutrition; conception and contraception; transmission, prevention, and treatment of sexually transmitted infections, reproductive tract infections, and HIV and AIDS; myths and misconceptions related to sexuality, reproduction, and STIs; recognizing and protecting against sexual harassment and abuse; spousal negotiation; gender-egalitarian sexual decision-making; the availability of reproductive health and family planning services; and the need to use such services. Job aids, pictorials, and models were used for illustrations of reproduction, disease transmission and prevention, and contraceptive methods and their use. A total of 17,451 girls and 16,136 boys between 15 and 19 participated in the ARSH education sessions during the period from March 2003 through September 2004.

In the sessions, health, social and family wellbeing, the economic benefits of delaying marriage and childbearing, birth spacing, and small family size were discussed. The training emphasized that girls should not be married before the legal age of marriage which is 18 years, the age when a person becomes an adult. It also emphasized that girls should wait until age 21 to have their first child. Emphasis was placed on couples spending time together, getting to know and enjoy each other's company, developing an understanding relationship, and becoming more emotionally mature. There was also emphasis on saving the money needed for children before taking the responsibilities of childbearing. The health consequences of unprotected sex were discussed. Discussion and exercises helped prepare them to resist family and community pressures to marry and conceive at a young age. Special sessions on tackling sexual abuse introduced both girls and boys to the fact that such abuse exists and that they can act to protect themselves from it. The training addressed gender issues at every opportunity, helping both girls and boys to think about their own notions of the equality of men and women, about sexual harassment of women, and about whether or not women have a right to decide about their own bodies and participate equally in decisions related to their own lives and families.

**The study: sample selection and survey methodology**

As part of the project, a study to assess the effect of the education program (and accompanying interventions) on age at marriage, contraceptive use before and after the first birth, and age at first birth was undertaken. The study also intended to identify the factors associated with these outcomes, and, to provide evidence from the project that could be used to promote scale-up of the interventions if the results were positive. In October 2008, about five years after participating in these training sessions, a survey was conducted among participants in the adolescent training in three intervention blocks, one each from the three districts where project activities were implemented: Nalanda (Noorsarai), Nawada (Akbarpur) and Patna (Bihta) and among a similar age cohort in a comparison area. The comparison area was comprised of geographically demarcated villages and hamlets covering a population of equivalent size (30,000-35,000) as were covered by the intervention in each of the same three blocks, but at least 5 kilometers away from the intervention villages.

Sample size was based on estimating a minimum expected difference in the proportion of women having a first birth before age 21 among those exposed to PRACHAR interventions and those in the comparison area. Using a one-sided test with 80% power to detect a difference of 15 percentage points (60% beginning childbearing before that age in the comparison area and 45% in the intervention area), with 95% confidence and a design effect of 2, the required sample (men and women in each of the two areas) was calculated to be about 300 in each group, allowing for 10% loss due to refusals and other reasons.

The sampling frame for the intervention area consisted of village lists of all males and females who had previously participated in the adolescent reproductive and sexual health education program. Now, five years later, the participants were aged between 19 and 24 years of age. Three hundred and seven females and 306 males were selected from the list of the 17,451 girls and 16,136 boys who received the adolescent training.

In order to prepare a sampling frame for the comparison area, men aged 19-24 from all households in the 20 selected comparison villages were listed. Similarly, all the unmarried daughters (aged 19-24) and daughters-in-law aged 19-24 currently resident in the households were listed. Daughters-in-law whose parental homes were located outside the respective districts were not included, to avoid the possibility that they were exposed to PRACHAR or other interventions prior to taking up residence in the comparison area.

The sample was selected in two stages. First, 20 villages (clusters) were selected from among villages in the intervention and comparison areas with probability proportional to size of the village population (PPS). Second, within the selected villages, a systematic random sample of 15 males and 15 female trainees was drawn from the list of those who participated in the adolescent training sessions or from the list of household residents compiled in the comparison area. At the time of the survey, the age range of these young people was between 19 and 24. Data were collected by interviewers in person, at the homes of the respondents.

In Bihar when women marry, they move to their husband's village, which may be quite distant from their natal village. For those women who had married and whose new residences were within the sub-district where they resided at the time of training, the interviewers went to the new home. For those who no longer resided in the sub-district, a replacement was made from the lists in that village. Also, many young men temporarily migrate to cities for work and cannot be found at their usual residences. In order to deal with issues of non-availability of respondents for interview, the survey was conducted during the time of an autumn festival (Late October) when men working elsewhere come home and most young married women visit their natal homes. Prior appointments for interviews were made for these individuals during the time of the festival. Most men who were temporary migrants were interviewed during the autumn festival. Most married women who were visiting from their marital home during the autumn festival were interviewed either before or shortly after the festival. There were still some cases where respondents selected into the sample could not be contacted for the interview, and they were substituted through further random selection to reach the required sample size.

Data were collected with a structured questionnaire, pre-tested in an area outside of the intervention and comparison areas. The interviewers were social science graduates from four-year degree colleges and also

had previous data collection experience. They were trained for the purpose of the survey which included in-class training and field based data collection training. Male and female respondents were interviewed by male and female interviewers, respectively. The key information collected in the survey included a history of marriage, contraceptive use, and pregnancy outcomes as well as information on reproductive health knowledge, attitude, and practices.

### Data analysis

Life tables were used to calculate median age at marriage and first birth and differences were tested statistically using the Wilcoxon (Gehan) statistic. Proportional hazards regression was used to estimate the net effect of the interventions after controlling for the effects of socio-demographic and other factors. Similarly, logistic regression was used to estimate the net effect of interventions on contraceptive use. Sixty females and 55 males who were already married (although the gauna ceremony had not been performed) before attending ARSH education sessions were excluded from analysis of age at marriage.

### Results

Table 1 presents a brief profile of female and male respondents in the intervention and comparison groups. The age of female respondents was similar in the intervention and comparison groups but males in the intervention group were significantly younger than the comparison group. The distributions of both education and caste of female and male respondents differ significantly between groups, the intervention group showing an advantage over the comparison group. Women in the intervention group were significantly more educated and less likely to be married at the time of the survey than women in the comparison group. Men in the intervention group were also significantly better educated, more likely to belong to an advantaged caste, and less likely to be married than were men in the comparison group.

**Table 1. Demographic profile of survey respondents**

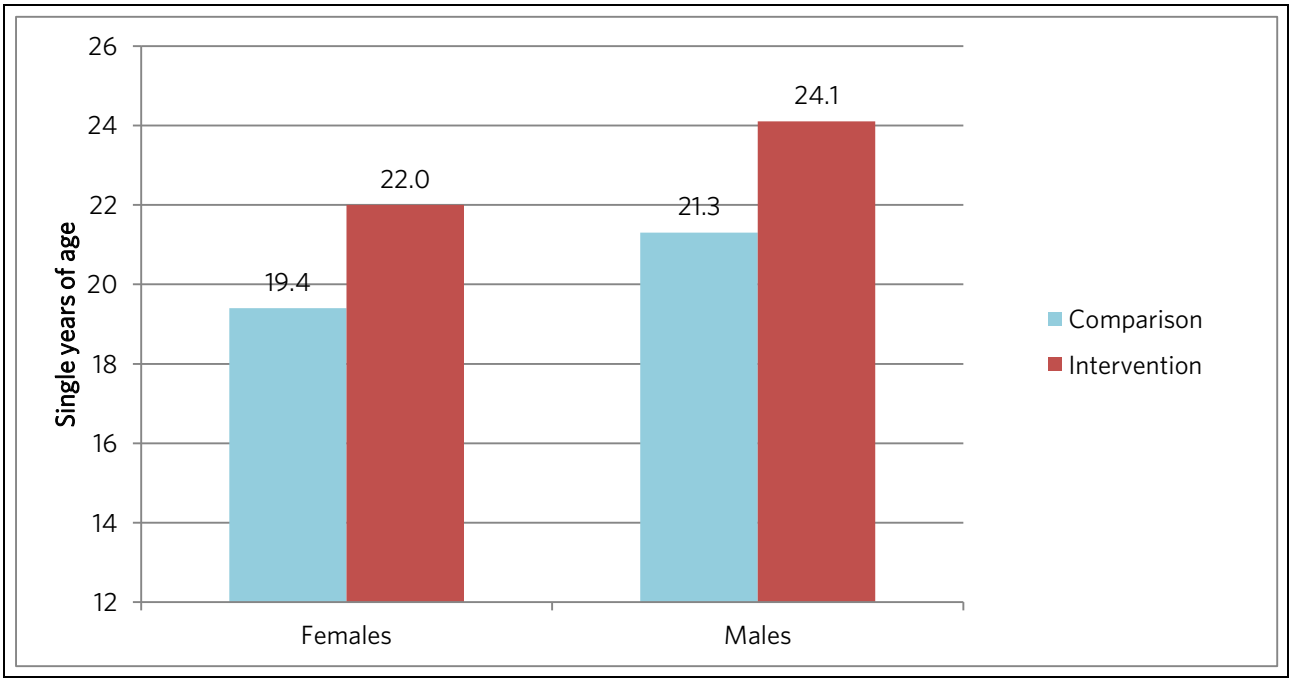
| **Female respondents** | | | |
|---|---|---|---|
| **Characteristics** | **Comparison (n=306)** | **Intervention (n=307)** | **p value*** |
| Mean age (SD) at survey | 21.51 (1.45) | 21.38 (1.59) | NS |
| % married at time of survey | 65.7 | 57.3 | < .05 |
| % married at time of training | N/A | 19.5 | |
| % with one or more children at survey | 38.9 | 24.1 | < 0.001 |
| **Years of schooling** | | | |
| None | 35.6 | 25.1 | < 0.05 |
| 1-9 years | 33.7 | 35.8 | NS |
| 10+ years | 30.7 | 39.1 | < 0.05 |
| **Caste** | | | |
| Schedule caste/tribe | 31.4 | 27.0 | NS |
| Most backward | 9.5 | 15.6 | <.05 |
| Backward | 36.9 | 30.9 | NS |
| Other | 22.2 | 26.4 | NS |
| **Male respondents** | | | |
| **Characteristics** | **Comparison (n=306)** | **Intervention (n=306)** | **p value** |
| Mean age (SD) at survey | 22.86 (1.79) | 22.19 (1.60) | < 0.001 |
| % married at time of survey | 60.1 | 51.0 | < .05 |
| % married at time of training | N/A | 17.9 | |
| % with one or more children at survey | 39.2 | 24.8 | <.05 |
| **Years of schooling** | | | |
| None | 20.6 | 3.9 | < 0.001 |
| 1-9 years | 34.3 | 25.2 | .01 |
| 10+ years | 45.1 | 70.9 | < 0.001 |
| **Caste** | | | |
| Schedule caste/tribe | 37.9 | 24.2 | < 0.001 |
| Most backward | 9.8 | 13.1 | NS |
| Backward | 38.2 | 37.6 | NS |
| Other | 14.1 | 25.2 | < 0.001 |

* Test of difference between two means or proportions.

### *Age at marriage*

The life table median age at marriage of females in the intervention group was 2.6 years higher (22.0 vs. 19.4) than the comparison group (Figure 1; p<0.001). (All analyses of age at marriage include only men and women who were unmarried at the time of training.) Similarly, the life table median age at marriage of males in the intervention group was 2.8 years higher (24.1 vs. 21.3) than the comparison group (Figure 1; p<0.001).

**Figure 1: Median age at marriage among female (n=553) and male (n=557) respondents**




Adjusting for respondents' education and caste, women in the intervention group were 44% less likely to be married at the time of the survey than women in the comparison group ($p<0.001$) (see Table 3). For men the differences were less pronounced: men in the intervention group were 26% less likely to be married than those in the comparison group ($p<0.05$). Education is also an independent predictor of marriage: the more years of schooling women and men have, the less likely they are to be married at the time of the survey ($p<0.001$). Likelihood of being married was not independently associated with caste among females, but men in 'other' castes (who are more advantaged socioeconomically) were 48% less likely to be married at the time of the survey than men belonging to scheduled castes or tribes.

**Table 3: Likelihood of marriage of female (n=553) and male (n=557) respondents: proportional hazards regression**

| **Factors** | **Females (n=553)** | **Males (n=557)** |
|---|---|---|
| Comparison | 1.00 | 1.00 |
| Intervention | 0.56*** | 0.74* |
| Number of years of schooling | 0.90*** | 0.89*** |
| Caste | | |
| Schedule caste/tribe | 1.00 | 1.00 |
| Most backward | 1.01 | 0.86 |
| Backward | 0.95 | 0.87 |
| Other | 0.84 | 0.52** |
| -2Loglikelihood | 3,614.16 | 3,249.21 |

*p<0.05; **p<0.01; and ***p<0.001

### *Contraceptive use after marriage and before first birth*

Looking at the use of contraception, we see from the data in Table 4 that women in the intervention group were 5 times more likely to use contraception after marriage and before a first birth than women in the comparison group (p<0.001).

**Table 4. Adjusted odds ratios of factors associated with ever use of contraception after marriage and before first birth, reports by men and women: logistic regression**

| Factors | Women (n=377) | Men (n=340) |
|---|---|---|
| Comparison | 1.00 | 1.00 |
| Intervention | 4.95*** | 3.58*** |
| Respondent's age at marriage | 1.03 | 1.06 |
| Years of schooling | 1.17*** | 1.08* |
| Caste | | |
| Schedule caste/tribe | 1.00 | 1.00 |
| Most backward | 1.34 | 1.24 |
| Backward | 0.95 | 0.59 |
| Other | 0.71 | 0.60 |
| Model constant | 0.01** | 0.03*** |
| -2Loglikelihood | 218.86 | 339.14 |

*p<0.05; **p<0.01; and ***p<0.001

Among married men in the intervention group, the odds of using contraception after marriage were 3.6 times as high as for men in the comparison group (p<0.001).

Contraceptive use after marriage was not independently associated with the age at which women or men married or with their caste. However, contraceptive use was positively associated with education (p<0.001) for both sexes. Every year of schooling increased the odds that a woman used a contraceptive by almost 20%; for men, the relationship was not quite as strong, but each year of schooling increased the odds of contraceptive use by about 8%.

### *Age at first birth*

The data shown in Figure 2 show the results of the unadjusted life table analysis for age at first birth (conducted for married female respondents). For women in the intervention group, this was 23.1 years of age, 1.5 years higher than age at first birth in the comparison group (21.6 years) (p <0.001). This makes the interval between marriage and first birth half as long in the intervention group - 1.1 years – as the marriage to first birth interval in the comparison group, which was 2.2 years. (Figure 3)

**Figure 2: Median age at first birth among female respondents (n=377)**

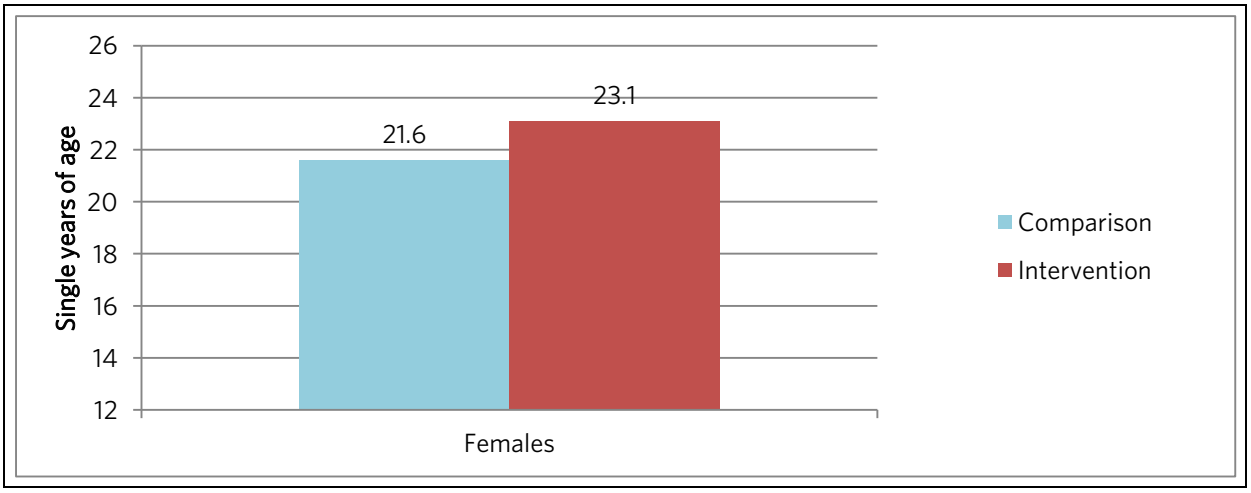



**Figure 3: Median age at marriage (n=553) and interval to first birth (n=377) among female respondents**

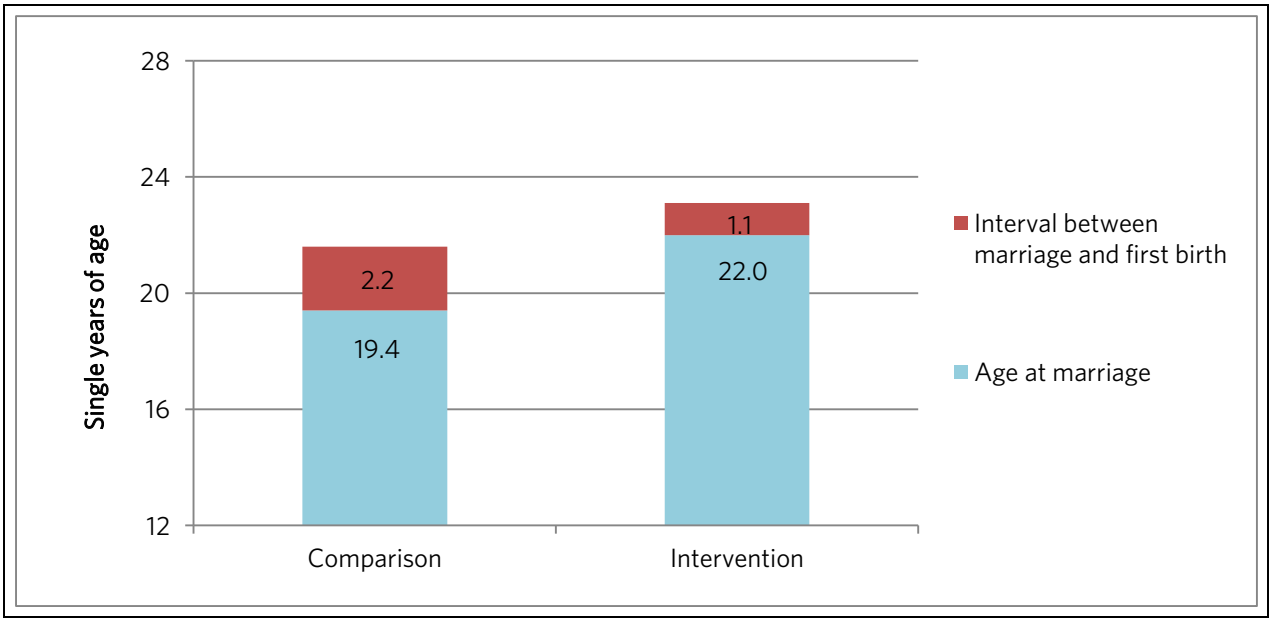



Table 5 shows the relative risk of having a first birth, adjusted for the effect of respondent's age at marriage, caste and education. After adjusting for differences between intervention and comparison groups, we find that women in the intervention group were 39% less likely than the comparison group ($p<0.01$) to have had a first birth at the time of the survey. Age at marriage and years of education were positively and independently associated with the propensity to have a birth at the time of the survey. The older and more educated a woman at her marriage, the more likely she was to have had a first birth, irrespective of her exposure to the intervention.

**Table 5. Relative risk of likelihood of having a birth: proportional hazards regression only married female respondents (n=377)**

| Factors | Main equation |
|---|---|
| Comparison | 1.00 |
| Intervention | 0.61** |
| Woman's age at marriage | 1.32*** |
| Number of years of schooling | 1.04** |
| Caste | |
| Schedule caste/tribe | 1.00 |
| Most backward | 0.91 |
| Backward | 0.87 |
| Other | 1.26 |
| -2Loglikelihood | 1,838.18 |

*p<0.05; **p<0.01; and ***p<0.001

### *Contraceptive use after first birth*

We then examined use of contraception after the first birth among respondents with one or more children. The data displayed in Table 6 show that both men and women in the intervention group were more likely than their comparison counterparts to report that they used a contraceptive method at some time after the birth of their first child (and, for those who had a second birth, before the birth of their second child). Women in the intervention group were over 5 times more likely and men in the intervention group over 6 times more likely to use contraception after their first birth than women and men in the comparison group.

**Table 6: Adjusted odds ratios of factors associated with ever use of contraception after first birth among married AFS respondents with one or more children**

| **Female Respondents (n=193)** | |
|---|---|
| Factors | |
| Comparison | 1.00 |
| Intervention | 5.10*** |
| Years of schooling | 1.07 |
| Caste | |
| Scheduled caste/tribe | 1.00 |
| Most backward | 0.14+ |
| Backward | 0.89 |
| Other | 0.80 |
| Model constant | 0.07*** |
| -2Loglikelihood | 145.46 |
| Male Respondents (n=196) | |
| Factors | |
| Comparison | 1.00 |
| Intervention | 6.82*** |
| Years of schooling | 1.21*** |
| Caste | |
| Scheduled caste/tribe | 1.00 |
| Most backward | 0.96 |
| Backward | 0.97 |
| Other | 0.87 |
| Model constant | 0.03*** |
| -2Loglikelihood | 177.80 |

*p<0.05; **p<0.01; and ***p<0.001

Among women, years of schooling was not an independent predictor of contraceptive use after first birth, but for men, the years of schooling they received remained an independent predictor of the odds that they used contraception after their first birth, whether or not they were exposed to the intervention.

**Discussion**

In this study, we compared marital, childbearing and contraceptive behavior of young men and women in intervention and comparison groups in rural areas of Bihar. The intervention group received ARSH education during their adolescent years (age group 15-19) through a three-day training program, and lived in communities where other PRACHAR interventions took place.

Delaying age at marriage until at least the legal age of 18 was a key message conveyed during the training sessions. Controlling for education and caste, we found that both males and females who participated in the ARSH education program were significantly less likely to be married at the time of the survey as compared to those not exposed to the PRACHAR interventions.

Contraceptive use after marriage and before the first birth was also significantly higher in the intervention group, and use continued to be higher after the first birth than use among those not exposed to the intervention. Education was an important predictor of contraceptive use in both groups, but after controlling for education, women in the intervention group were 5 times more likely than women in the comparison group to use contraception both before and after the first birth.

Another key message delivered through the PRACHAR training is that it is best to delay the first birth until the woman is at least 21 years of age. The findings of this analysis demonstrate that women in the intervention group are much more likely to delay their first birth than women in the comparison group. The odds of having a first birth by the time of the survey were almost 40% lower if the woman was exposed to the PRACHAR interventions.

The analysis also suggests that, in this area of Bihar, the older a woman is when she marries, the faster she will progress to her first birth – and this seems to be true, irrespective of her exposure to the intervention or her education. The bivariate results confirm this analysis because it showed that women in the intervention group had, on average, a shorter marriage to first birth interval than women in the comparison group. Delaying age at marriage is the mechanism through which a delay in first birth is achieved.

In sum, our findings suggest that educated women in both groups tend to marry later and compress the interval between their marriage and their first birth. The more educated a woman in the intervention group is, the more likely she is to have her first birth more quickly after marriage than women in the comparison group. The important finding is that those exposed to the PRACHAR interventions significantly delayed both marriage and first birth when compared to an unexposed group of the same age.

PRACHAR interventions aimed to enhance adolescents' knowledge and understanding of reproduction and healthy timing and spacing of births. The training program explained how key SRH behaviors are linked to family health and wellbeing, and to increased socioeconomic opportunities. PRACHAR training also aimed to provide participants with information and skills on how to approach problems and seek means of probable solutions through negotiation with their parents. These communication and skills-building interventions appear to have had a solid impact on key behaviors the program targeted: contraceptive use, delaying age at marriage and delaying first birth.

How was it possible to achieve such a significant improvement in the century-old practices of early marriage and childbearing in just a four to five year period of time? India as a country is undergoing rapid social, economic, and ideational transformation, as is the state of Bihar. Carefully designed and culturally appropriate interventions can bring rapid change. We think, based on our grass-roots experience, that conditions in Bihar and similar rural Indian communities are ripe for change. An increase of contraceptive use

from 5% to 20% in about a two-year period in the PRACHAR project is an example of rapid behavioral change [12], but this is not the only example of such changes. After only one year of systematic behavior change communication interventions in selected rural areas of Uttar Pradesh, a disadvantaged north Indian state similar to Bihar, there was a significant increase in prenatal care, maternal immunization, and child immunization coverage [14]. In rural Jharkhand and Orissa, participatory behavior change communication interventions on antenatal care, delivery, and newborn care through women's groups proved to be successful in dealing with more difficult health problems. With about two years of intervention, neonatal mortality declined significantly in the intervention communities [15]. Similarly, a community-based behavior-change program helped reduce neonatal mortality in Uttar Pradesh [16].

In Bihar, parents generally decide when to marry their daughters. Therefore our communication interventions were directed to young people, and their parents, to help change the age of marriage. Our data provide evidence of high demand for potential change as suggested by the data shown in Table 7. Virtually no young woman in either the intervention or comparison group reported being willing to marry before the legal age of marriage (18 years), yet the most recent NFHS-3 [3] in 2005-6 reported that in Bihar 69% of women aged 20-24 were married before 18 years of age. Our data also show that less than 10% of young women in the comparison group said they expressed to their parents the age at which they wanted to marry, while women in the intervention group were six times more likely to have done so. These women were exposed to the full range of behavior change communication methods used by PRACHAR which imparted negotiation, assertion and decision-making skills aimed at helping them evaluate and interpret the health information they received, as well as how to pursue effecting a positive change with their parents and others. Thus, we think they were in a better position to negotiate with their parents by presenting the risks of early marriage and childbearing and the benefits of delaying marriage. The communication messages parents also received from other PRACHAR interventions may have acted as a catalytic factor that helped make parent-child negotiations about marriage a success. In any case, we have seen that, when compared to members of their age cohort not exposed to the PRACHAR interventions, these young people were much more likely to use contraception, and significantly delayed their marriages and first births.

**Table 7. Selected empowerment indicators by intervention and comparison group**

| Indicators | Comparison (C) Males=306 Females=306 | Intervention (I) Males=306 Females=307 | Odd ratio I/C [95% CI] |
|---|---|---|---|
| % willing to marry before legal age of marriage | | | |
| Males | 16.0 | 10.0 | 0.59 [0.36-0.98] |
| Females | 1.0 | 0.3 | 0.33 [0.01-3.56] |
| % expressed their desire to parents when to get married | | | |
| Males | 11.0 | 40.0 | 5.30 [3.41-8.29] |
| Females | 7.0 | 31.0 | 6.10 [3.59-10.45] |

The adolescent reproductive and sexual health education program emphasized health and economic advantages of delaying the first birth and of spacing between births, as well as benefits of small family size. We found that young couples in the intervention group continued to use contraception after the first birth at a higher rate than those not exposed to the intervention. This suggests that healthy behavior once adopted by beneficiaries is likely to continue, at least in the short term.

There are two main limitations of the study. First, we cannot claim that the behavioral changes we observed in this study are entirely due to the adolescent reproductive and sexual health education program. Most young men and women in the sample were residents of the PRACHAR project areas where other interventions were also implemented: home visits to young married women; group meetings with young men,

with parents, and with influential community members; and mass media campaigns. Thus we cannot separate out the effects of ARSH education program from that of other PRACHAR interventions.

The other limitation is related to the sample that was unavailable for interview. After the survey was completed in 2008, analysis showed that 495 of the 1225 originally targeted respondents (40% of the original sample) could not be contacted for interview, and were thus replaced by making further random selections from the lists. The proportion of the sample replaced ranged from 30% of the sampled women in the intervention area to 51% of sampled men in the comparison area. Since unavailability of respondents may be due to marriage-related migration, and marriage is one of the outcomes of interest, the magnitude of these losses could cause a bias in our findings. A decision was made to return to the homes of those in the original sample who could not be located in 2008, and when it was not possible to interview the original target respondent to interview a close relative about the target respondent's date of marriage and, if any births had occurred, the dates of those births. We did this to assess whether the 495 respondents who were not contacted experienced marriage and birth earlier than those substituted in their place, which would bias the results of the 2008 survey. This re-survey was conducted during November and December 2010, targeting only those from the original sample who had not been interviewed in 2008.

For the re-survey a shorter questionnaire collected only information on education, caste, and residence and reason for change of residence, as well as the information needed to calculate age at marriage, gauna ceremony, and first birth.

Analyses were conducted using two datasets: 1) the original 2008 dataset; 2) a new dataset combining data from the 2008 dataset for the original sample (i.e. found without substitution) with the data from the 2010 re-survey of the sample not contacted in 2008 (i.e. removing the substitutions). Bivariate tables and multivariate Cox proportional hazards regression analyses were conducted using both datasets to assess whether the 2008 marriage and first birth estimates were biased due to the substitutions.

If the marriage and first birth estimates from the 2008 survey were biased because women married and left the area before they could be surveyed, the findings would overestimate the effect of PRACHAR interventions. In fact, the comparison of results of the re-survey and the original survey (see Annex) found that the unadjusted median ages of marriage and first birth in the original 2008 dataset were quite similar when compared to the 2010 data. (See Annex Table 1.) Furthermore, when the 2010 data were analyzed, and controlling for other factors, the likelihood of marriage and first birth among the intervention group were even lower than the 2008 data showed. (See Annex Table 2.) This finding reassures us that the results presented in this paper, which use the original 2008 dataset, are a conservative estimate of the intervention's effects.

## Conclusions

The findings have strong programmatic implications in rural India, especially for the northern states where nearly 40% of India's population live. If achieved at scale, the significant improvement in the reproductive health behavior of adolescents documented here could result in significant population changes. For example, an increase of the age at first birth by two years can help reduce by 20% the effect of population momentum, a leading factor in population growth in India [10]. Projections made using the RAPID model, a computer model that assumes changes in key fertility variables to estimate their impact on future population and development outcomes, illustrate the potential of focusing targeted investments in delaying the age at childbirth and spacing subsequent births among young people in Bihar. Under a scenario that assumes the TFR in Bihar will decline from 4.0 in 2005 to 2.2 in 2025, and that, beginning in 2010, childbearing will begin at age 20 or later, the changes would result in 15,604,144 fewer people in Bihar in 2025. Using these assumptions to look at health and economic outcomes, a delay in the age at childbearing and a reduction in the total fertility rate in the state of Bihar could lead to as many as 60,000 fewer maternal deaths and a reduction in the infant mortality rate by three quarters over the next twenty years (from 62 to 15 deaths per 1,000 live births). This is equivalent to 1.9 million fewer infant deaths over the twenty year period from 2005 to 2025.

State governments should consider adding the PRACHAR interventions to their health delivery systems as one means to improve these health indicators. Currently, the state governments of Bihar and Rajasthan and elsewhere in the world are adopting PRACHAR communication interventions. With support from the Packard Foundation and UNFPA, PRACHAR is implementing a package of interventions through government frontline health workers in 10 sub-districts of Bihar. Also in Bihar, through the State Health Society, PRACHAR inputs and materials will eventually enable training of approximately 68,000 ASHAs statewide in the effective use of interpersonal communications for behavior change in family planning. In Rajasthan, a prototype ARSH intervention is being implemented in Udaipur district. This intervention will reach 1000 unmarried adolescent girls and boys with materials and comprehensive messages about sexual reproductive health, including delaying age at marriage. Materials developed by PRACHAR have also been adapted for use in adolescent health interventions in Mozambique and Ethiopia, and the PRACHAR model has been adapted and is being fully implemented in Pakistan. Adolescents are often considered hard to reach and difficult to persuade to adopt healthy practices. The PRACHAR project demonstrates that with correct sexual and reproductive health information, adolescents can often make life-altering decisions – about marriage and planning a family, staying in school and developing leadership skills – that will help them live healthy, productive lives.

**References**


1. Singh S and Samar R. (1996) Early marriage among women in developing countries. *International Family Planning Perspectives,* 22: 148-157 and 175.

2. Raj A, Saggurty N, Bilash D, and Silverman JG. (2009) Prevalence of child marriage and its effect on fertility and fertility-control outcomes of young women in India: a cross-sectional, observational study. *Lancet*, 373:1883-89.

3. International Institute for Population Sciences (IIPS) and ORC Macro (2007): *National Family Health Survey (NFHS-3), Bihar, 2005–2006: India.* Mumbai: IIPS.

4. International Institute for Population Sciences (IIPS) and Macro International (2007) *National Family Health Survey (NFHS-3)*, 2005-2006, *India: Volume I,* Mumbai: IIPS.

5. Conde-Agudelo A and Belizan JM (2005) Maternal-perinatal morbidity and mortality associated with adolescent pregnancy in Latin America: cross sectional study. *American Journal of Obstetrics and Gynecology,* 192:342-49.

6. Boerma JT and Bicego GT (1992) Preceding birth intervals and child survival: searching for pathways of influence. *Studies in Family Planning,* 23:243-56.

7. Govindasamy P et al. (1993) High-risk births and maternity care, *DHS Comparative Studies No. 8.* Columbia, Maryland: Macro International.

8. Pandey A et al. (1998) Infant and child mortality in India, *National Family Health Survey Subject Reports No. 11.* Mumbai: International Institute for Population Sciences; and Honolulu: East-West Center.

9. Sanderson WC and Tan JP (1995) *Population in Asia.* Washington, DC: World Bank, p 152.

10. Bongaarts J. Population policy options in the developing world (1994) *Science*, 263(5148):771-76.

11. Wilder J, Masilamani R and Daniel E., (2005) *Promoting Change in the Reproductive Behavior of Youth, Pathfinder International's PRACHAR Project, Bihar, India.* Watertown, Massachusetts, USA: Pathfinder International: http://www.pathfind.org/site/DocServer/India-Prachar_Project.pdf?docID=4261, accessed 16 December2011.

12. Daniel EE, Masilamani R, Rahman M, (2008) The effect of community-based reproductive health communication interventions on contraceptive use among young married couples in Bihar, India. *International Family Planning Perspectives*, 34 (4): 189-97.

13. Rahman M and Daniel EE (2010), A reproductive health communication model that helps improve young women's reproductive lives and slow population growth: the case of PRACHAR from Bihar, India. Watertown, MA: Pathfinder International *Research and Evaluation Working Paper,* 2010.

14. Pandey P, Sehgal AR, Riboud M, Levine D, Goyal M (2007) Informing resource-poor populations and the delivery of entitled health and social services in rural India: a cluster randomized controlled trial. *Journal of the American Medical Association*, 298(16):1867-75.

15. Tripathy P, Nair N, Barnett S, Mahapatra R, et al, (2010) Effects of a participatory intervention with women's groups on birth outcomes and maternal depression in Jharkhand and Orissa, India: cluster-randomised controlled trial. *Lancet*, 375:1182-92.

16. Kumar V, Mohanty S, Kumar A et al, (2008) effect of community-based behavior change management on neonatal mortality in Shivgarh, Uttar Pradesh, India: a cluster-randomized controlled trial. *Lancet,* 372: 1151-62.

**Annex**

We found that the unadjusted median ages of marriage and first birth were relatively similar in the original 2008 dataset compared to the 2010 dataset (see Annex Table 1). As in the original 2008 analysis, the 2010 re-analysis showed a higher unadjusted median age at marriage and first birth among women exposed to the PRACHAR intervention. Using the re-survey dataset (2010), women exposed to PRACHAR had a median age of marriage of 21.6 years, more than three years higher than the median age of 18.3 years among women not exposed to PRACHAR. Similarly, the median age at first birth among PRACHAR participants was two years higher among PRACHAR participants (23.2 years) than in the comparison group (21.2 years). These findings reinforce those of the original 2008 survey.

The multivariate analysis using he original 2008 dataset found that women exposed to PRACHAR were 44% less likely to be married and 23% less likely to have had a first birth than women in the comparison group. In the 2010 re-analysis, women exposed to PRACHAR were 58% less likely to be married and 51% less likely to have had a first birth. (Annex Table 2)

**Annex Table 1.Median age of men and women at marriage and median age of women at first birth (unadjusted)**

| **2008 data set** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Median age** | **Sex** | **n** | **Comparison** | **Intervention** | **Difference** | **Wilcoxon (Gehan) statistic** | **df** | **p value** |
| At marriage | Men | 557 | 21.3 (n=306) | 24.1 (n=251) | 2.8 years | 37.2 | 1 | <0.001 |
| | Women | 553 | 19.4 (n=306) | 22.0 (n=247) | 2.6 years | 53.8 | 1 | <0.001 |
| At first birth | Women | 377 | 21.6 | 23.1 | 1.5 years | 23.17 | 1 | <0.001 |
| **2010 data set** | | | | | | | | |
| **Median age** | **Sex** | **n** | **Comparison** | **Intervention** | **Difference** | **Wilcoxon (Gehan) statistic** | **df** | **p value** |
| At marriage | Men | 574 | 21.9 (n=306) | 24.7 (n=268) | 2.8 years | 28.88 | 1 | <0.001 |
| | Women | 554 | 18.3 (n=306) | 21.6 (n=248) | 3.3 years | 98.36 | 1 | <0.001 |
| At first birth | Women | 437 | 21.2 | 23.2 | 2 years | 45.88 | 1 | < 0.001 |

All estimates of marriage age pertain only to those participants who were unmarried at the time of training.

**Annex Table 2. Proportional hazards regression, likelihood of marriage and first birth, adjusted for education and caste, 2008 and 2010 data sets**

| **Relative risk of the likelihood of marriage of female respondents** | | |
|---|---|---|
| **Factors** | **2008 (n=553)** | **2010 (n=554)** |
| Comparison | 1.00 | 1.00 |
| Intervention | 0.56*** | 0.42*** |
| Number of years of schooling | 0.90*** | 0.89*** |
| Caste | | |
| Schedule caste/tribe | 1.00 | 1.00 |
| Most backward | 1.01 | 0.90 |
| Backward | 0.95 | 0.91 |
| Other | 0.84 | 0.88 |
| -2Loglikelihood | 3,614.16 | 4230.12 |
| **Relative risk of likelihood of having first birth, married female respondents** | | |
| **Factors** | **2008 data (377)** | **2010 data (437)** |
| Comparison | 1.00 | 1.00 |
| Intervention | 0.61** | 0.49*** |
| Woman's age at marriage | 1.32*** | 1.22*** |
| Number of years of schooling | 1.04** | 1.03* |
| Caste | | |
| Schedule caste/tribe | 1.00 | 1.00 |
| Most backward | 0.91 | 1.02 |
| Backward | 0.87 | 1.07 |
| Other | 1.26 | 1.02 |
| -2Log likelihood | 1,838.18 | 2499.51 |

+p<0.10; *p<0.05; **p<0.01; and ***p<0.001

Pathfinder International/Headquarters
9 Galen Street, Suite 217
Watertown, MA 02472 USA
Tel: 617-924-7200
Fax: 617-924-3833
www.pathfinder.org

Pathfinder INTERNATIONAL

a global leader in reproductive health

0112