Article

Women's television watching and reproductive health behavior in Bangladesh

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ABSTRACT

Bangladesh has made significant social, economic, and health progress in recent decades, yet many reproductive health indicators remain weak. Access to television (TV) is increasing rapidly and provides a potential mechanism for influencing health behavior. We present a conceptual framework for the influence of different types of TV exposure on individual's aspirations and health behavior through the mechanisms of observational learning and ideational change. We analyze data from two large national surveys conducted in 2010 and 2011 to examine the association between women's TV watching and five reproductive health behaviors controlling for the effects of observed confounders. We find that TV watchers are significantly more likely to desire fewer children, are more likely to use contraceptives, and are less likely to have a birth in the two years before the survey. They are more likely to seek at least four antenatal care visits and to utilize a skilled birth attendant. Consequently, continued increase in the reach of TV and associated growth in TV viewing is potentially an important driver of health behaviors in the country.

Introduction

Bangladesh, a South Asian country with resource-scarcity and high population density, has made considerable progress in social and health outcomes and in economic improvement in recent decades. The country is on track to achieve most of the MDGs (Arifeen et al., 2014; Dhaka Tribune, September 8, 2014). Literacy has improved, especially among women; there are signs of steady but consistent decline in poverty; infant and child mortality and maternal mortality have reduced significantly; and the total fertility rate has reached nearly replacement level at 2.3 births per woman during 2012–2014 (NIPORT et al., 2016).

Although Bangladesh has made significant social, economic, and health progress in recent decades, much progress remains to be made in the area of reproductive health. Despite recent declines, the maternal mortality rate in 2010 was 194 deaths per 100,000 live births (NIPORT et al., 2012). The idea that a pregnant woman should have antenatal check-ups with a medically trained provider, should deliver at a health facility, or should have a post-natal check-up, is new, especially in rural areas where over 70% of people live. Delivering a child at home has been the norm in the recent past; in the early 2000s, less than 10% of deliveries took place at facilities (Streatfield et al., 2002). In the same

period, only about 33% of pregnant mothers received antenatal care from medically trained providers (NIPORT et al., 2004). Fertility norms have been changing over a longer period, associated in part with a strong family planning program. In the early 1980s, about 55% of two-child mothers wanted to have additional children (Mitra et al., 1983). In 2014, only about 21% of two-child mothers want to have additional children; however 25 percent of recent births were reported to be mistimed or unwanted (NIPORT et al., 2016).

TV owning and watching has grown rapidly in Bangladesh in the last 25 years. In the early 1990s only 7% of households owned a TV and less than 18% of women aged 15–49 watched TV (Mitra et al., 1994). Recently, possession of TV and watching TV has reached over 40% and 50%, respectively (NIPORT et al., 2013, 2016). TV watching is markedly more common in urban than rural areas (80% vs. 40%). In this context of rapid expansion of access to mass media, low use of modern health care, and largely traditional lifestyles, there is marked potential for mass media, especially TV, to act as a health behavior change catalyst. The effect of health awareness-raising programs on health behavior is fairly well established (Wakefield, Laken, & Hornik, 2010), but we argue that TV watching for entertainment can have an independent influence on reproductive

health behavior through the mechanisms of observational learning and information processing.

Conceptual framework

TV watching, observational learning, diffusion, and behavior

There are two main mechanisms through which media in general and TV in particular have been hypothesized to affect people's lifestyle aspirations and behavior: "observational learning" and "information processing" (Bandura, 1994; Huesmann et al., 1986). The proponent of these mechanisms argued that people learn new behaviors by watching others. Observation of a behavior increases effective attention which increases retention of the information learned about the behavior in memory. Once information is stored in memory, it can sustain even in the absence of any behavioral manifestation until individual aspirational processes lead to its expression (Bandura, 1994). Television provides people with access to a wide range of observational learning experiences so it follows that people should learn a great deal from viewing others on television. Television programming helps viewers acquire various types of prosocial behavior such as "altruistic," "friendly," and "self-controlled" behaviors (Rushton, 1982). Experimental investigations, from both laboratory and naturalistic settings, show that television and film programs can modify viewers' social behavior.

Anthropological, ethnographic, and sociological studies in low income countries argue that entertainment TV exposes viewers to the outside world and other ways of life and ideas which are new to them (Barber & Axinn, 2004; Mankaker, 1993; Pace, 1993). TV watching was found to influence a wide range of day-to-day lifestyle behaviors, including reproductive behaviors. Ferrara, Chong, & Duryea, 2012 provides evidence from Brazil that television soap operas in which a small family is portrayed as ideal affected individual choice to have a smaller family and thus reduced fertility. In Indonesia, Dewi, Suryadharma, & Suryahadi, 2013 found that fertility reduction was associated with increased access to television. In Nepal, Barber and Axinn (2004) found that mass media is associated with childbearing behavior, and with preference for a small family, reduced son preference, and tolerance of contraceptive use. A significant reduction in reported son preference and pregnancy rate was observed following the introduction of cable TV in four states of India and the capital, Delhi (Jensen & Oster, 2009). Son preference is associated with high fertility and child mortality (Arnold et al., 1998; Das Gupta, 1987). In Southern India, watching TV or listening to radio was associated with use of maternal health care (antenatal care (ANC), facility delivery, and skilled birth attendance) and childhood immunization (Navaneetham & Dharmalingam, 2002).

Analysis of the World Values Surveys during the 1980s and 1990s demonstrated that television can modify the viewers' perception of the world and how to live in it; television viewing was found to be a contributing factor to raising individual income aspirations, but higher income aspiration lowered the effect of higher income on individual happiness (Bruni & Stanca, 2005). Jensen and Oster (2009) found evidence that the rapid spread of cable and satellite television in India was associated with significant positive changes in gender attitudes and norms, including decreased reported acceptability of intimate partner violence and increases in women's autonomy. However, television exposure and specific content of television entertainment can have negative effects on behavior, especially among children and adolescents. See, for example, Anderson et al. (2001), Gerbner and Gross (1976), Hughes (1980), and Pearl, Bouthilet, and Lazar (1982) for their work on the effects on children and adolescent norms and behavior of TV entertainment programs.

Summarizing television effects, Rushton (1982) maintained "*The message is clear: People learn from watching television, and what they learn depends on what they watch. Television is much more than mere entertainment; it is also a major source of observational learning experiences, a*

setter of norms. It determines what people judge to be appropriate behavior in a variety of situations. Indeed it might be that television has become one of the most important agencies of socialization that our society possesses."

Pathways of TV effects on health behavior

The pathways through which TV watching can affect health behavior is depicted in a simplified manner in Fig. 1. We identify three main pathways: 1) sponsored health mass media campaigns that specifically aim to change health behavior; 2) mass media coverage of health topics that are not aimed to change behavior but do; and 3) general mass media entertainment (e.g., dramas or movies that deal with familial and social issues) that does not specifically aim to cover health but may change norms and aspirations leading to changes in health behavior.

Sponsored health programming through television

Health communication programs are designed to change particular behaviors. They can include donor-sponsored programming but also private sector advertising and programming to promote particular products or behaviors. There are numerous examples of the effects of media campaigns on health behavior change (Wakefield et al., 2010). For example, in family planning, spread of information through mass media was found to be associated with contraceptive use (Cleland & Ali, 2006). In Bangladesh, use of immunization services was associated with national campaign exposure (Hutchinson et al., 2006). Also in Bangladesh, the NGO Service Delivery Program (NSDP) aired a drama serial to promote specific health messages for about six months which became very popular; a study showed that health care utilization was significantly higher among the serial watchers than non-watchers after controlling for confounding factors (Rahman, Timmon, & Shahjahan, 2007). However, in their review article, Pegurri, Fox-Rushby, & Damian, 2005 documented no effect on vaccination of mass media campaigns alone.

Health reporting through television

Health reporting that is commonly done in the media can affect health awareness and subsequent behavior although it is not specifically designed to change behavior. Examples include general reporting of side effects of drugs, findings of new studies, documentaries, news coverage (e.g., on health systems), etc. From such reporting, people learn about the availability of new health technologies, services, or products along with sources of such products and services, or learn about day-to-day issues associated with health service delivery. Such reporting leads to acquisition of new ideas of and aspirations for health behavior or healthcare utilization. For example, in the US, media coverage of the public debate over risks of children's aspirin consumption was associated with an abrupt decline in use of aspirin in children and in the incidence of the diseases associated with its use (Soumerai, Ross-Degnan, & Kahn, 1992). General health reporting can also influence health behavior negatively, however, especially if it is inaccurate or overly simplified (e.g. Skjeldestad, 1997; Mason & Donnelly, 2000).

Television entertainment programming

Entertainment, such as reality TV, drama, movies, chat shows, etc., is the principal product of the television industry. Most viewer time spent on TV is on entertainment and this is a primary avenue for TV to affect lifestyle aspirations and behaviors. TV entertainment, especially drama and movies, attract people's interest and also move them emotionally (Kincaid et al., 1988). In the US, the popular MTV reality show "16 and Pregnant" follows the lives of real teenage girls who are pregnant. A recent analysis suggests that the show may be associated with up to third of the recent reduction in teenage pregnancy in the US (Kearney & Levine, 2014). Stories in TV dramas and movies in Bangladesh and South Asia commonly deal with ordeals of personal or family life associated with scarcity of resources. Young men or women from large families cannot achieve what their counterparts from a small
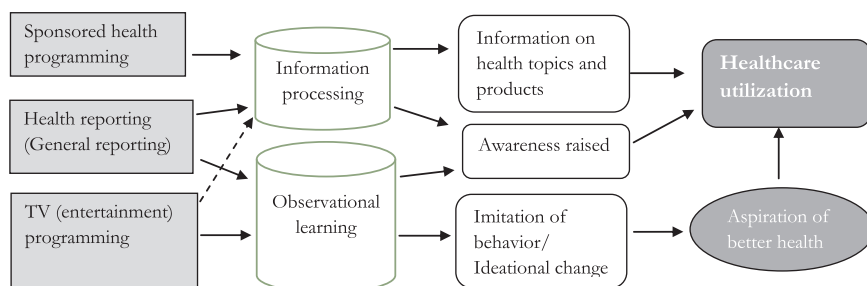
Fig. 1. Pathways of the effects of TV watching on healthcare utilization.

family can achieve. Many stories have a happy ending when a woman's life is saved after she was able to reach a health center when she faced a crisis in pregnancy and delivery, or alternatively have a sad ending when a pregnant woman dies when she was not taken to a hospital due to poverty, lack of transportation, or taboos against bringing woman out of home because of traditional beliefs. Ideational change towards a small family and improved healthcare are accumulated among TV watchers over time from the role models seen in these movies or dramas.

TV watchers may learn about new health information or products through entertainment programming which may lead to higher healthcare utilization through the mechanism of information processing as shown in Fig. 1.

TV programs in Bangladesh

Currently, Bangladesh has a large TV network; there are over 20 domestic TV channels, mostly through paid cable network. The two nationwide public TV channels can be accessed without cable in any locality of the country. The paid cable network provides access to as many as 100 foreign or international channels, dozens of them from India, which are very popular among viewers. The Indian channels by and large are in Hindi, a language quite well understood by Bangladeshis. There are also a number of Bengali channels from India. Indian public TV in Bengali can be accessed without cable in large border areas surrounding India.

Bangladeshi TV programs are typically comprised of news, documentaries, talk shows, dramas, drama serials, movies, and other entertainment. A substantial amount of TV time consists of commercial advertisements. Most commonly watched programs are the dramas, drama serials, and movies. Indian channels are popular for their drama serials, movies, and entertainment programs.

The Bangladeshi channels air sponsored awareness-raising programs on health and associated topics, education, gender relationships and empowerment, agriculture, small-scale economic improvement topics, and others. The educational content is provided through documentaries, talk shows, drama or drama serials, entertainment programs, and advertisements. These are funded by multilateral and bilateral development partners. Some examples of health awareness-raising short TV programs include– UNFPA's maternal health topics, UNICEF's child health topics, and USAID's family planning and reproductive health topics. In the mid- 2000s USAID sponsored a drama serial for about six months to promote the idea of a small family with high investment in children, use of family planning and reproductive health services, and other associated issues. This serial was rated as one of the most popular serials in Bangladesh. USAID also supported similar popular drama serials in the 1990s.

Private multinational and national health-providing and pharmaceutical companies also sponsor talk shows and question-answer programs on curative and preventive health care. By and large this programming focuses on specialty care, mostly of chronic illnesses that are largely associated with lifestyle and eating habits. Maternal health topics such as pregnancy care including facility delivery are covered in these types of sponsored programs. These programs are popular. Social

Marketing Company (SMC) advertises their child health and family planning and reproductive health products, e.g., oral rehydration saline, oral pills and sanitary napkins.

Objective of this study

In this paper, we examine the association between women's TV watching and their reproductive health behavior in Bangladesh using data from two national surveys. We hypothesize that fertility is lower and use of reproductive healthcare is higher among TV watchers than non-watchers. Prior research has explored the effect of exposure to specific behavior change media programs on reproductive health outcomes in Bangladesh (Hutchinson et al., 2006; Rahman et al., 2007; Rabbi, 2012) but studies have not focused on the association of general TV exposure with these outcomes in the country. We examine the association between TV watching and five reproductive health outcomes: 1) ideal family size, 2) current contraceptive use, 3) births in the 24 months preceding the survey, 4) four or more antenatal care (ANC) visits, and 5) delivery of recent births with a skilled birth attendant (SBA).

Methods and procedures

Data

We use two data sets: The 2010 Bangladesh Maternal Mortality and Health Care Survey (BMMS 2010) and the 2011 Bangladesh Demographic and Health Survey (BDHS 2011). Details on the methods and procedures of the BMMS 2010 can be obtained from the BMMS 2010 report (NIPORT et al., 2012). Briefly, information on maternity care and selected indicators on family planning and reproductive health were collected from a nationally representative sample- of over 164,000 women of reproductive age in 2010. The BMMS 2010 used two questionnaires— "short" and "long"—to collect information. The long questionnaire was administered among a sample of about 60,000 married women of reproductive age (MWRA). The information we use in our analysis comes from the long questionnaire and thus our sample is the 60,000 MWRA who received that questionnaire. The BDHS 2011 covered about 17,000 MWRA; details of the survey methods can be found in the BDHS 2011 report (NIPORT et al., 2013).

The variables

We consider five *dependent variables* in the analysis. The analysis for all the dependent variables except ideal family size are based on the BMMS 2010 data. The analysis of ideal family size is based on the BDHS 2011 data. Information on ideal family size is not available in the BMMS 2010 data set. The dependent variables are:

- Ideal family size (desired number of children)
  This variable is based on a question (for women who had children at the time of survey): "If you could go back to the time you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be?" For women who did not have any children at the time of survey, the question is

"If you could choose exactly the number of children to have in your whole life, how many would that be?" The sample size for this indicator was 16,407.

- Current contraceptive use among currently married women of reproductive age, i.e., 15–49.
  The sample size for this indicator is 57,785.
- Birth in the 24 months before the survey.

This variable is based on the pregnancy history information collected from each respondent; 57,785 women are included in the analysis of this variable.

- Four or more antenatal care (ANC 4+) visits among women who had delivered in the 36 months before the survey
  Women who had a live birth in 36 months preceding the survey were asked about their utilization of antenatal care services. There were 18,256 such women who had a live birth in the last 36 months.
- Use of skilled birth attendant (SBA) among deliveries occurring in the last 36 months before the survey

Women who had a live birth in the 36 months period were also asked if the birth was attended by a medically trained provider. The sample for this analysis is the 18,256 women who had a live birth in last 36 months of the survey. If there were more than one birth in this period, antenatal care and skilled birth attendant information was collected for the most recent one.

The main *independent variable* of interest in the analysis is "Watching TV," which is based on the question asked to women "Do you watch TV?" In the BMMS 2010, women who answered "Yes" to this question were then asked: "Do you watch TV almost every day, at least once a week, or less than once a week?" For this study, the TV watching variable is categorized as "Don't watch TV," "Watch TV less than weekly or at least weekly," and "Watch TV almost daily." For the BDHS 2011, the additional question on frequency of TV watching was not asked so the TV watching categories—"Don't watch" and "Watch"— were considered.

We consider the following control variables: Age, Education, Household wealth quintile, Religion, Residence (urban vs. rural), and Region. The household wealth quintile is based on a household wealth index created from the household possession of durable goods (e.g., table, chair, etc.), consumer items (e.g., TV, refrigerator, etc.), and household characteristics (e.g., type of drinking water availability, sanitation facilities, etc.) using principal components analysis. A detailed description of the procedure to construct the household wealth index and quintiles is found in NIPORT et al. (2012).

Bangladesh has shown distinct regional variation in demand for and utilization of health and family planning services. The health and family planning indicators, by and large, are worst in the *eastern* region (Chittagong and Sylhet Divisions) that has systematically remained disadvantaged in gaining programmatic strength as well as overcoming the socio-cultural barriers to health and family planning. The people in this region tend to have a conservative outlook and traditional beliefs in the context of health and family planning behavior. The *western* region (Khulna, Rajshahi, and Rangpur Divisions) has the most favorable health and family planning behavior. The family planning programs are also relatively stronger in western region compared to those in other regions of the country. The *central* region (Barisal and Dhaka Divisions) is in between.

Statistical analysis

We undertake both bivariate and multivariate analyses. In the bivariate analysis, we present the *unadjusted* association between TV watching and each dependent variable. There are several observed potential confounding factors that influence both TV watching and the health outcomes of interest which can affect the bivariate associations. This problem is addressed through the use of multivariate regressions.

For the dependent variable "ideal family size" we use ordinary least square multiple linear regression. The four dependent variables—"Use of any methods of contraception," "Having a birth in last 24 months," "Seeking ANC4+ for last pregnancy in last 36 months," and "Use of skilled birth attendant for the last delivery in last 36 months—" are dichotomous, and we use logistic regression.

We hypothesize that TV can play a greater role in bringing ideational changes and improving health care utilization among the poorer and less educated than among the wealthier and more educated. This is because we hypothesize that the educated and wealthier already have many of the lifestyle aspirations and health beliefs depicted on TV so there is less scope for TV to further influence them. To test these hypotheses we estimate models with interactions between "TV watching" and "Household wealth quintile" and between "TV watching" and "Education."

We present regression coefficients for the dependent variable "ideal family size." We also estimate adjusted outcomes (mean of ideal family size; probability for contraceptive use, having a birth in the 24 months before the survey, ANC 4+, and use of SBA against the categories of 'Don't watch TV,' 'Watch less than weekly or at least weekly,' and 'Watch almost daily.' The estimates of adjusted outcomes are obtained from the multivariate models where the confounding variables are controlled for. Data analysis was done in STATA 14.

We use sampling weights in the bivariate and multivariate analyses of both data sets—BMMS 2010 and BDHS 2011 using the "svy" commands in STATA. The weights calculation considers sampling stratification and clustering and varying response rates in the survey. The weight calculation procedures are similar for the two surveys, and, for the BDHS 2011, they can be found in NIPORT 2013.

Results

In Table 1 we present the distribution of the independent variables. In 2010, 45% of women reported that they don't watch TV while 19% reported that they watch TV less than weekly or at least weekly and 35% said that they watch TV almost daily. This prevalence of TV watching is similar to that observed in the BDHS 2011.

Table 1
Distribution of the independent variables, BMMS 2010 and BDHS 2011.

| Independent variables	BMMS 2010 (n = 57,908)	BDHS 2011 (n = 16,632)
Watching TV (%)		
Don't watch TV	45.5	39.3
Watch TV at least weekly	19.1	60.7
Watch TV almost daily	35.4	
Women's education (%)		
No education	33.1	27.7
Primary incomplete	16.2	18.4
Primary complete	14.6	11.6
Secondary incomplete	26.9	30.3
Secondary +	9.2	12.0
Household wealth quintile (%)		
Lowest	19.0	18.3
Second	20.9	19.6
Medium	20.5	20.1
Medium-High	19.2	20.6
Highest	20.4	21.3
Religion (%)		
Muslim	90.2	90.0
Non-Muslim	9.8	10.0
Urban vs. rural (%)		
Rural	74.5	74.0
Urban	25.5	26.0
Region (%)		
Eastern	24.7	23.6
Central	38.3	38.0
Western	36.9	38.4
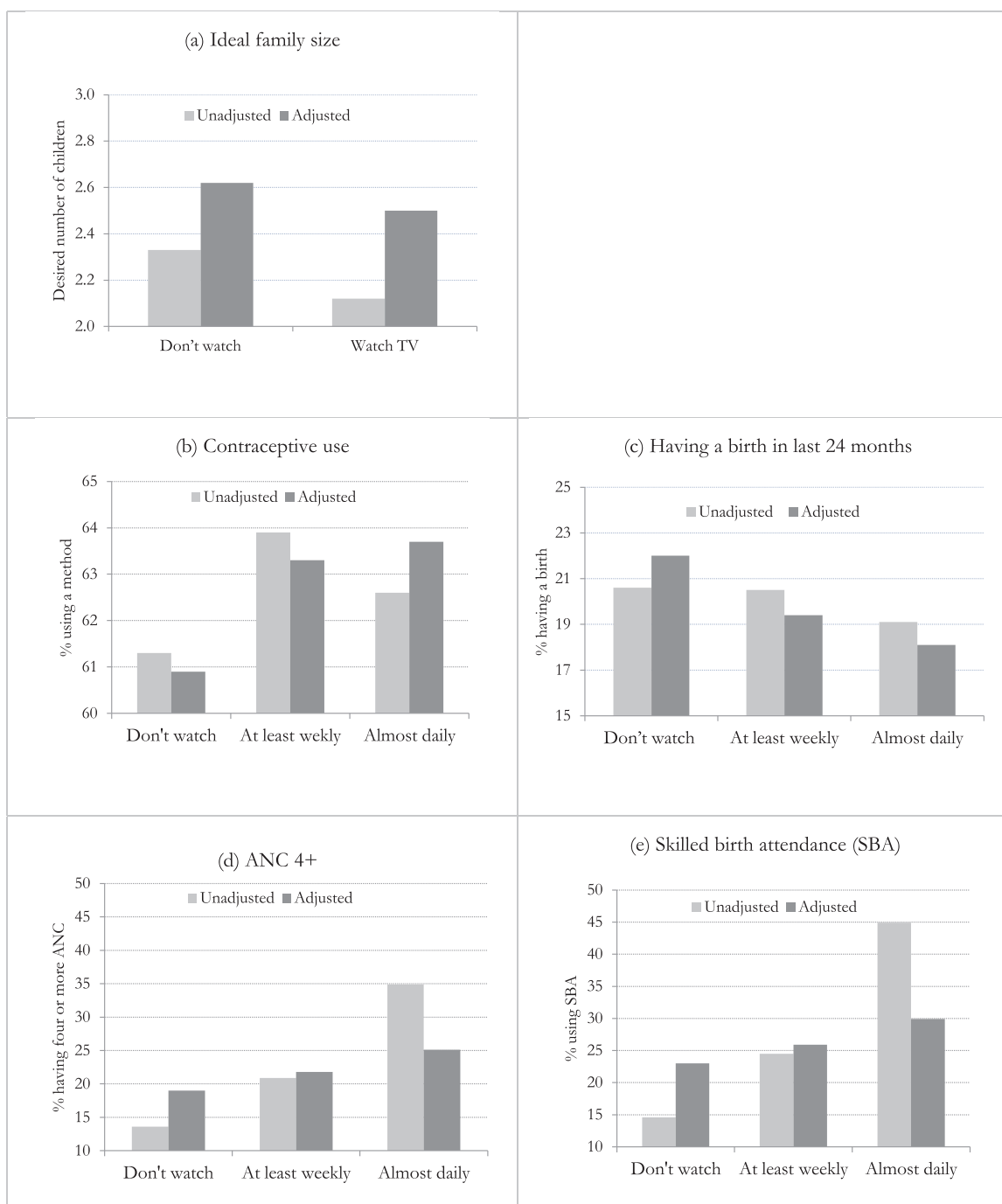
Fig. 2. Unadjusted and adjusted association between TV watching and different dependent variables.

Access to TV is a function of socioeconomic conditions. In Appendix A, we show logistic regression results for the determinants of TV watching. The following characteristics of women are associated with higher likelihood of watching TV: Young age, education, living in wealthier households, being a non-Muslim, living in urban areas or in the western or central regions of the country. Most of these characteristics are also associated with better health behavior.

Bivariate results

The bivariate or unadjusted association between TV watching and each of the dependent variables is shown in Fig. 2. Fig. 2 [Panel (a)] shows that ideal family size was 2.33 and 2.12, respectively, for those women who don't watch TV and those who watch TV.

Contraceptive use was 61.3% among those who do not watch TV, 63.9% among those who watch it less than weekly or at least weekly and it was 62.6% among those who watch TV almost daily [Fig. 2; Panel (b)] indicating that contraceptive use is not associated with TV watching. The probability of birth was similar for those who don't watch TV or watch less than weekly or at least weekly (20.6% and 20.5%) but it was 19.1% among those who watch TV almost daily [Fig. 2; Panel (c)]. Prevalence of four or more ANC visits and skilled birth attendance sharply increase with the intensity of TV watching [Fig. 2; Panel (d) and Panel (e)]. The prevalence of four or more ANC visits was 13.6% for women who don't watch TV. The prevalence increases to 20.9% among those who watch TV less than weekly or at least weekly, and to 34.9% among those who watch TV almost daily. Similarly, prevalence of skilled birth attendance was 14.6% among TV

Table 2

Multiple regression coefficients of ideal number of children reported by women, BDHS 2011.

Covariates	Coefficients	95% confidence interval	
		Lower	Upper
Watching TV [Reference Category (RC) = Don't watch TV]			
Watch TV at least weekly	-0.126***	-0.153	-0.099
Women's age (RC = 25–34)			
15–24	-0.117***	-0.138	-0.097
35–49	0.171***	0.143	0.200
Women's education (RC = No education)			
Primary	-0.045**	-0.076	-0.012
Secondary	-0.147***	-0.183	-0.110
Higher	-0.237***	-0.283	-0.190
Household wealth quintile (RC = Lowest)			
Second	-0.015	-0.053	0.023
Medium	0.003	-0.034	0.040
Medium-High	0.003	-0.035	0.042
Highest	0.001	-0.044	0.047
Religion (RC = Muslim)			
Non-Muslim	-0.201***	-0.234	-0.167
Urban vs. rural (RC = Rural)			
Urban	-0.070***	-0.103	-0.058
Region (RC = Eastern)			
Central	-0.243***	-0.292	-0.195
Western	-0.323***	-0.368	-0.2776
Constant	2.607***	2.540	2.776
R-squared	0.121***		
Sample size	16,429		

** $p < 0.01$.
*** $p < 0.001$.

non-watchers, 24.5% among those who watch TV less than weekly or at least weekly, and 44.9% among those who watch TV almost daily.

Multivariate results

Multivariate regression results are presented in Table 2 through Table 4, and regression-based adjusted outcomes are shown in Fig. 2.

Ideal family size (desire for children)

Table 2 shows the multiple regression coefficients for ideal number of children. Women who watch TV desired 0.12 less children ($p < 0.001$) than those women who don't watch TV after controlling for the effects of the demographic and socioeconomic variables. The adjusted ideal family size was 2.62 for those who do not watch TV and 2.50 for those who watch TV (Fig. 2, panel a).

Contraceptive use

Although no bivariate (unadjusted) association was found between TV watching and contraceptive use [Fig. 2; Panel (b)], logistic regression results (Table 3, panel a) show that contraceptive use was positively and significantly associated with TV watching after controlling for other variables in the model. Fig. 2 (Panel b) shows that the adjusted contraceptive use was 60.7% for those who do not watch TV, 63.3% for those who watch TV less than weekly or at least weekly, and 63.7% for those who watch TV almost daily. Contraceptive use among women who watch TV (less than weekly or at least weekly or almost daily) is significantly higher than among those who do not watch TV but the difference between weekly watchers and daily watchers is not statistically significant, as indicated by the 95% confidence intervals for these two categories.

Fertility behavior

The adjusted odds of having a birth in the 24 months before the survey was 17% (and significantly) lower among women who watch TV at least weekly than among those who do not watch TV (Table 3, panel b). The adjusted odds were further lower, by 24%, among those who watch TV almost daily than those who do not watch TV. The adjusted

Table 3

Logistic regression estimates of adjusted odds ratios (AOR) of covariates associated with (a) contraceptive use and (b) having a birth in last 24 months, BMMS 2010.

Covariates	(a) Contraceptive use			(b) Birth in last 24 months		
	AOR	95% confidence interval		AOR	95% confidence interval	
		Lower	Upper		Lower	Upper
Watching TV						
Don't watch	1.00	–	–	1.00	–	–
Watch TV at least weekly	1.13***	1.06	1.19	0.83***	0.78	0.89
Watch TV almost daily	1.15***	1.08	1.22	0.76***	0.71	0.82
Women's age						
Below 20	0.61***	0.57	0.66	1.02	0.95	1.11
20–24	1.00	–	–	1.00	–	–
25–29	1.40***	1.31	1.49	0.62***	0.58	0.66
30–34	1.97***	1.83	2.13	0.33***	0.30	0.35
35–39	2.26***	2.09	2.44	0.14***	0.12	0.15
40+	0.82***	0.75	0.88	0.03***	0.02	0.03
Women's education						
No education	1.00	–	–	1.00	–	–
Primary incomplete	1.11**	1.02	1.17	1.06	0.98	1.15
Primary complete	1.13***	1.06	1.21	1.03	0.95	1.13
Secondary incomplete	1.03	0.97	1.10	1.04	0.97	1.13
Secondary +	1.02	0.93	1.12	1.12*	1.01	1.25
Household wealth quintile						
Lowest	1.00	–	–	1.00	–	–
Second	0.97	0.90	1.03	0.86***	0.79	0.93
Medium	0.92*	0.85	0.98	0.85***	0.85	0.98
Medium-High	0.83***	0.76	0.89	0.83***	0.76	0.92
Highest	0.76***	0.69	0.83	0.86***	0.78	0.97
Religion						
Muslim	1.00	–	–	1.00	–	–
Non-Muslim	1.32***	1.22	1.43	0.88***	0.81	0.96
Residence						
Rural	1.00	–	–	1.00	–	–
Urban	1.29***	1.22	1.43	0.97	0.91	1.03
Region						
Eastern	1.00	–	–	1.00	–	–
Central	1.55***	1.46	1.66	0.72***	0.67	0.77
Western	2.06***	1.94	2.18	0.57***	0.53	0.60
Constant	0.85***	0.78	0.92	0.99	0.90	1.09
-Log (Pseudo-likelihood)	36,602.93			24,800.42		
Pseudo R-squared	0.05***			0.15***		
Sample size	57,785			57,785		

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

probability of having a birth was 22.0%, 19.4%, and 18.1% for those do not watch TV, watch TV less than weekly or at least weekly, and watch TV almost daily (Fig. 2, panel c). These results are consistent with the results on the association between TV watching and desired fertility measured by ideal number of children (observed above, Table 2) as well as with those on contraceptive use (also, Table 3 in panel a).

Seeking antenatal care four times or more (ANC 4+) during most recent pregnancy in last 36 months

The adjusted odds of receiving four or more ANC visits was 21% higher ($p < 0.001$; Table 4, ANC 4+) among women who watched TV weekly or less than weekly than among those who did not watch TV. The adjusted odds were 48% higher ($p < 0.001$) among those who watch TV almost daily. The adjusted probability of having four or more ANC visits was 19.0%, 21.8%, and 25.1% for those who do not watch TV, watch TV less than weekly or at least weekly, and watch TV almost daily (Fig. 2, panel d).

Table 4

Logistic regression estimates of adjusted odds ratios (AOR) of covariates associated with (a) having 4 or more ANC visits (ANC 4+) and (b) having the delivery by skilled birth attendant (SBA), both in last 36 months, BMMS 2010.

Covariates	(a) ANC 4+			(b) SBA		
	AOR	95% confidence interval		AOR	95% confidence interval	
		Lower	Upper		Lower	Upper
Watching TV						
Don't watch TV	1.00	–	–	1.00	–	–
Watch TV at least weekly	1.21**	1.07	1.38	1.21***	1.05	1.38
Watch TV almost daily	1.48***	1.32	1.67	1.54***	1.33	1.74
Women's age						
Below 20	0.96	0.85	1.09	1.03	0.91	1.17
20–24	1.00	–	–	1.00	–	–
25–29	0.91	0.81	1.01	0.88*	0.79	0.99
30–34	0.93	0.81	1.07	0.95	0.82	1.10
35–39	0.81	0.65	1.01	1.13	0.91	1.39
40+	0.91	0.64	1.31	0.94	0.66	1.33
Women's education						
No education	1.00	–	–	1.00	–	–
Primary incomplete	1.48***	1.25	1.75	1.31**	1.10	1.56
Primary complete	1.49***	1.26	1.75	1.44***	1.21	1.72
Secondary incomplete	2.16***	1.86	2.52	2.41***	2.06	2.81
Secondary +	4.48***	3.37	5.36	6.63***	6.49	8.02
Household wealth quintile						
Lowest	1.00	–	–	1.00	–	–
Second	1.02	0.87	1.21	1.29**	1.09	1.52
Medium	1.10	0.93	1.31	1.82**	1.54	2.17
Medium-High	1.28**	1.08	2.53	2.48***	2.08	2.97
Highest	2.32***	1.93	2.80	4.76***	3.90	5.81
Religion						
Muslim	1.00	–	–	1.00	–	–
Non-Muslim	1.33**	1.13	1.56	1.81***	1.55	2.11
Residence						
Rural	1.00	–	–	1.00	–	–
Urban	1.44***	1.29	1.61	1.34***	1.20	1.51
Region						
Eastern	1.00	–	–	1.00	–	–
Central	1.34***	1.18	1.52	1.28***	1.21	1.46
Western	1.54***	1.34	1.77	1.74***	1.52	1.98
Constant	0.07***	0.06	0.08	0.05***	0.04	0.06
-Log (Pseudo-likelihood)	8,572.46			8,620.28		
Pseudo R-squared	0.11***			0.18***		
Sample size	18,256			18,256		

* p < 0.05.
** p < 0.01.
*** p < 0.001.

Use of skilled birth attendant (SBA) for most recent delivery in last 36 months

Women who watch TV weekly or less than weekly had 21% higher adjusted probability of delivering with an SBA compared to those who did not watch TV (Table 4, panel b). The adjusted odds was 54% higher among women who watch TV almost daily than those who don't watch TV. The adjusted probability of SBA use was 23.0%, 25.9%, and 29.9% for those who do not watch TV, watch TV weekly, and watch TV almost daily (Fig. 2, panel e).

Interactions

We tested interaction effects of TV watching between education and wealth quintile which were not found to be significant, meaning that the effect of TV watching is the same across the socioeconomic groups.

The control variables and reproductive health behavior

We find that most of the control variables were associated with dependent variables we consider in the analysis, and the results are in the expected direction. For example, ANC 4+ and SBA increased with education or with wealth quintile, they were higher in urban than rural areas, they were higher in central and western regions than eastern region, and they were higher among non-Muslim than Muslim women. Desired fertility decreased with education, was lower among non-Muslim than Muslim and in urban than rural areas, was lower in western and central regions than eastern region; it did not vary with wealth quintile. Actual fertility (measured by having a birth in last 24 months) was lower among older women and was lower among the wealthier than the poor but it did not vary with education and urban-rural residence; and it was lower among the non-Muslim than Muslim; and was lower in western than central than eastern region.

Discussion

Our analysis supports our hypothesis that TV watching is associated with reproductive health behavior in Bangladesh; women who watch TV, even occasionally, practice better reproductive health behaviors than women who do not. After controlling for observed confounders, TV watchers are significantly more likely to desire a small family, are more likely to use contraceptives and are less likely to have a birth in the two years before the survey. They are also more likely to seek at least four antenatal care visits and to utilize a skilled birth attendant for delivering their last child.

While our results demonstrate moderate to strong, consistent associations between TV watching and various positive reproductive health behaviors and are supported by an extensive theoretical literature, determining the extent to which the observed associations are causal and disentangling the different potential causal mechanisms is challenging. TV watching is expected to influence health behavior through exposure to sponsored health programs, health reporting, and general entertainment programming. However, our analysis is not able to distinguish between these potential pathways as we do not have data on the specific TV content that women watch. We are also unable to distinguish the contribution of the different potential underlying causal mechanisms of observational learning and information processing described in the literature.

Our findings are derived from cross-sectional associations between TV watching and reproductive health behaviors so we cannot determine the extent to which these association are causal. The multivariate analysis controls for important observed confounding factors. We tested the robustness of the multivariate findings by refitting models using propensity score weights as an alternative way to control for selective TV watching based on observable confounders (data not presented). The results of the propensity score weights analysis were consistent with the results from the multivariate analysis. However, both these methods only control for selection based on observable characteristics; there are likely to be additional unobserved variables that affect both TV watching and health behaviors. For example, it is possible that social innovators adopt more modern health behaviors such as lower fertility, seeking ANC or delivering with SBA; the same social innovators may also be TV watchers. Our options for dealing with selection on unobservables are limited by the data we have. We explored using an instrumental variables approach but were unable to find strong instruments for these models. Another common approach for dealing with selection on unobservables is to use a difference in differences approach but that requires longitudinal data (see Lance et al., 2014 for descriptions of these methods). Our ability to make definitive causal statements about the associations observed is therefore limited.

It is also possible that our analysis underestimates the total effect of TV on health behavior in the population. The acquired behavior due to observational learning through TV can spread to non-watchers through diffusion. The diffusion model argues that behavior change occurs

through ideational change by observing other individuals' behavior which is thought to be ideal or regarded as a role model (Palloni, 2001). Fishbein and Azjen (2010) argued that mass media, in our case TV, can reach large audiences, by changing behavior that becomes norms within an individual's social network which can then influence others who have not been directly exposed to the information dissemination. Hughes (1980) hinted at the possibility of the association of TV with cultural diffusion in the American society. In Bangladesh, it is common to seek advice from peers, neighbors, and relatives about health or related issues or for people to volunteer advice facilitating the spread of knowledge and ideas obtained from watching TV to people who do not watch TV. To the extent that diffusion is operating in the effects of TV on health behavior, comparing TV watchers and non-watchers will underestimate the total effect of TV on health behaviors.

To the extent that our findings reflect causal associations, inequity in access to TV could exacerbate inequities in reproductive health behaviors and outcomes in the short term. Lack of availability of electricity is an infrastructural barrier to the spread of TV, especially in the rural areas where 70% of Bangladesh population reside; electricity has not yet reached to 35% of rural households (NIPORT et al., 2016). The growth in solar power in Bangladesh is among the fastest in the world and has potential to reduce electricity availability as a barrier to TV access (*The Daily Star*, March 8, 2015 and July 1, 2014). Solar-power generation in Bangladesh currently covers 11% of households, mostly in low-lying and difficult to reach rural areas.

In conclusion, continued increase in the reach of TV in the country and associated growth in TV viewing has the potential to act as a driver of improved reproductive behaviors. It also has potential to influence other behaviors relevant to emerging health threats both positively and negatively. For example, TV can play a role in enhancing awareness of prevention and treatment of emerging non-communicable diseases (NCDs). As in many developing countries, obesity is rising in Bangladesh, especially in urban areas, and the risk of having chronic illnesses such as diabetes, diseases of the circulatory system, cancer, and chronic kidney diseases, are increasing sharply (see, e.g., Ng et al., 2014, The Global Burden of Metabolic Risk Factors for Chronic Diseases Collaboration, 2014). Many of these health problems are associated with lifestyle and eating habits that could potentially be influenced by TV messages related to healthy lifestyles and diet. However, TV watching can have negative effects on these behaviors too; for example, advertising of highly processed foods and portrayal of these foods in a positive light in entertainment can increase less desirable behaviors and outcomes associated with NCDs (Swinburn and Shelley, 2009). More research is needed in future on the relationship between TV watching and these types of lifestyle choices and related outcomes in Bangladesh.

Appendix A

See Table A1

Table A1
Logistic regression estimates of adjusted odds ratios (AOR) of factors associated with TV watching among currently married women of reproductive age, BDHS 2011.

Covariates	AOR
Women's age	
15–24 (RC)	1.00
25–34	0.79***
35–49	0.52***
Women's education	
No education (RC)	1.00
Primary	1.31***
Secondary	1.65***
Higher	1.61***
Household wealth quintile	
Lowest (RC)	1.00
Second	1.45***
Medium	3.26***
Medium-High	8.21***
Highest	23.29**
Religion	
Muslim (RC)	1.00
Non-Muslim	1.49**
Region	
Eastern (RC)	1.00
Central	1.29*
Western	1.31**
Urban vs. rural	
Rural (RC)	1.00
Urban	2.21***
Constant	0.29

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

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