Safe vs. Unsafe Pregnancy Termination in Matlab, Bangladesh: Trends and Correlates

Julie DaVanzo
RAND Corporation
Mailing address: 16541 Akron Street, Pacific Palisades, CA, USA 90272
E-Mail address: julie@rand.org
Tel: 1-310-454-8849
FAX: 1-310-454-8849

Mizanur Rahman
MEASURE Evaluation
Postal address: c/o ICDDR,B, G P O Box 128, Dhaka 1000, Bangladesh
Street address: c/o ICDDR,B, 68 Shaheed Tajuddin Sarani, Mohakhali, Dhaka 1212, Bangladesh
E-Mail address: mizanur20wood@gmail.com

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Abstract

There have been a number of studies of influences on abortion, but little is known about the choice of method of pregnancy termination. We conduct multivariate analyses (logistic and multinomial logit regressions) of high-quality data from the Matlab (Bangladesh) Demographic Surveillance System to look at influences on the likelihood that pregnancies are voluntarily terminated and, if so, whether by safer or less safe methods. We consider 122,691 pregnancies that occurred between 1989 and 2008. Of these pregnancies, 5,221 (4.3%) were voluntarily terminated. Of these terminations, 3,495 were by more safe methods (menstrual regulation or D&C) (66.9% of all terminations) and 1,726 (33.1%) were by other, less safe, means.

Over the 1989-2008 period, there was a general increase in the proportion of pregnancies that were voluntarily terminated. This was due entirely to an increase in the use of safer methods. Use of less safe methods decreased absolutely as well as in relative terms over this period. Since 1993, most pregnancy terminations have been by more safe methods.

If pregnant, women under age 18 and those aged 25 or older are more likely than those aged 18-24 to terminate their pregnancies. Although older women are absolutely more likely than those aged 18-24 to terminate a pregnancy by a less safe method, if they are do terminate a pregnancy, they are relatively more likely to use a safer method compared to younger women.

The likelihood of termination by any method is higher for women with some education compared to women with no education. This is entirely due to their greater use of safer methods. Use of unsafe methods is not significantly related to education.

The decreasing use of less safe methods of pregnancy termination may explain why maternal mortality rates have decreased in Bangladesh despite an increase in pregnancy terminations.

Introduction

Worldwide, there were around 43.6 million abortions in 2008 (Sedgh et al., 2012), of which nearly 21.6 million are unsafe (Åhman and Shah, 2011). Unsafe abortion is defined as "a procedure for terminating an unintended pregnancy carried out either by

persons lacking the necessary skills or in an environment that does not conform to minimal medical standards, or both" (WHO, 1992). Nearly all unsafe abortions occur in developing nations (Åhman and Shah, 2011). It is estimated that, globally, 14 of 1,000 women aged 15-44 had an unsafe abortion in 2008 and that this rate was the same as in 2003 (Åhman and Shah, 2011). In 2008, about 47,000 maternal deaths, or one in eight maternal deaths worldwide, resulted from unsafe abortion; though high, and preventable, this is a considerable decrease from the estimate of 60,000 in 1990. Furthermore, unsafe abortions are associated with short- and long-term morbidity, including infertility (Åhman and Shah, 2011); they are estimated to lead to five million disabilities per year globally, some of which are permanent (Grimes, 2006; Shah and Åhman, 2009). By contrast, pregnancy terminations performed by trained personnel in hygienic conditions can be safer than childbirth (Grimes, 2006). It has been estimated that the case-fatality rate associated with unsafe abortion (220 per 100,000 procedures) is around 350 times higher than the rate for legal abortion in the United States (Åhman and Shah, 2011). Reducing the number of unsafe terminations can help reduce maternal mortality and the disabilities associated with the procedure.

While there have been a number of studies of influences on abortion (e.g., Bankole et al., 1999; Ahmed et al., 1996 a&b, 1998, and 2005; Bhuiya et al., 2001), little is known about the factors that affect the choice of method of pregnancy termination. In a companion paper (DaVanzo et al., 2011), we analyze the effects of socioeconomic, demographic, and programmatic variables on the decision to terminate pregnancies over the period April 1978-2008. In this paper we look at the choice of method of termination among those ending their pregnancies over the period 1989-2008.

Conceptual Framework

Along with frequency of intercourse and use of contraception (including breastfeeding in some settings), voluntary pregnancy termination (VPT) is one of the methods couple use to achieve the number, spacing, and sex composition of children that they desire (Bongaarts, 1978). The first two methods of fertility regulation affect the likelihood of conception, whereas VPT affects whether a live birth will occur given that a conception has occurred. Like the other methods of fertility control, use of VPT is more likely if the woman does not want to have any more children or does not want to have a

child at that time, and is more likely the higher the "costs" of an unintended pregnancy. Like the other methods of fertility regulation, VPT has information, monetary, and psychic costs as well as the possibility of serious health consequences for women, all of which will affect the likelihood that it is practiced.

There are various methods of VPT, and they differ in these costs in ways that may affect a woman's choice of method of VPT if she chooses to terminate a pregnancy. For example, in Bangladesh, the setting for this research, menstrual regulation (MR), a relatively safe method of pregnancy termination by uterine evacuation using manual or electric vacuum aspiration, is available from medically trained providers in the formal health sectors, both public and private. MR is supposed to be free of cost at the public sector, but one has to spend a considerable amount of money even from the public sector for various reasons. Furthermore, the providers have to keep records of MRs, which may raise clients' concerns about confidentiality. In Bangladesh, less safe methods of VPT can be obtained from traditional practitioners, and they are less expensive than MR. Traditional practitioners are more commonly available in the communities than are formally trained providers. Relatively richer and more educated women are more likely to have information about services available at the formal sectors as well a greater ability to afford to pay for MR.

In this paper, we look at influences on the likelihood that pregnancies are voluntarily terminated and, if so, whether by safer or less safe methods. We use a sample of pregnancies, so we are dealing with cases that have already experienced the first two phases of producing a live birth – intercourse and conception. Many couples who do not want more children will not have sexual intercourse or will prevent conception through the use of contraception, and they will not be in our sample. Our sample thus consists of a combination of intended and unintended pregnancies. Many of the latter may be due to non-use or ineffective use of contraception. Our goal is to explain which pregnancies will be terminated and whether by more safe or less safe methods. Our presumption is that if a pregnancy is not voluntarily terminated, the woman has chosen to take the pregnancy to term and have a live birth. We recognize that a small proportion of pregnancies will miscarry and or result in stillbirths. However, VPT occurs, on average, before all other types of pregnancy outcomes (the median and average duration of pregnancies that end in VPT are shorter than those for miscarriages and, of course, live

births and stillbirths), and hence decisions about VPT typically occur before the competing risks of these other outcomes.

In explaining whether pregnancies are terminated by VPT, we are explaining the net result of the incidence of unintended pregnancy and the likelihood that those unintended pregnancies are voluntarily terminated. If women do not want (more) children, they are less likely to become pregnant (and hence less likely to be in our sample), but if they do become pregnant, they should be more likely to terminate their pregnancies. We hypothesize that variables that are associated with lower fertility and the desire to not to have another birth (soon) will be associated with a greater likelihood of VPT. We expect that many of the variables that affect the likelihood of VPT and the way they affect it should be similar to those that affect the likelihood of contraception.

The specific variables that we consider and the ways in which they may differentially affect the likelihood of using safer vs. less safe methods of VPT are discussed below.

Pregnancy Termination in Bangladesh

Since independence in 1971, Bangladesh has had a strong political commitment to reducing its high rate of population growth. In the past three decades, fertility in Bangladesh has fallen considerably, from 6.3 children per woman in the early 1970s to 2.5 children in 2010 (NIPORT, 2011).

VPT is legal in Bangladesh when it is practiced to save women's lives in the early stages of pregnancy. Uterine evacuation, called menstrual regulation (MR), is permitted within ten weeks of a woman's last menstrual period using manual or electric vacuum aspiration. MR is available from trained female paramedics at government and private health centers both in urban and rural areas. Husband's consent is not legally required prior to the procedure, but many providers ask for it. MR has been available through government and other medical facilities in Bangladesh since the late 1970s, when the government agreed to permit such pregnancy terminations in an effort to replace the practice of unsafe abortion. Abortion remains a very sensitive topic in Bangladesh; in fact, many of the restrictions for MR, particularly its availability only before pregnancy is clinically confirmed, are to reinforce the perception of MR as something other than

abortion. Since MR is not treated as abortion in Bangladesh, we refer to it and other methods used to terminate pregnancies as "voluntary pregnancy terminations" (VPTs).

VPT in a non-medical setting or after pregnancy is clinically confirmed is prohibited in Bangladesh except when done to save a woman's life. Nevertheless, research suggests that clandestine and unsafe VPTs have been common (Ahmed et al., 1996 a&b; Bhuiya et al., 2001). Illegal VPTs are available from traditional healers, usually older women who perform the abortion by inserting herbal roots or other solid objects into the uterus. Such VPTs have been found to be a leading cause of maternal mortality and short- and long-term maternal health complications. From the late 1970s to the early 1990s, about 15 percent of maternal deaths in Matlab, the area we study, were caused by VPT (Ronsmans et al., 1997). Patients with complications from VPT accounted for about half of the admissions to gynecology units of major urban hospitals in Bangladesh in the late 1970s, resulting in a huge burden on health service resources (Dixon-Mueller, 1988).

The incidence of VPT increased in Matlab until the early 2000s (Rahman et al., 2001; DaVanzo et al., 2011), but VPT-related maternal mortality decreased over this period (Maine et al., 1996; Chowdhury et al., 2007; Chowdhury et al., 2009). Nationally, there has been substantial decline in maternal mortality (NIPORT and ORC Macro, 2002; NIPORT, 2011): The maternal mortality ratio (MMR) declined from 514 per 100,000 live births in 1986-1991 to 194 per 100,000 in 2008-2010; the MMR from VPT declined from 16 per 100,000 in 1999-2001 to 2 per 100,000 in 2008-2010. While part of this decrease may be associated with increased availability of organized maternal health care, including greater availability of post-abortion care and improved care for complications of VPTs, it may also due to a change in methods of VPT used -- that the use of less safe methods has decreased despite the overall increase in the incidence of VPT. We investigate this possibility below.

Study Area

We use data from Matlab, Bangladesh, which is well known for its Demographic Surveillance System (DSS), operated by the International Center for Diarrheal Disease Research, Bangladesh (icddr,b) since 1966. Since 1977, Matlab has also been the site of a family planning initiative, in which the Maternal Child Health and Family Planning

(MCH-FP) Project has provided one half of the area, the MCH-FP Area, with more accessible and higher-quality family planning services than the standard government services provided in the other half of the area, the Comparison Area. The Comparison Area is typical of much of Bangladesh in contraceptive practice (icddr,b, 2003), fertility (icddr,b, 2011), VPT (Khan et al., 1986b), and maternal mortality (Alauddin, 1986; Khan et al., 1986a; Koblinsky et al., 2008).

From 1977 to 1998, specially trained female community health workers (CHWs) in the MCH-FP Area visited married women of reproductive age (MWRA) every two weeks to provide counseling about family planning services and to deliver pills, condoms, and injectables at the doorstep. Because marriage is nearly universal and occurs at a young age, the focus of family planning programs on MWRA effectively targets all sexually-active women of childbearing age. In the Comparison Area, MWRA were supposed to receive the standard visits every two months from female welfare assistants of the government family planning program, though evidence suggests that these visits did not always occur. In 1999, visits by CHWs to MWRA in the MCH-FP Area were reduced to once monthly. In 2000, family planning services in the Comparison Area (as in the rest of the country) were delivered from fixed-site clinics rather than from doorstep visits every two months. In 2001, visits by community workers to MWRA in the MCH-FP Area were eliminated, and family planning services in both areas were provided from fixed-site clinics. The shifting of the family planning service delivery mode from home to fixed site did not reduce contraceptive use in rural Bangladesh (Mercer et al., 2005). In addition to the standard government Health and Family Welfare Centers, the MCH-FP Area also has icddr,b sub-centers that provide maternal and child health and family planning services.

At least until recently, the MCH-FP Area has been characterized by greater contact among clients, workers, and supervisors, as well as greater availability and a broader mix of contraceptive methods than are available in the Comparison Area. In 1990, women in the MCH-FP Area reported greater accessibility and higher quality of family planning services than those reported by women in the Comparison Area (Koenig et al., 1992).

The difference in contraceptive services between the two areas has led to a difference in contraceptive practice, with women of childbearing age in the MCH-FP

Area more likely to use contraception than are women in the Comparison Area (e.g., 54.2 percent vs. 42.5 percent in 2009) (icddr,b, 2011). These areas also differ in the contraceptives that are used (icddr,b, 2011). Users in the Comparison Area are more likely to use pills, for which inconsistent use may lead to unintended pregnancy. Users in the MCH-FP Area are much more likely to use injectables such as depo-medroxyprogesterone acetate (DMPA), which have very low failure rates but sometimes cause side effects that lead to discontinuation of use.

These trends and differences in contraceptive use have resulted in decreases in fertility in both areas and in lower fertility rates in the MCH-FP Area since the late 1970s. However, the differences between the areas have narrowed over time, and there is now no difference in fertility. In 1990, the total fertility rate (TFR) in the Comparison Area was 5.0 children per woman, while that in the MCH-FP Area was 3.4 children per woman. In 2001, the TFR in the Comparison Area was 3.4 children per woman, while that in the MCH-FP Area was 3.1 children per woman. In 2009, the TFR was the same in both areas, at 2.5 children per woman (icddr,b, 2003 and 2011). The mean desired number of children has been similar in both areas and has decreased at similar rates, from about 4.5 in 1975 to 3.0 in 1990 to 2.3 in 2007 (the most recent year for which such data are available) (Koenig et al., 1992; NIPORT et al., 2009). Hence, until very recently, there has been more excess fertility in the Comparison Area than in the MCH-FP Area.

At its beginning, in 1977, the MCH-FP project provided MR services as backup in case of contraceptive failure, in addition to those offered by government clinics in both areas (Bhatia and Ruzicka, 1980). This was discontinued in 1983 when donors withdrew their support from that part of the program.

Data and Methods

Data from the Matlab Demographic Surveillance System (DSS)

From 1966 to 1997, specially trained female CHWs employed by the DSS visited every household in both areas every two weeks to record the pregnancy status of each woman of reproductive age and any pregnancy outcomes occurring since the previous visit. These visits occurred monthly between 1998 and 2006, and have occurred bimonthly since 2007. A study that compared the reporting of vital events for fortnightly,

monthly, and bimonthly recall periods concluded that the accuracy of reporting was the same in all three systems (Alam et al., 1999).

The DSS has distinguished the method of VPT since 1989, though, for unknown reasons, this distinction was not made in the data for the year 2001. Our analyses consider the period 1989-2008 but exclude the year 2001. Between 1989 and 2008, excluding 2001, there were a total of 5,221 VPTs in Matlab; 3,389 of these were by MR and 106 were by D&C, while 1,726 were by other, presumably much less safe, methods of VPT. The other methods of VPTs are recorded in layman's terms. The two main other methods recorded were internal manipulation of the female genitalia (n=821) and drug application (n=595). Others were manipulation of the abdomen (n=80), injections (n=74), and drug ingestion (n=47). Method was not reported for 109 cases. Since D&C is also a relatively safe method of pregnancy termination, in our analyses of method of VPT we include the relatively few cases of D&C together with the cases of MR in a category we call "more safe VPT." All other methods are combined into a category "less safe VPT."

The Matlab data on pregnancy outcomes are likely to be of high quality. In their many years of work in the community the female CHWs have established themselves as trustworthy and in a good position to collect reliable information on pregnancy and abortion. In addition, because of the frequency of their visits, they were likely to know pregnancy status and changes. However, an investigation we have done of the causes of maternal deaths revealed that there are a small number of maternal deaths that were reported in the DSS as occurring during pregnancy that were actually associated with VPT but were not reported or not recorded as VPTs in the DSS; we treat these cases as VPTs in this paper. This exercise leads to the suspicion that there may be some under-reporting of VPTs in the DSS.

Sample Considered in This Study

We consider 122,691 pregnancies that occurred between 1989 and 2008 excluding the year 2001 (for which type of method of pregnancy termination was not distinguished). Of these pregnancies, 5,221 (4.3%) were voluntarily terminated. Of these VPTs, 3,495 were by more safe methods (MR or D&C) (66.9% of all VPTs in these years) and 1,726 (33.1%) were by other, most likely less safe, means.

Statistical Methods

Descriptive Analyses

We begin with a descriptive analysis that shows trends in the proportion of pregnancies that were voluntarily terminated -- the number of VPTs per 1,000 pregnancies. We show these separately for the MCH-FP and Comparison Areas for each year between 1989 and 2008 (excluding 2001) and decompose them into their "more safe" and "less safe" components. We test whether differences between areas are statistically significant using t-tests.

Multivariate Analyses

For the sample of pregnancies that occurred between 1989 and 2008 (excluding 2001), we estimate a logistic regression explaining whether pregnancies are voluntarily terminated (by any method). We then estimate a multinomial logistic regression to assess the effects of each of the variables we consider on whether the pregnancy was terminated by a more safe method, by a less safe method, or was not voluntarily terminated. The last category includes miscarriages and stillbirths as well as live births.

We also estimate a logistic regression for the sample of VPTs where we explain whether the termination was by a more or less safe method, so that we can test whether the effects of explanatory variables differ significantly between the two categories of VPTs that we consider.

All of our multivariate analyses adjust for the fact that we have multiple observations on some women. The 122,691 pregnancies that we consider occurred to 57,331 women.

In a companion paper we consider the sample of pregnancies that occurred between 1979 and 2008 and explain which of them was voluntarily terminated (DaVanzo et al., 2011). We initially included in the analysis for this paper the same explanatory variables as those in that study. However, many of the variables that explained whether pregnancies were terminated did not explain the choice of *method* of VPT and are not included in the analyses reported herein. The variables that explained whether pregnancies were terminated but did not explain the choice of method of VPT are number of living children at the time of the index pregnancy, sex composition of living children, duration of the preceding interpregnancy interval, whether the previous outcome was a

multiple birth, previous child death and sex of the child who died, husband's education, household space, and religion.

The explanatory variables included in our analysis are:

The woman's age. We consider the following groupings of the women's ages at the time of the pregnancy outcome: ≤15, 16-17, 18-19, 20-24 (reference category), 25-29, 30-34, 35-39, 40-44, and 45+. We expect that VPT probabilities will be highest for the youngest and oldest women because they are least likely to want to have a(nother) child and hence should be the most likely to terminate a pregnancy if they find themselves pregnant. Because older women may be more knowledgeable about methods of VPT and have more time to observe the experiences of friends who've had a VPT (or to have previously had one themselves), we expect that the relative likelihood that the VPT is by safer methods is likely increase with women's age.

The woman's education. Although use of contraception is positively related to women's education in Bangladesh (NIPORT, 2009), educated women are less likely than those with more education to use permanent methods of contraception and are more likely to use non-permanent methods, such as condoms, pills, or even traditional methods, which have higher failure rates (NIPORT, 2009). Hence, educated women may be more likely to have an unintended pregnancy. Furthermore, educated women may associate higher "costs" of having an unintended birth; e.g., they may be more likely to recognize the desirability of educating their children and they have higher opportunity costs of raising children. In addition, educated women are likely to have greater decision-making power and better access to information and services; for example, they are more likely to know about safer methods of pregnancy termination and about the health risks associated with unsafe methods. For all of these reasons we expect the likelihood of VPT to be positively related to the woman's level of education. We expect that educated women will be more likely to terminate their pregnancies with safer methods and less likely to use less safe methods. We consider four categories of the woman's education -- none (reference category), 1-5 years of schooling, 6-10 years, and 11-16 years, and also include a dichotomous indicator for cases where the level of education is unknown. Two fifths of the pregnancies in our sample were to women with no education, and over a quarter more were to women with 1-5 years of schooling (see the appendix).

Calendar Year and MCH-FP vs. Comparison Area. We include dichotomous indicators for four five-year periods of time: 1989-1993 (reference category), 1994-1998, 1999-2003, and 2004-2008. We expect that the likelihood of VPT has increased over time as children become more expensive in Bangladesh (e.g., parents increasingly realize the importance of educating their children) and hence the costs are greater of having an unintended child, though a decrease in the incidence of unintended pregnancies (which was found in a recent study [Kamal and Islam, 2011]) could offset this. The increasing availability of MR reduces some the costs of VPT (particularly the psychic costs of concerns about illegality and health consequences) and should increase the likelihood that this method is used.

Contraceptive use rates have been higher, and relatively more contraceptive use has been of effective methods, in the MCH-FP Area relative to the Comparison Area of Matlab (icddr,b, 2011). More of the pregnancies in the MCH-FP Area were intended, and, as a result, the pregnancies that did occur in this area were less likely to be terminated (Rahman et al., 2001). In recent years, contraceptive use has increased relatively more rapidly in the Comparison Area (icddr,b, 2011), and hence it is possible that the gap in VPT incidence between the areas has shrunk. We explore this possibility in our analysis by including interactions between area and calendar year. We do this in two alternative ways: In the first, we interact dichotomous indicators for the four Year periods with a dichotomous indicator for each of the area of Matlab; 1989-1993 x Comparison Area is the reference group. This specification enables us to see the trend over time in each area. In the second specification, we include dichotomous variables for the calendar year periods by themselves, with 1989-1993 as the reference period, and we also interact each of the Year categories with the indicator for the MCH-FP Area. These interactions show us how the VPT probability in the MCH-FP Area differs from that in the Comparison Area in each time period (and test the statistical significance of the differences). For example, because MR was provided by the MCH-FP project in the early years of the intervention, people in the MCH-FP Area might be more familiar with it.

Descriptive Results

Overall Trends and Differences between Areas

The proportion of pregnancies that were voluntarily terminated was larger in the Comparison Area than in the MCH-FP Area in all years except 2008 (Figure 1); the differences are quite large and statistically significant for each of the years during the study period except 2008. Between 1989 and 2006, the proportion of pregnancies that were voluntarily terminated was 50 percent to 220 percent larger in the Comparison Area than in the MCH-FP Area. However, the proportion of pregnancies terminated has risen since 2005 in the MCH-FP Area, whereas it has fallen since 2003 in the Comparison Area. In 2008, the proportion of pregnancies that were terminated in the MCH-FP Area *exceeded* that in the Comparison Area, but the difference was not statistically significant.

[Figure 1 about here]

The lower proportions of pregnancies that were terminated in the MCH-FP Area over most of the study period are matched by lower likelihoods of VPT of each type in all years, except 2008 for less safe methods. The likelihood of VPT by more safe methods is significantly lower (at $p<0.05$ or better) in the MCH-FP Area than in the Comparison Area in all years except 1989, 1990, 2007, and 2008 and for less safe methods in all years except 1993, 2004, and 2008.

During this period, in both areas of Matlab there has been a shift in pregnancy terminations toward those done more safe methods and away from those done by less safe methods. Between 1989 and 2008, the proportion of pregnancies terminated by more safe methods increased from 8.4 per 1,000 pregnancies to 38.4/1,000 in the MCH-FP Area and from 11.8/1,000 to 39.8 (and reached a high of 66.1 in 2002) in the Comparison Area. The proportion of pregnancies terminated by less safe methods fell in the MCH-FP Area from around 15.5 per 1,000 in 1991 to as low as 5.4/1,000 in 2005, though it has increased since then (to 10.4 in 2008). In the Comparison Area from the proportion fell from 25.5/1,000 in 1989 (and as high as 30.8 in 1997) to 7.5/1,000 in 2008. The percentage of VPTs done by more safe methods increased from 38.0 to 78.6 percent in the MCH-FP Area, and from 31.6 to 81.4 percent in the Comparison Area (Figure 2). Since 1993, most VPTs in both areas have been done by more safe methods. There is no systematic pattern in whether this percentage is greater in the MCH-FP Area

or the Comparison Area; the difference between the areas is statistically significant at $P<0.05$ in only one year (1997), when it was greater in the MCH-FP Area.

[Figure 2 about here]

Multivariate Analyses

Table 1 presents the results of our multivariate analyses. We first present a logistic regression that shows which pregnant women terminate their pregnancies. Next we present a multinomial logit analysis of which pregnant women are likely to have an more safe VPT, a less safe type of VPT, or not to terminate their pregnancies (which in the majority of cases means seeing the pregnancy to term); the third category is the reference group. The samples for the first two models are all pregnancies that occurred between 1989 and 2008, excluding 2001. The third model considers only the pregnancies that were voluntarily terminated and estimates a logistic regression explaining which of them were terminated by more safe (vs. less safe) methods. This enables us to test whether the differences seen in Model 2 between influences on more vs. less safe methods are statistically significant.

[Table 1 about here]

The woman's age has a J-shaped relationship with the likelihood pregnancies are terminated. Relative to the reference group (age 20-24) the likelihood of termination is significantly higher for women aged ≤15 (OR=3.2) and 16-17 (OR=1.5); this is true for both safe and less safe methods of VPT. The likelihood a pregnancy is terminated is lowest for women aged 18-24 and then increases with age thereafter, overall and for each method; the odds of termination are particularly high for the oldest women (OR=6.7 for ages 35-39, 14.1 for ages 40-44, and 26.1 for ages 45+, all relative to 20-24). Very young women are statistically as likely to use more safe methods as to use other methods to terminate their pregnancies relative to women age 20-24. If women age 25 and older terminate their pregnancies, they are relatively more likely to use more safe methods (relative to less safe methods) than are younger women.

The likelihood that pregnancies are terminated is significantly greater for women with some education compared to those with none. This is entirely due to their greater likelihood of having a more safe termination. Education has no significant effects on the likelihood of termination by less safe methods of VPT. In Model 3 we can see that, of

women who terminate their pregnancies, the likelihood that a more safe method of termination is used is positively related to the woman's level of education.

In the Comparison Area, the likelihood of VPT is lowest in the reference period (1989-1993); it increases over the next two time periods we consider and then decreases in the last one (2004-2008). The increase is entirely due to the increase over time in the use of more safe methods of VPT. The odds that a woman in the Comparison Area will have a more safe VPT were almost three times higher in 1999-2003 than in 1989-1993. The likelihood of termination by a less safe method decreased monotonically over time in the Comparison Area. Similar patterns are seen for the MCH-FP Area: In this area the likelihood of using a more safe method increased monotonically over time; the likelihood of termination by a less safe method is highest in the earliest period considered and lower in all subsequent subperiods. Of women terminating their pregnancies, the likelihood that a more safe method is used rather than a less safe method increases monotonically and significantly over time in both areas (Model 3). In the Comparison Area, the odds that a more safe rather than less safe method is used is 4.5 times higher in 2004-2008 than in 1989-2003. The comparable ratio is even larger in the MCH-FP Area – 5.0.

The results for the specification shown at the bottom of Table 1enable us to examine more directly the differences between areas in each time period. In each time period, women who live in the MCH-FP Area have a substantially and significantly lower likelihood of terminating a pregnancy. This is true for VPTs overall and for both more and less safe methods. In the 1994-98 period, women in the MCH-FP Area are significantly more likely to terminate with a safe method rather than a less safe method compared to those in the Comparison Area, but there are no significant differences between the two areas in this respect in the other time periods.

Summary of the Main Findings and Their Implications

Over the period of study, 1989-2008, there was a general increase in both areas of Matlab in the proportion of pregnancies that were voluntarily terminated. However, in the most recent years we consider, the patterns have been different in the two areas. The proportion of pregnancies terminated decreased between 2003 and 2008 in the Comparison Area of Matlab, whereas it increased between 2005 and 2008 in the MCH-FP Area; these differences may reflect the relatively greater improvements in

contraceptive practice in the Comparison Area in recent years. The recent decrease in VPTs in the Comparison Area could reflect the recent national decline in unintended pregnancy since 1999-2000 (Kamal and Islam, 2011).

Between 1989 and 2007, as has been found in other studies of Matlab (Ahmed et al., 1998; Rahman et al., 2001; Ahmed et al., 2005), pregnancies were less likely to be terminated in the area with the better family planning and health services, the MCH-FP Area. However, this was not true in 2008, though the difference between the areas is not statistically significant in that year.

The lower proportions of pregnancies that were terminated in the MCH-FP Area over most of the study period are matched by lower likelihoods of use of both more safe and less safe methods of VPT in all years except 2008 for less safe methods. The percentage of VPTs done by more safe methods increased in both areas -- from 38.0 to 78.6 percent in the MCH-FP Area, and from 31.6 to 81.4 percent in the Comparison Area. Since 1993, most VPTs in both areas have been done by more safe methods. There is no systematic pattern in whether this percentage is greater in the MCH-FP Area or the Comparison Area.

One of the principal aims of our analysis is to identify the women most at risk for an unsafe VPT. If pregnant, very young women (under age 18) and those age 25 or older are more likely than those ages 18-24 to terminate their pregnancies, and this is true for both safer and less safe methods of termination. Data from other countries show similar patterns for overall abortion ratios (abortions per 100 known pregnancies), though the minimum is at older ages (around 25-29) in the more developed countries studied than in Matlab and the ratio is lowest below age 20 in some countries in Eastern Europe and Central Asia (Bankole et al, 1999).

If pregnant, older women in Matlab are absolutely more likely than younger women to terminate a pregnancy by a less safe method. However, if they do terminate a pregnancy, they are *relatively* more likely to use a safer method compared to younger women. This may be because older women are more likely to know about safer methods and/or to better understand the risks associated with unsafe methods.

The likelihood of termination by any method is higher for women with some education compared to women with no education. This has been found in other studies of Matlab (Ahmed et al., 2005; DaVanzo et al., 2011). The higher use of temporary

methods of contraception by more educated Bangladeshi women may be one reason for their higher VPT rates. Another may be that they consider the costs of an unplanned child to be higher than their less educated counterparts do. It is encouraging, though, that when educated women terminate their pregnancies, they are more likely to use safer methods than their less educated counterparts. The higher incidence of VPTs for more educated women is entirely due to their greater use of safer methods. Use of unsafe methods is not significantly related to education, which is contrary to our expectation.

In our multivariate analysis, broadly over the study period the likelihoods of both types of VPT are significantly lower for women who live in the MCH-FP Area. As noted above, other studies of Matlab have found lower incidence of VPT in the MCH-FP Area, but they did not distinguish safer and less safe methods.

The desire of Bangladeshi couples to limit their family size may be even stronger in the near future with rapid social transformation and increased population crowding continuing. The most recent data indicate that unmet need for contraception is still high in Bangladesh—17 percent in 2007 (NIPORT et al., 2009). This unmet need could continue to lead to more VPTs, as pregnancies that might be prevented by contraception are instead terminated. This indeed most likely explains the general increase in the VPT rate we see over the study period.

To limit the number of VPTs, two interrelated family planning program strategies seem to be in order: increasing contraceptive use and achieving a more effective contraceptive mix. Although contraceptive use continues to increase in Bangladesh, its effectiveness is complicated by changing patterns in types of methods used. Use of voluntary sterilization and IUDs, which have no or few failures, is decreasing, while use of short-term methods is increasing (NIPORT et al, 2009). Nationally, in 2007, 74.0 percent of contraceptive users used the pill, condoms, or traditional methods, which have high rates of discontinuation or failure, and 12.5 percent used injectables, which have low failure rates but, like pills, have high discontinuation rates due to side effects (NIPORT et al., 2009; Roy et al., 2011). Within the MCH-FP Area, reliance among users on the pill, condoms, or traditional methods increased from 29 percent in 1989 to 45 percent in 2001 and then fell to 40 percent in 2009, while use of injectables decreased from 48 percent of contraceptive users in 1989 to 44 percent in 2001 but then rose slightly to 46 percent in 2009 (though such use has increased among all women). The use of IUDs decreased from

7 to 2 percent, and use of permanent contraception decreased from 17 to 9 percent between the 1980s and the late 2000s (icddr,b, 2003; icddr,b, 2011). The fragility of the method mix in the MCH-FP Area may be a reason for the recent increase in VPTs there.

Improving the mix of permanent and temporary contraception, and reducing failure rates of temporary methods and the side effects of otherwise-reliable injectables, will require greater efforts by both public and private parties. Such efforts can and do succeed. Use of injectables throughout Bangladesh has increased, for example, thanks to the efforts of government and NGO clinics to increase their availability. (Use of injectables in increasing among all women, though not as a proportion of all users, in the Matlab area.)

It is encouraging that the use of less safe methods of VPT is decreasing in Matlab (though the recent increase in the MCH-FP Area merits further investigation). This may explain why maternal mortality rates have decreased in Bangladesh despite an increase in VPT rates.

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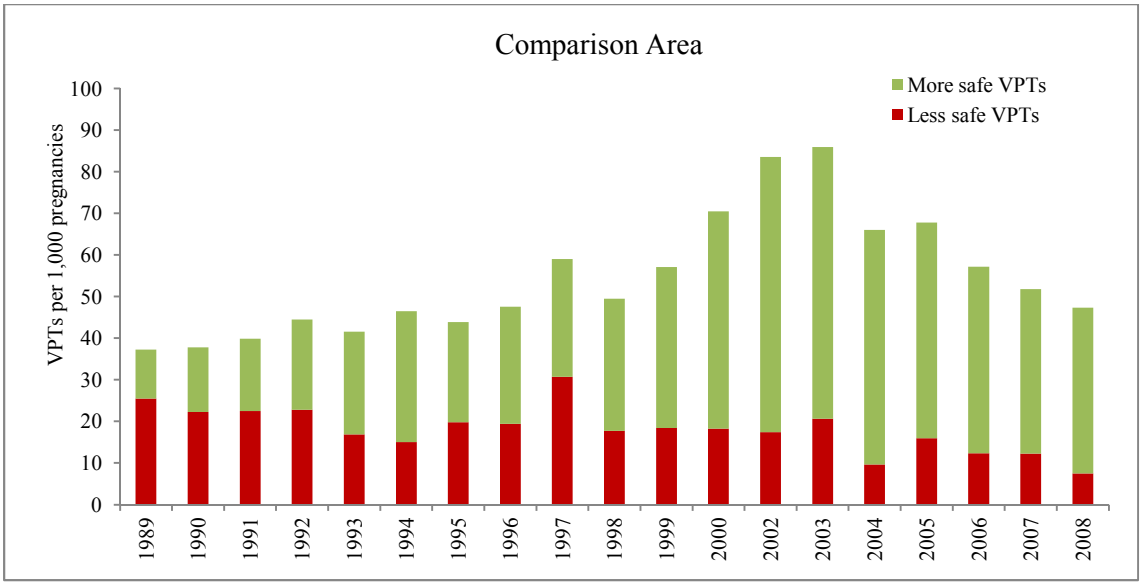

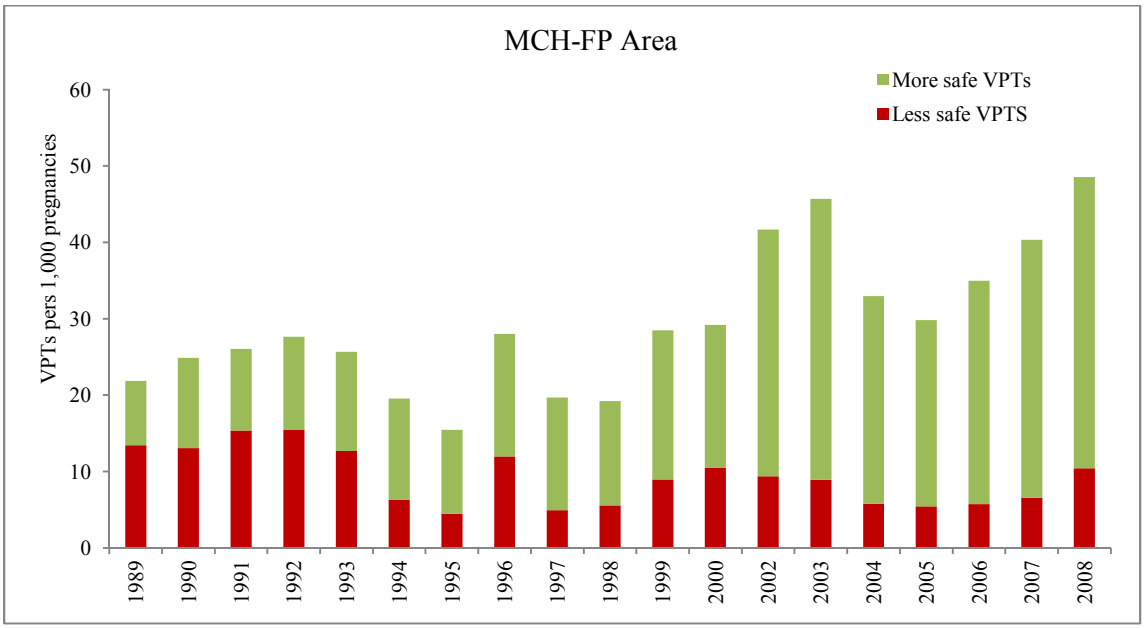

Figure 1. The likelihood pregnancies are voluntarily terminated (VPTs per 1,000 pregnancies), by method of termination and area of Matlab, 1989-2008 (excluding 2001)

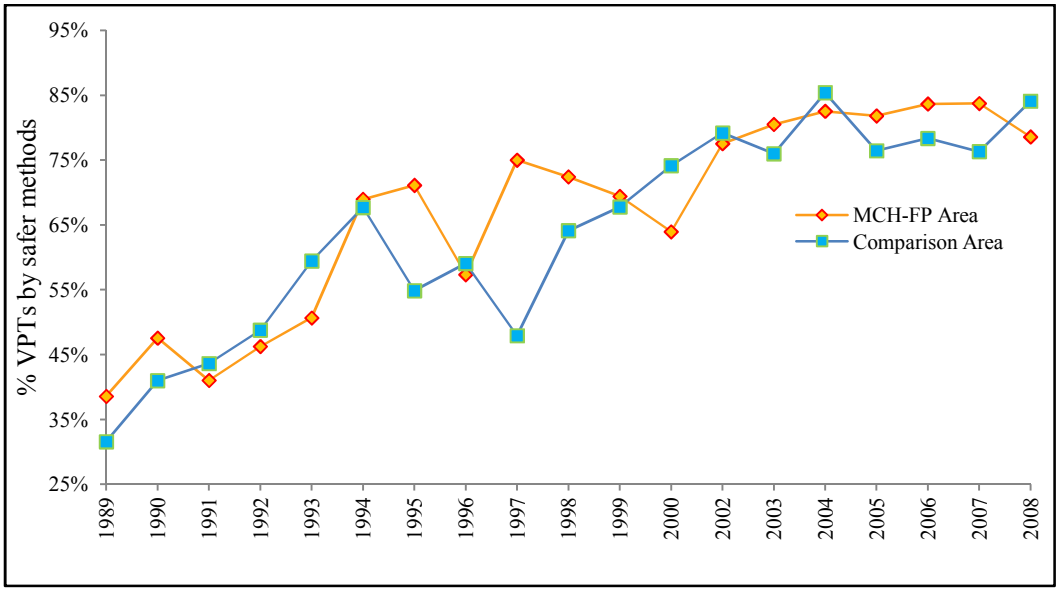

Figure 2. The percentage of VPTs that are by more safe methods, by area, 1989-2008 (excluding 2001)

Table 1: Odds Ratios from Regressions Explaining Whether Pregnancies Were Terminated and by What Method

(All samples exclude observations on the Year 2001)

	(1)		(2)				(3)	
Dependent variable:	Whether pregnancy terminated		Whether pregnancy terminated by more safe or less safe method (each relative to not terminated)				Whether VPT was by more safe method (relative to less safe method)	
Sample:	122,691 pregnancies		122,691 pregnancies				5,221 VPTs	
Estimation technique:	Logit		Multinomial logit				Logit	
			More safe		Less safe			
Maternal Age								
<=15	3.20	***	3.51	***	2.72	**	1.34	
16-17	1.51	***	1.51	**	1.52	*	0.98	
18-19	1.07		1.12		0.99		1.17	
20-24 (RC)	1.00		1.00		1.00		1.00	
25-29	1.51	***	1.69	***	1.23	*	1.45	**
30-34	3.10	***	3.58	***	2.39	***	1.61	***
35-39	6.67	***	7.71	***	5.16	***	1.51	***
40-44	14.05	***	16.4	***	10.7	***	1.50	**
>=45	26.11	***	30.5	***	20.0	***	1.42	+
Women's education								
None (RC)	1.00		1.00		1.00		1.00	
1-5	1.24	***	1.35	***	1.07		1.45	***
6-10	1.37	***	1.53	***	1.11		1.80	***
11-16	1.27	*	1.43	*	0.93		2.17	**
Educ. unknown	1.28	**	1.34	**	1.19		1.14	
Time period X Area								
1989-1993 x Comp. Area (RC)	1.00		1.00		1.00		1.00	
1994-1998 x Comp. Area	1.25	***	1.63	***	0.96		1.68	***
1999-2003 x Comp. Area	1.79	***	2.96	***	0.85	+	3.56	***
2004-2008 x Comp. Area	1.35	***	2.35	***	0.52	***	4.54	***
1989-1993 x MCH-FP	0.66	***	0.67	***	0.66	***	0.97	
1994-1998 x MCH-FP	0.51	***	0.77		0.30	***	2.51	***
1999-2003 x MCH-FP	0.84	**	1.37	***	0.41	***	3.24	***
2004-2008 x MCH-FP	0.84	**	1.48	***	0.30	***	4.84	***
Log likelihood	-19,576.9		-22,648.3				-3,056.5	

Alternative Specification of Area and Calendar Year Variables and Their Interactions
(all other results are the same as those above)

	(1)		(2)				(3)	
	Whether pregnancy terminated		Whether pregnancy terminated by more safe or less safe method (each relative to not terminated)				Whether VPT was by more safe method (relative to less safe method)	
			More safe		Less safe			
Time period								
1989-1993 (RC)	1.00		1.00		1.00		1.00	
1994-1998	1.25	***	1.63	***	0.96		1.68	***
1999-2003	1.79	***	2.96	***	0.85	+	3.56	***
2004-2008	1.35	***	2.35	***	0.52	***	4.54	***
Time period x MCH-FP								
1989-1993 x MCH-FP	0.66	***	0.67	***	0.66	***	0.97	
1994-1998 x MCH-FP	0.41	***	0.48	***	0.32	***	1.49	**
1999-2003 x MCH-FP	0.47	***	0.46	***	0.48	***	0.91	
2004-2008 x MCH-FP	0.62	***	0.63	***	0.57	***	1.07	

+= P<0.10, *=P<0.05, **=P<0.01, ***=P<0.001

Appendix

Means of Explanatory Variables

	Sample	
Variable	*All Pregnancies Considered (n=122,691)*	*Cases That Had a VPT (n=5,221)*
Maternal Age		
<=15 years	0.004	0.006
16-17 years	0.031	0.022
18-19 years	0.086	0.044
20-24 years	0.317	0.148
25-29 years (RC)	0.277	0.187
30-34 years	0.176	0.234
35-39 years	0.082	0.220
40-44 years	0.023	0.111
45+ years	0.004	0.029
Maternal Education		
None (RC)	0.411	0.429
1-5	0.281	0.290
6-10	0.260	0.227
11-16	0.018	0.017
Education unknown	0.029	0.037
Calendar Year		
1989-93 (RC)	0.282	0.221
1994-98	0.253	0.212
1999-03	0.217	0.289
2004-08	0.248	0.278
Area		
MCH-FP Area	0.470	0.333
Comparison Area	0.530	0.667

RC = Reference category