

## Socioeconomic Factors and Processes Associated With Domestic Violence in Rural Bangladesh

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**CONTEXT:** Although the pervasiveness of domestic violence against women in Bangladesh is well documented, specific risk factors, particularly those that can be affected by policies and programs, are not well understood.

**METHODS:** In 2001–2002, surveys, in-depth interviews and small group discussions were conducted with married women from six Bangladeshi villages to examine the types and severity of domestic violence, and to explore the pathways through which women's social and economic circumstances may influence their vulnerability to violence in marriage. Women's odds of experiencing domestic violence in the past year were assessed by logistic regression analysis.

**RESULTS:** Of about 1,200 women surveyed, 67% had ever experienced domestic violence, and 35% had done so in the past year. According to the qualitative findings, participants expected women with more education and income to be less vulnerable to domestic violence; they also believed (or hoped) that having a dowry or a registered marriage could strengthen a woman's position in her marriage. Yet, of these potential factors, only education was associated with significantly reduced odds of violence; meanwhile, the odds were increased for women who had a dowry agreement or had personal earnings that contributed more than nominally to the marital household. Women strongly supported educating their daughters, but pressures remain to marry them early, in part to avoid high dowry costs.

**CONCLUSIONS:** In rural Bangladesh, women's social and economic circumstances may influence their risk of domestic violence in complex and contradictory ways. Findings also suggest a disconnect between women's emerging expectations and their current realities.

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Intimate partner violence is the most prevalent form of gender-based violence worldwide.<sup>1</sup> Domestic violence has been directly linked to numerous kinds of immediate and long-term physical and psychological injury to women.<sup>2</sup> Such violence also may contribute to unwanted pregnancies and may increase the risk of sexually transmitted infections among victims by compromising their ability to dictate the terms of their sexual relationships.<sup>3</sup> Moreover, domestic violence is a common problem during pregnancy<sup>4</sup> and has been associated with increased risks of miscarriage, preterm labor, fetal distress and low birth weight.<sup>5</sup> In light of mounting evidence of its varied and deleterious immediate and secondary effects, domestic violence is increasingly being recognized not only as an issue of human rights but also as a serious public health concern.<sup>6</sup>

Numerous studies have identified possible determinants, or "triggers," of intimate partner violence, many of which are salient across diverse cultural and social contexts. Theories to explain intimate partner violence remain relatively limited, however. This lack of a theoretical perspective may limit efforts to better understand intimate partner violence and to respond to it effectively,<sup>7</sup> particularly at the level of primary prevention.

Heise has proposed an ecological framework suggesting that intimate partner violence arises from an interplay among personal, situational and sociocultural factors.<sup>8</sup> This

framework draws on the cross-cultural literature to identify potential specific factors associated with abuse at each level of the social ecology.<sup>9</sup> However, more empirical information and theory are needed regarding the relative importance of these various factors,<sup>10</sup> how they are inter-related, and how they may interact with one another to influence women's risk of violence.

We report findings on the prevalence, nature and potential determinants of domestic violence—that is, violence perpetrated against a woman by her husband—among married women in six Bangladeshi villages. We explore some of the complex processes underpinning domestic violence in this context by looking at relationships and interactions among variables and by drawing on both quantitative analyses and qualitative data.

### BACKGROUND

Domestic violence is common in rural Bangladesh. Among rural married women surveyed in 1992<sup>11</sup> and 1993,<sup>12</sup> 47% and 42%, respectively, reported having experienced physical violence at the hands of their husband; 43% of women in a 1999 study reported having been slapped and beaten.<sup>13</sup> In addition, domestic violence appears to be an important cause of maternal mortality in Bangladesh.<sup>14</sup>

In Bangladesh, violence against women is closely linked to the institution of marriage, as it is in India.<sup>15</sup> Marriage-

related norms and practices reinforce women's relative powerlessness, often exposing them to domestic violence. Bangladeshi females frequently are married in childhood to an older man who is unknown to them. Despite a law prohibiting marriage for females younger than 18, rural women aged 20–49 reported a median age at marriage of 15 years in a 1999–2000 national survey.<sup>16</sup> At the time of marriage, young women usually know little or nothing of sex,<sup>17</sup> and sexual initiation can be a traumatic experience. Domestic violence is often used to establish and enforce gender roles early in marriage, and very young women may be particularly vulnerable and unable to resist.

Domestic violence is used in both Bangladesh and India to extort dowry payments and other property from the families of young married women.<sup>18</sup> Violence—often of escalating severity over time—may be perpetrated against women in conjunction with demands for outstanding (often unaffordable) dowry payments or demands for additional amounts.<sup>19</sup> In a study in India, perceived dowry inadequacy was one of the main reasons cited to explain domestic violence.<sup>20</sup>

In studies by Schuler and colleagues on the connections between violence and gender inequality and the factors that may influence these outcomes in Bangladesh, men often used violence to enforce their dominance and nonegalitarian gender norms, particularly in the initial years of marriage. This research suggested that the effects of interventions such as microcredit loan programs—which empower women economically and socially—on domestic violence are ambiguous. Participation in such programs can, on the one hand, reduce a woman's risk of domestic violence by making her life more visible and by increasing her perceived value in the family; on the other hand, if the woman's economic empowerment results in her acting more assertively, her husband may respond with violence.<sup>21</sup>

We report results from in-depth interviews, small group discussions and survey data collected in 2001–2002 in six villages in Bangladesh to document the types and severity of violence against women in marriage, and to explore the potential social determinants of domestic violence and the pathways through which social and economic factors might influence women's vulnerability in marriage. Key assumptions guiding this work are that marriage is an important site for the negotiation and expression of gender roles and relations, and that the prevailing marriage systems and practices in Bangladesh need to be understood in the context of strategies developed by individuals and families for economic survival.

In this article, we focus on five potential social and economic factors that have been identified in previous studies, including our own previous qualitative research in these sites, as possible determinants of women's rights and vulnerability in marriage: women's education, women's participation in microcredit lending programs, women's contribution to covering household expenses, dowry arrangements and marriage registration. All these factors are evolving phenomena in the context of Bangladesh; related changes may work to subvert and redefine traditional gender roles, rights and re-

sponsibilities. Men may, in response, use violence to reassert their control and reinforce the prevailing gender order.<sup>22</sup>

Girls' education has been promoted extensively by the Bangladesh government and by nongovernmental organizations (NGOs). The proportion of girls enrolled in formal and informal schooling has risen dramatically; it is now nearly at a par with the proportion of boys.<sup>23</sup> Simultaneously, women have increasingly become economically active; for example, many participate in income-generating schemes, such as microcredit loan programs, or seek paid employment outside the home, which can entail a departure from traditional gender norms mandating women's seclusion.

In Bangladesh, a minimum legal age at marriage of 18 years for females was established in 1929, and the practice of dowry was outlawed in 1980.<sup>24</sup> Although these laws have been publicized in recent years through various channels, families typically disregard them and enforcement barely exists. Similarly, a law requiring the registration of marriages has existed since 1974. The practice has recently been promoted by officials and NGOs interested in supporting women's rights because of women's profound dependence on marriage for economic survival. One requirement of Muslim marriage in Bangladesh (and in many other Muslim countries where laws pertaining to marriage are based on religious tradition) is that the husband must agree to provide *mehr* (or, colloquially, *den mohor*) at the time of marriage.<sup>25</sup> Often translated as "dower," *mehr* is property or payment promised by the groom and his family to the bride—a practice originally intended to provide the wife with economic security and to limit the husband's arbitrary use of unilateral divorce. The amount is customarily recorded in the marriage contract and can be claimed in the event of divorce or death of the husband. (Theoretically, wives may claim this payment at any time, but in practice, they rarely do so.<sup>26</sup>) Thus, in theory, legal registration of a marriage provides the wife with a basis for filing suit to collect the dower if her husband deserts her or divorces her, or if he gives her grounds for divorce by habitually assaulting her.

## METHODS

### Setting

The data are drawn from six villages in three districts (Rangpur, Faridpur and Magura). Our criteria for selecting the villages were designed, in part, to ensure some geographic variation and to include areas in which the two largest microcredit lending programs in Bangladesh were well established. They were also selected to avoid areas near the capital city, which could be atypical of rural Bangladesh, and areas in which other studies were under way. Although

\*In that study, women's median age at marriage had increased over time—from 14 years among 45–49-year-olds to 16 years among 20–24-year-olds; still, 75% of married women reported having been married before age 18. However, such data should be treated with some caution, as we have found that many rural Bangladeshis do not know their precise age or birth date. In addition, because educational improvements and media campaigns sponsored by government agencies and nongovernmental organizations have, over time, increased awareness of the minimum legal age requirement for marriage, respondents increasingly may have tended to intentionally misreport their age at marriage.

we did not select the villages randomly, when we compared our survey data with rural averages from the most recent Demographic and Health Survey,<sup>27</sup> the villages collectively appeared indistinguishable from others in Bangladesh, except that they had a somewhat lower mean educational level among women and a lower use of antenatal care. The villages are poor and somewhat conservative, but not unusually so for rural Bangladesh. The religious composition is typical of Bangladeshi villages—96% of women are Muslim. In or near the villages are schools operated by the government, NGOs or religious organizations.

In 1991, when we began conducting research in these villages, NGOs providing microcredit loans were active in four of the villages; now at least one such NGO is present in each. Nongovernmental organizations working in these villages also promote girls' education and raise awareness about marriage- and family-related national laws. According to our own data, from 1994 to 2001–2002, the proportion of married women with no education decreased from 63% to 45%. Rice-processing centers and road maintenance projects employ women from some of the villages.

### Qualitative Components

The qualitative data come from semistructured, in-depth interviews with 76 women and from four small group discussions conducted among married female villagers in 2001–2002. Participants were selected to represent different groups of interest—for example, poor women; women, or mothers of women, who married at a relatively young or old age; and women whom the field researchers considered relatively empowered or disempowered. All participants were briefed in advance on the nature of the interview; they provided oral consent to participate in the study. No incentives were given.

The study's qualitative components examined the social and economic processes underlying early marriage, gender inequality and violence within marriage. Much of the material pertinent to the topic of domestic violence emerged spontaneously during interviews on broader topics related to marriage and to women's rights and roles within marriage. To explore the range of potential social and economic factors shaping women's experiences of marriage, including violence, the interviewers asked women open-ended questions about the process of marriage formation and about their perceptions of what influenced it and women's status within marriage. Participants were also asked to describe their own experiences and those of women in general, especially whether and how they perceived women's circumstances in marriage to have changed over time.

Experienced female Bangladeshi researchers conducted the in-depth interviews and small group discussions; each generally lasted 1–4 hours. The in-depth interviews were conducted one-on-one, usually in the participant's home. Two or three researchers facilitated each small group

\*To minimize the odds of systematic error due to differential questionnaire administration, researchers asked standardized "filler" questions during such interruptions.

discussion, typically in a place where 5–8 participants were already gathered.

The field researchers subsequently generated written transcripts in Bangladeshi by reviewing tape recordings and field notes. The transcripts were then translated into English by local translators unaffiliated with the project. The translations were checked for accuracy and corrected by the interviewer and, when needed, by another member of the research team. This process was designed to minimize the imposition of interpretations during transcription or translation. We subsequently reviewed and coded the transcripts (using open-ended and thematic codes); the field researchers provided clarifications and checked interpretations, as needed. During periodic meetings in Dhaka, the field researchers reviewed our preliminary analyses and provided evidence to confirm or refute these interpretations. The field researchers also offered alternative interpretations and suggested previously unidentified themes and patterns.

### Quantitative Component

• *Data collection.* The quantitative data come from a survey administered orally in 2002 to married women of reproductive age (younger than 50 years) in the six villages, plus 130 married women older than 50. The latter group had participated in a 1994 study by Schuler and colleagues involving all women of reproductive age in the villages. Our sample comprised 1,212 respondents, representing 86% of eligible women. After obtaining informed consent, female researchers administered the surveys according to World Health Organization (WHO) ethical safety guidelines for research on violence against women.<sup>28</sup> Every effort was made to ensure privacy during the interviews; interviews were suspended during discussion of sensitive topics when interruptions by other household members or neighbors could not be avoided.\* The researchers were trained to deal with reactions to questions on domestic violence.

The survey covered a range of topics related to women's social, economic and physical well-being, including their capacities and access to resources, empowerment, marriage characteristics, experiences of domestic violence and health outcomes. Development of the questionnaire content was guided by the 1994 survey and the qualitative findings to date. The final questionnaire was pretested extensively in areas comparable but not adjacent to the study sites. All survey data were double entered into a database and analyzed by using SAS software.

• *Measures and data analysis.* Our measures of domestic violence were consistent with WHO guidelines, and we adapted questions from the WHO Violence Against Women Instrument.<sup>29</sup> Currently married women whose husband lived at home were asked six questions on whether their husband had committed violent acts of increasing severity against them ever or in the past 12 months. To minimize bias based on subjective perceptions of abuse, all these questions asked about specific behaviors. The primary outcome used in the main logistic regression analysis was any domestic violence experienced in the past year.

Education, one of the independent variables, was measured as number of years of school completed. In addition, two variables were used for women's economic activity. The first, contribution to household expenses, was based on the woman's rough estimate of her relative economic contribution to meeting household expenses. The second such variable was an indicator of whether the woman currently belonged to an NGO microcredit loan program.

The dowry variable is based on the woman's report of whether an agreement on dowry (in the form of cash or property) was made at the time of marriage. Marriage registration indicates whether her marriage was formally registered.

Additional control variables were marital household socioeconomic status and age. Socioeconomic status was measured by an aggregate scale of seven dichotomous items based on household size; substances used to build the walls, roof and latrine of the house; presence of electricity in the home; and television and radio ownership. Age was ascertained by asking current age. For those who responded "don't know" (24%), we inferred the woman's age on the basis of additional information asked about age in relation to individual (e.g., menarche, marriage, childbearing) and national (the 1971 Liberation War) events.\*

With the exception of socioeconomic status and age, all variables used in the analyses were dichotomous. Logistic regression models were used to examine associations between domestic violence and the five primary variables of interest. To further explore the processes and potential influences suggested by the qualitative findings, we performed additional logistic regression analyses, which examined the relationships among key covariates.

## RESULTS

### Qualitative Findings

Many women recognized and were dismayed by the increasing practice of dowry throughout Bangladesh.† (Until the 1960s, a "bride price" system of material exchange was customarily observed, in which the groom's family gave money and gifts to the bride's family at marriage.<sup>30</sup>) According to numerous respondents, women are highly vulnerable to maltreatment if the economic resources they bring to their marriage—usually in the form of dowry—are perceived as meager. Respondents universally condemned the practice of dowry; they recognized its common use as a tool of resource extraction and exploitation.

A 40-year-old woman provided this explanation: "If the dowry is not paid, then a husband...beats his wife or usually says that he will marry again to a girl whose parents are able to pay dowry. Some men also send the(ir) wife to her parents' house to pressure them to pay the dowry."

Despite their condemnation of dowry, most women seemed resigned to it, as they believed it affords young women an important degree of social legitimacy and security. As a 32-year-old woman with no education or income explained, "If a girl brings dowry, then she has a stronger position in her in-laws' home....Her mother-in-law cannot torture her, nor can her husband beat her. If they do, then

she can say, 'Did I come here empty-handed?'" According to this interpretation, a dowry can raise a bride's status and improve her security in her husband's home. The practice is therefore perpetuated reluctantly, and often with considerable shame, by families to help ensure that their daughters are treated well in the marital home.

Dowry demands and the stress and hardship they impose on many families and on new brides emerged as a paramount consideration in decision-making about marriage formation—a consideration that increasingly seems to dwarf all others, such as social status or the quality of the groom and his family (although these issues remained important). For most respondents, managing a daughter's marriage negotiations is an agonizing process fraught with tension and fear. The economic burden of dowry can be high—even exorbitant—but mothers often reported feeling that dowry is necessary for their daughters' well-being. The interaction of these concerns can clearly translate into downward pressure on age at marriage, because young women's marriageability is believed to diminish with age, not least because of concerns about "sexual purity";‡ mothers feared that they would have to pay higher dowry to find acceptable husbands for older daughters. Although numerous women expressed a strong desire to educate their daughters, the apparent social and, increasingly, economic imperative to marry daughters early is likely to compromise girls' educational attainment and undermine the potential for girls' increased education to translate into delayed marriage.

Women often spontaneously mentioned females' increasing education level as a major change in recent years and an important determinant of women's experiences. Participants suggested that education can improve the circumstances in which females enter marriage—for example, by allowing them legitimate reasons to postpone marriage; by improving their marriageability and, therefore, their prospects for marrying a "good" man (by making them more desirable to prospective husbands and their families); and by increasing the affordability of marriage by acting, at least in part, as a surrogate for dowry.

Many women perceived education as also improving women's status and opportunities in their conjugal households, thereby affording them more freedom and less dependence. In their view, education has both direct effects on women's status and indirect effects that operate through increased earning potential.

Many participants argued that education can also help a woman speak on her own behalf and defend herself, regardless of personal earnings or family wealth. As one uneducated

\*In general, women for whom age was inferred had less education than did women who stated their age (60% vs. 40% had no education). Thus, we created a dummy control variable indicating whether age had been inferred.

†The use of dowries in the six study villages has increased dramatically over time: The quantitative data show that among women aged 15–19, 72% had dowry agreements at marriage, compared with fewer than 20% among those aged 45 or older.

‡Numerous women expressed concern that they cannot keep their unmarried adolescent daughters safe from sexual violence or prevent them from developing consensual romantic liaisons.

**TABLE 1. Percentage distribution of rural married women surveyed in six Bangladeshi villages, by selected characteristics, 2002**

Characteristic	%
<b>Yrs. of education</b>	
0	45.1
1-5	34.8
>5	20.1
<b>Member of microcredit program</b>	
No	59.9
Yes	40.1
<b>Economic contribution to household</b>	
Nominal or none	80.4
More than nominal	19.6
<b>Dowry agreement</b>	
No	54.1
Yes	45.9
<b>Outstanding dowry debt</b>	
No	78.4
Yes	21.6
<b>Registered marriage</b>	
No	37.7
Yes	62.3
Total	100.0

Note: Percentages for outstanding debt were calculated for the 551 women with a dowry agreement. For other items, denominators range from 1,189 to 1,203, depending on the number of women eligible to answer questions and the number of eligible women who answered them.

32-year-old woman said, "Not only daughters of wealthy fathers can speak for themselves. Those girls with education who are aware can protest when their situation is bad."

An employed woman with a secondary education believed that educated women's assertiveness can be contagious:

"The act of protesting has...increased due to...education. [But] it is not like all who are protesting are [highly educated]. When I, an educated woman, protest against my husband's misbehavior, then my neighbor..., who has studied [only] up to class five, thinks...she will...protest against her husband's behavior as I protested. [She will think,] 'Why should I tolerate such oppression?'"

Some women expected that education could translate into at least the potential for employment or earnings; the earnings would then afford women greater status and rights in the home and protection from abuse. A 40-year-old woman with a source of personal income noted, "If a woman earns, then she has to be treated as an equal to her husband, because both are earning members of the family. In that case, the husband can't beat her."

A few women even suggested that with education, women have opportunities for independence from marriage: If they cannot change the nature of the marriage, they can leave it. An educated respondent explained:

"If women are educated, they can get jobs, and they will be happy...because they themselves are independent. They don't need to tolerate the torture and oppression of their husbands. If [a woman] thinks she cannot go on, then she can leave her husband."

However, this optimistic scenario contradicts most of our

findings. Interviewed women who themselves were desperate (e.g., severely abused or neglected) were indeed better able to survive and support their children if they were earning money, but they did not achieve independence. Often these women earned money when their husbands did not, and in these situations, the wife was likely to use her earnings to support her husband and family rather than leave.

Finally, some respondents saw a great potential for marriage registration, an increasingly common practice, to ensure marital security and protect families' financial investment in marriages. Many said that women with registered marriages felt more secure because their husbands would be unlikely to abandon or severely mistreat them for fear of financial repercussions. According to one participant, "...women can take shelter of law if their husbands beat them—it is written in the registry." Another participant provided this explanation:

"If the marriage is registered, a man cannot leave his wife easily. He has to pay the amount of dowry given at his wedding time back to his wife....Now, if I have to pay this amount of dowry to get my daughter married, I will, of course, want the safety of registered marriage, so...they cannot send our daughter back without the money."

### Survey Findings

Among survey respondents, the median age was 31, and the median age at marriage was 14. Forty-five percent of women had had no schooling, and 20% had completed more than five years (Table 1). Nearly half of women (49%) had ever belonged to a microcredit program (not shown), and 40% currently belonged to one. Twenty percent of women were contributing earnings toward at least some household payments. Forty-six percent had dowry agreements, and 62% had registered marriages. Use of marriage registration, like that of dowries, has increased consider-

**TABLE 2. Percentage of rural married women reporting domestic violence, by experience**

Experience	%
<b>Violence ever (N=1,186)†</b>	
Any	67.0
Minor	66.2
Major	33.4
<b>Violence in past year (N=1,084)†</b>	
Any	34.6
Minor	32.1
Major	17.3
<b>Violence during pregnancy (N=1,158)</b>	
Any	17.7
Violence worse during pregnancy	2.6
<b>Violence resulted in injury (N=1,185)</b>	
Any injury	23.5
Injury interfered with work	17.3
Injury warranted medical attention	18.6
Injury received medical attention	14.9

†Violence was considered minor if the woman reported being slapped, pushed or hit, and major if she reported being kicked or burned, or having had a weapon used against her. Note: Denominators vary according to the number of women eligible to answer questions and the number of eligible women who answered them.

**TABLE 3. Percentage of rural married women experiencing any domestic violence in the past year, by selected marital and socioeconomic characteristics**

Characteristic	%
<b>Yrs. of education</b>	
0	36.0
1-5	35.7
>5	30.0
<b>Dowry agreement***</b>	
No	24.5
Yes	45.3
<b>Registered marriage***</b>	
No	27.6
Yes	38.8
<b>Member of microcredit program</b>	
No	35.1
Yes	33.7
<b>Economic contribution to household**</b>	
Nominal or none	32.8
More than nominal	42.4
<b>Household socioeconomic status***</b>	
Median or lower	41.7
Higher than median	22.4

\*p<.05. \*\*p<.01. \*\*\*p<.001. Note: Denominators range from 1,072 to 1,084, depending on the number of women eligible to answer questions and the number of eligible women who answered them.

ably over a relatively short period: More than 70% of women younger than 30 had registered marriages, compared with fewer than 40% of those aged 45-49 (not shown).

Sixty-seven percent of respondents reported ever having experienced domestic violence, and one-third of women reported ever having experienced major violence (i.e., involving kicks, burns or use of weapons; Table 2). Slightly more than one-third of women had experienced violence in the past year; 17% of respondents said that they had experienced at least one episode of major violence in the past year. Eighteen percent of respondents had experienced violence during pregnancy, and 3% of respondents said that violence they had experienced during pregnancy seemed worse than usual. About one-quarter of respondents reported ever having been injured by their husband; 17% of women said such an injury had interfered with normal work, 19% had had an injury that warranted medical attention and 15% had received medical care for such an injury.

The proportion of women who reported experiencing domestic violence in the past year was significantly higher among women with a dowry agreement than among women with no such agreement (45% vs. 25%; Table 3). Domestic violence was also significantly higher among women with a registered marriage (39%, vs. 28% of women without a registered marriage), women who cover at least some of their household expenses with their own income (42%, vs. 33% of those who cover little or none) and women with a marital household socioeconomic status at or below the median for the sample (42% vs. 22%). The proportion experiencing domestic violence was nonsignificantly lower among women with more than five years of education than among less educated or noneducated women (30% vs.

36%). Members and nonmembers of microcredit programs had roughly comparable proportions reporting domestic violence (34% and 35%, respectively).

In the main multivariable logistic regression analysis (Table 4), women with a dowry agreement were more likely than those without a dowry agreement to report experiencing violence in the past year (odds ratio, 1.5). This finding may be driven primarily by an effect of unpaid dowry: Women with outstanding dowry debt had significantly elevated odds of violence (1.7; not shown). In a further analysis, restricted to women without outstanding dowry obligations, the association between having a dowry and experiencing violence decreased in size and statistical significance (1.3).

Compared with uneducated respondents, women with more than five completed years of education had significantly lower odds of violence (0.6). Moreover, current membership in a microcredit program was associated with lower odds of violence (0.8). In contrast, women whose earnings contributed more than nominally to covering their household's expenses were significantly more likely to report violence than were women who contributed very little or none (1.8). However, the odds of violence decreased as women's household socioeconomic status or current age increased (0.8 and 0.7, respectively). The difference in the odds for women with a registered marriage and those for women with a non-registered marriage was only marginally significant (p=.06).

In the first of two additional logistic regression analyses exploring the processes and influences suggested by the qualitative findings, the odds of having a dowry agreement were significantly lower among women with more than five completed years of schooling than among those with no education (0.6; Table 5, page 196). The odds declined with rising socioeconomic status (0.9), but they increased with age at marriage (1.1). Age at marriage was also positively associated with the amount of the dowry (not shown). In the final logistic regression analysis, the odds of marriage registration were significantly higher for women with 1-5 or more than five completed years of education than for women with no education (1.6 and 2.3, respectively; Table 5). However, the odds were reduced significantly for those with a dowry agreement (0.6).

**TABLE 4. Adjusted odds ratios (and 95% confidence intervals) from logistic regression analysis assessing the association between selected characteristics and women's report of domestic violence in the past year**

Variable	Odds ratio (N=1,056)
Registered marriage	1.35 (0.99-1.85)†
Dowry agreement	1.46 (1.08-1.98)*
Yrs. of education	
0 (ref)	1.00
1-5	0.78 (0.56-1.08)
>5	0.62 (0.40-0.97)*
Member of microcredit program	0.75 (0.56-1.00)*
Economic contribution to household	1.79 (1.26-2.54)**
Household socioeconomic status	0.81 (0.73-0.89)***
Current age	0.74 (0.68-0.81)***

\*p<.05. \*\*p<.01. \*\*\*p<.001. †p<.10. Notes: Model is adjusted for whether age was inferred from other data. ref=reference group.

**TABLE 5. Adjusted odds ratios (and 95% confidence intervals) from logistic regression analyses assessing the association between selected characteristics and women's having a dowry agreement or a registered marriage**

Variable	Dowry agreement (N=1,053)	Registered marriage (N=1,177)
Yrs. of education		
0 (ref)	1.00	1.00
1-5	0.98 (0.71-1.35)	1.56 (1.17-2.07)**
>5	0.60 (0.38-0.92)*	2.29 (1.51-3.48)***
Household socioeconomic status	0.85 (0.77-0.93)***	1.01 (0.93-1.09)
Age at marriage	1.08 (1.02-1.14)*	na
Dowry agreement	na	0.58 (0.43-0.77)***

\*p≤.05. \*\*p≤.01. \*\*\*p≤.001. Notes: Both models are adjusted for whether age was inferred from other data. na=not applicable. ref=reference group.

## DISCUSSION

This study has several important limitations. First, although the villages in this study generally are typical of rural Bangladesh, they were not selected randomly; the generalizability of the results is therefore limited. Second, because of our study's cross-sectional design, no cause-and-effect relationships could be established. In addition, the associations observed in the regression analyses could be the function of some common prior cause. For example, families with an increased likelihood of domestic violence may be predisposed to seek a less educated bride (perhaps because of cultural conservatism).

Another potential limitation is reporting bias: Women may be differentially likely to report certain outcomes in ways that are systematically related to other characteristics of interest in the analyses. This may help explain, for example, the inverse association between dowry agreement and education or household socioeconomic status. Our qualitative data indicate widespread condemnation of the practice of dowry and shame among many who nevertheless felt compelled to perpetuate it. Relatively well educated and well-off respondents may have had an increased sensitivity to these views and, as a result, may have been less likely to report their practice of dowry. However, as other researchers have noted, Bangladeshi women are unlikely to falsely deny domestic violence, because such violence is widespread and, for the most part, socially sanctioned, at least in some circumstances.<sup>31</sup> Furthermore, the research team included highly skilled interviewers who were already known and trusted in the communities; thus, they could elicit candid responses from participants. Finally, according to observations of the field researchers and feedback solicited from participants after the study, the questions on domestic violence seemed not to be troublesome to most participants.

Despite these limitations, we believe this study contributes to our understanding of the prevalence and possible determinants of domestic violence in rural Bangladesh. Generated by using specific reference periods and concrete,

\*The quantitative finding that poorer families are more likely to demand dowry assumes that household socioeconomic status at the time of the survey corresponds to that at the time of marriage.

behavioral measures of domestic violence, these data on the prevalence and severity of physical abuse can be compared with findings from other studies in Bangladesh. By integrating qualitative and quantitative data and examining the relationships among possible factors, we can begin to understand the interplay of complex economic and social factors that influence women's risk of violence in the evolving context of Bangladesh.

Our study results highlight the centrality of marriage as a setting where various influences intersect—particularly gender inequality and poverty—and lay the foundation for women's vulnerability. The findings also highlight the complex and often contradictory nature of the relationships among factors at different levels, and the ways in which they may influence women's risk of violence. Another theme that emerges is the extent to which norms and practices in Bangladesh are in transition, and how that transition itself may be a risk factor.

Our quantitative findings of a negative association between women's education and dowry agreement and also between household socioeconomic status and dowry agreement\* suggest that the practice of dowry disproportionately affects the disadvantaged. Poor men and their families may demand dowry to obtain resources by exploiting the vulnerability of brides' families. Perhaps, in turn, the poor are less able to leverage resources (including their daughters' education) against dowry demands. In this context of gender inequality and poverty, the practice of dowry appears to exacerbate women's risk of domestic violence. The association between dowry and violence probably reflects a selection process, at least to some extent, whereby families who demand dowry may also be more likely than others to perpetrate or tolerate violence. Formal dowry arrangements are associated with some social disapproval; parents who can afford to give informal gifts instead often do so. The most economically desperate families may be the least likely to find brides whose parents will spontaneously give gifts, and more likely to press for a dowry agreement and then resort to violence or the threat of violence to obtain outstanding dowry payments or to add to the agreed amount. Consistent with the extortion interpretation, our qualitative and quantitative results suggest that unpaid dowry may put women at especially high risk of violence, as shown elsewhere.<sup>32</sup>

In addition, an alternative pathway could be at work. The qualitative findings suggest that women with dowries may feel more entitled and therefore may behave more assertively in the marital home, and such behavior may meet with a violent response. Other researchers have theorized that violence may occur in situations in which women's increased bargaining power threatens men's sense of control and superiority.<sup>33</sup> This interpretation also may help explain the seemingly contradictory findings on marriage registration and domestic violence. Perhaps, as interviewed women contended, marriage registration does indeed give women some measure of long-term economic security (by decreasing their risk of abandonment and increasing their chances of se-

curing access to money or property should abandonment occur); yet, as our survey findings suggest, marriage registration does not seem to protect women from domestic violence. If anything, marriage registration may be associated with an increased risk of domestic violence, possibly by undermining husbands' sense of control.

Our survey results indicating that dowry agreement and marriage registration are inversely associated contradicts interviewees' stated rationale for marriage registration as a means to protect dowry investments in daughters' marriages. One possible interpretation of our quantitative findings is that families' agreement to give dowry reflects a degree of vulnerability and desperation in the marriage market that also makes these families willing to forego other measures, such as marriage registration, that might protect their daughter in the event of mistreatment or divorce.

In our analyses examining associations with domestic violence, we found different results for the two measures of women's economic activity—participation in a microcredit program and contribution of personal earnings to the household budget. The effect of membership in a microcredit program on women's status and autonomy, and on their risk of domestic violence, is a subject of ongoing debate.<sup>34</sup> Schuler and colleagues have noted that a reduced risk for violence among women in microcredit programs might not reflect a protective effect of program participation; instead, women whose husbands have a reduced inclination toward violence may be more likely than other women to enter such programs.<sup>35</sup> Findings reported by Mahmud suggest a different selection process, whereby women in less equitable relationships may be pressured by their husbands to join credit programs; these women also may be more likely to experience violence, independent of their credit involvement, than women in more equitable relationships.<sup>36</sup>

It is also possible that participation in microcredit programs is becoming socially acceptable as a way for women to contribute resources to their household, not least because they often make the loan money available for their husbands' use.<sup>37</sup> Khan and colleagues reported that physical abuse was slightly more prevalent among members of the Bangladesh Rural Advancement Committee (BRAC) credit and savings program than among nonmembers; however, that abuse seemed to decrease with duration of membership.<sup>38</sup> Koenig and colleagues' findings from Bangladesh highlight the importance of the normative context in shaping the effects of individual-level factors.<sup>39</sup> Thus, our finding of no positive association between microcredit program participation and domestic violence may indicate that program participation has become normalized in the study sites and that, as a result, such participation today does not increase women's risk of violence because it is not seen as provocative.

However, women whose income is substantial enough to make them more than marginal contributors to the household budget may be at increased risk of violence. The observed positive association between women's financial contribution to the household and their odds of domestic violence may, again, reflect a shift in the balance of power

between husband and wife that leads to violence. However, it also may reflect a degree of material hardship not captured by our measure of household socioeconomic status that may, by itself, explain the increased odds of violence. Our study, like other research,<sup>40</sup> indicates an association between poverty and domestic violence. In our sample, women who earned money and contributed meaningfully to the household budget typically were in the most economically deprived families. Particularly in the context of deprivation, women's economic contribution may increase the risk of violence by undermining male authority and established gender roles. This interpretation is supported by qualitative data suggesting that men's inability to provide economically for their families may place women at increased risk of maltreatment. Several respondents described conflict over scarcity as precipitating violence, a finding supported elsewhere.<sup>41</sup>

Our observation of a negative association between women's education and domestic violence seems less ambiguous, but its implications are limited. The odds of domestic violence were reduced only for women who had at least six years of education,\* suggesting that the modest increases in educational attainment available to the majority of females in rural Bangladesh will not substantially alter their risk. The expectation expressed in the qualitative data that women's education would lead to higher status and security through increased economic participation appears less realistic in light of the quantitative results. Furthermore, our results indicate that education cannot be assumed to improve the terms under which women enter marriage. Findings of an earlier qualitative study in Bangladesh suggest that the role of girls' education in families' marriage decisions is largely dwarfed by other considerations.<sup>42</sup>

The social and economic environment in Bangladesh has been undergoing rapid change. In response to economic necessity, new opportunities and changing norms, women are increasingly deviating from traditional roles, developing new aspirations and, often unintentionally, challenging the prevailing gender order. In this changing environment, people have been exposed to information and behavioral change messages on various health and social issues, including marriage age, dowry, marriage registration, girls' education and, to a lesser extent, women's rights. The disconnect between some of our qualitative and quantitative findings may reflect the lag between women's emerging awareness and expectations on the one hand, and their present situation on the other. The changes under way and the further transitions that may be signaled by this disconnect could continue to put women at risk.<sup>43</sup> As we have suggested previously, and Jewkes and colleagues also have argued, changes that somewhat empower women may lead to violence in the near term.<sup>44</sup> Such changes may become protective only after a critical threshold of empowerment has been reached and gender roles have shifted substantially.

\*However, another study in Bangladesh found strong protective effects of education at low and high levels (source: reference 12).



## REFERENCES

1. Heise L, Ellsberg M and Gottemoeller M. A global overview of gender-based violence, *International Journal of Gynaecology and Obstetrics*, 2002, 78(Suppl. 1):S5-S14.
2. Diaz-Olavarrieta C et al., Prevalence of battering among 1,780 outpatients at an internal medicine institution in Mexico, *Social Science & Medicine*, 2002, 55(9):1589-1602; Gomez A and Meacham D, eds., Women and mental health: reflections of inequality, *Women's Health Collection #6*, Santiago, Chile: Latin American and Caribbean Women's Health Network, 2001; and Heise L and Ellsberg M, Violence against women: impact on sexual and reproductive health, in: Murphy E and Ringheim K, eds., *Reproductive Health, Gender and Human Rights: A Dialogue*, Washington, DC: Program for Appropriate Technology in Health, 2001.
3. Heise L, Ellsberg M and Gottemoeller M, 2002, op. cit. (see reference 1).
4. Gazmararian JA et al., Prevalence of violence against pregnant women, *Journal of the American Medical Association*, 1996, 275(24):1915-1920.
5. Valladares EM et al., Physical partner abuse during pregnancy: a risk factor for low birth weight in Nicaragua, *Obstetrics & Gynecology*, 2002, 100(4):700-705; and Leung WC et al., Pregnancy outcome following domestic violence in a Chinese community, *International Journal of Gynaecology and Obstetrics*, 2001, 72(1):79-80.
6. Heise L, Ellsberg M and Gottemoeller M, Ending violence against women, *Population Reports*, 1999, Series L, No. 11; and Heise L and Garcia-Moreno C, Violence by intimate partners, in: Krug EG et al., eds., *World Report on Violence and Health*, Geneva: World Health Organization (WHO), 2002.
7. Heise L and Garcia-Moreno C, 2002, op. cit. (see reference 6).
8. Heise L, Violence against women: an integrated, ecological framework, *Violence Against Women*, 1998, 4(3):262-290.
9. Ibid.
10. Heise L and Garcia-Moreno C, 2002, op. cit. (see reference 6).
11. Schuler SR et al., Credit programs, patriarchy and men's violence against women in rural Bangladesh, *Social Science & Medicine*, 1996, 43(12):1729-1742.
12. Koenig MA et al., Women's status and domestic violence in rural Bangladesh: individual- and community-level effects, *Demography*, 2003, 40(2):269-288.
13. Khan ME, Ubaidur R and Hossain SMI, Violence against women and its impact on women's lives—some observations from Bangladesh, *Journal of Family Welfare*, 2001, 46(2):12-24.
14. Faveau V et al., Causes of maternal mortality in rural Bangladesh, 1976-1985, *Bulletin of the World Health Organization*, 1988, 66(5):643-651; and Ronsmans C and Khat M, Adolescence and risk of violent death during pregnancy in Matlab, Bangladesh, *Lancet*, 1999, 354(9188):1448.
15. Gautam DN and Trivedi BV, *Unnatural Deaths of Married Women with Special Reference to Dowry Deaths: A Sample Study of Delhi*, New Delhi: Bureau of Police Research and Development, Ministry of Home Affairs, Government of India, 1986; Jain RS, *Family Violence in India*, New Delhi: Radiant, 1992; Khan ME, Ubaidur R and Hossain SMI, 2001, op. cit. (see reference 13); and Rao V, Wife-beating in rural south India: a qualitative and econometric analysis, *Social Science & Medicine*, 1997, 44(8):1169-1180.
16. Mitra SN et al., *Bangladesh Demographic and Health Survey 1999-2000*, Calverton, MD, USA: ORC Macro, 2001.
17. Rashid SF, Communicating with rural adolescents about sex education: experiences from BRAC, Bangladesh, in: Bott S et al., eds., *Towards Adulthood: Exploring the Sexual and Reproductive Health of Adolescents in South Asia*, Geneva: WHO, 2003.
18. Huq I. and Amin S, Dowry negotiations and the process of union formation in Bangladesh: implications of rising education, paper presented at the annual meeting of the Population Association of America, Washington, DC, Mar. 28-31, 2001; Schuler SR et al., 1996, op. cit. (see reference 11); and Schuler SR, Hashemi SM and Badal SH, Men's violence against women in rural Bangladesh: undermined or exacerbated by microcredit programmes? *Development in Practice*, 1998, 8(2):148-157; Geetha V, On bodily love and hurt, in: John ME and Nair J, eds., *A Question of Silence? The Sexual Economies of Modern India*, London: Zed Books, 1998; Jejeebhoy SJ, Impressions from a survey in rural India, *Studies in Family Planning*, 1998, 29(3):282-290; and Rao V, 1997, op. cit. (see reference 15).
19. Bloch F and Rao V, *Terror as a Bargaining Instrument: A Case Study of Dowry Violence in Rural India*, Development Research Group Working Paper, Washington, DC: World Bank, 2000, No. 2347; Geetha V, 1998, op. cit. (see reference 18); and Rudd J, Dowry-murder—an example of violence against women, *Women's Studies International Forum*, 2001, 24(5):513-522.
20. Rao V, 1997, op. cit. (see reference 15).
21. Schuler SR, Hashemi SM and Badal SH, 1998, op. cit. (see reference 18); and Schuler SR et al., 1996, op. cit. (see reference 11).
22. Counts D, Brown J and Campbell JC, eds., *Sanctions and Sanctuary: Cultural Perspectives on the Beating of Wives*, Boulder, CO, USA: Westview Press, 1992.
23. United Nations Children's Fund (UNICEF), *State of the World's Children*, New York: UNICEF, 2003.
24. Center for Reproductive Rights, *Women of the World: Laws and Policies Affecting Their Reproductive Lives—South Asia*, New York: Center for Reproductive Rights, 2004.
25. Mahbub ul Haq Human Development Centre, *Human Development in South Asia 2000: The Gender Question*, Karachi, Pakistan: Oxford University Press, 2000.
26. Bangladesh National Women Lawyers' Association (BNWLA), *Violence Against Women in Bangladesh, 2002*, Dhaka, Bangladesh: BNWLA, 2003; and Hossain K, In search of equality: marriage related laws for Muslim women in Bangladesh, *Journal of International Women's Studies*, 2003, 5(1):96-113.
27. Mitra SN et al., 2001, op. cit. (see reference 16).
28. WHO, *Putting Women First: Ethical and Safety Recommendations for Research on Domestic Violence Against Women*, Doc. WHO/EIP/GPE/99.2, Geneva: WHO, 2001.
29. Ibid; and WHO, *Multi-Country Study on Women's Health and Domestic Violence Study Protocol*, Doc. WHO/EIP/GPE/99.3, Geneva: WHO, 2001.
30. Huq I. and Amin S, 2001, op. cit. (see reference 18); and Lindenbaum S, Implications for women of changing marriage transactions in Bangladesh, *Studies in Family Planning*, 1981, 12(11):394-401.
31. Koenig MA et al., 2003, op. cit. (see reference 12).
32. Rao V, 1997, op. cit. (see reference 15).
33. Hoffman KL, Demo DH and Edwards JN, Physical wife abuse in a non-Western society: an integrated theoretical approach, *Journal of Marriage and the Family*, 1994, 56(1):131-146; Jewkes R, Levin J and Penn-Kekana L, Risk factors for domestic violence: findings from a South African cross-sectional study, *Social Science & Medicine*, 2002, 55(9):1603-1617; and Whaley RB, The paradoxical relationship between gender inequality and rape: toward a refined theory, 2001, *Gender and Society*, 15(4):531-555.
34. Kabeer N, Conflicts over credit: re-evaluating the empowerment potential of loans to women in rural Bangladesh, *World Development Report*, 2001, 29(1):63-84.
35. Schuler SR, Hashemi SM and Badal SH, 1998, op. cit. (see reference 18).
36. Mahmud S, The gender dimensions of programme participation: who joins a microcredit programme and why? *Bangladesh Development Studies*, 2000, 26(2-3):79-101.
37. Hashemi SM, Schuler SR and Riley AP, Rural credit programs and women's empowerment in Bangladesh, *World Development*, 1996, 24(4):635-653.
38. Khan MR et al., Domestic violence against women: does development intervention matter? in: Three studies on the effect of BRAC interventions on the lives of the poor women, Socioeconomic Development and Human Well-Being Working Paper, Dhaka, Bangladesh: Bangladesh Rural Advancement Committee—International Centre for Diarrhoeal Disease Research, Bangladesh, 1998, No. 28.

39. Koenig MA et al., 2003, op. cit. (see reference 12).
40. Hoffman KL, Demo DH and Edwards JN, 1994, op. cit. (see reference 33); Ellsberg MC et al., Wife abuse among women of childbearing age in Nicaragua, *American Journal of Public Health*, 1999, 89(2): 241-244; and Martin SL et al., Domestic violence in northern India, *American Journal of Epidemiology*, 1999, 150(4):417-426.
41. Hoffman KL, Demo DH and Edwards JN, 1994, op. cit. (see reference 33).
42. Huq L and Amin S, 2001, op. cit., (see reference 18).
43. Counts D, Brown J and Campbell JC, eds., 1992, op. cit. (see reference 22).
44. Schuler SR, Hashemi SM and Badal SH, 1998, op. cit. (see reference 18); and Jewkes R, Levin J and Penn-Kekana L, 2002, op. cit. (see reference 33).

## RESUMEN

**Contexto:** Si bien está bien documentada la presencia generalizada de la violencia contra la mujer en Bangladesh, aún no se conocen a fondo los factores de riesgo específicos, en particular aquellos que pueden ser afectados por políticas y programas.

**Métodos:** En 2001-2002, se llevaron a cabo encuestas, entrevistas detalladas y grupos de estudio pequeños con mujeres casadas de seis poblados de Bangladesh, con el objeto de examinar los diferentes tipos y niveles de severidad de la violencia doméstica y para explorar las formas a través de las cuales las circunstancias sociales y económicas de la mujer pueden influenciar su vulnerabilidad a la violencia en su vida en pareja. Mediante el uso de análisis de regresión logística, se evaluaron las probabilidades de que la mujer sufriera actos de violencia doméstica durante el último año.

**Resultados:** De aproximadamente 1.200 mujeres encuestadas, el 67% alguna vez habían experimentado violencia doméstica, y el 35% eran objeto de violencia durante el último año. De acuerdo con los datos cualitativos, las participantes esperaron que las mujeres con un mejor nivel educativo y con mayores ingresos debían ser menos vulnerables a actos de violencia doméstica; también creían (o esperaban) que el tener una dote o un matrimonio registrado podría fortalecer la posición de la mujer en su matrimonio. No obstante, de estos factores potenciales, solamente el nivel educativo estuvo relacionado con una significativa reducción de las probabilidades de sufrir violencia; al mismo tiempo, las probabilidades fueron significativamente elevadas entre las mujeres que tenían un acuerdo de dote o ingresos personales que contribuían en forma efectiva al hogar. Las mujeres apoyaban sólidamente la educación de sus hijas, aunque existen presiones para que contraigan matrimonio a edad temprana, en parte para evitar los elevados costos de la dote.

**Conclusiones:** En las zonas rurales de Bangladesh, las circunstancias sociales y económicas de la mujer pueden influenciar el nivel de riesgo con respecto a la violencia doméstica en formas complejas y contradictorias. Los resultados obtenidos también sugieren que hay una falta de conexión entre las expectativas emergentes de la mujer y su realidad actual.

## RÉSUMÉ

**Contexte:** Si l'omniprésence de la violence familiale à l'encontre des femmes au Bangladesh est bien documentée, les facteurs de risque spécifiques—ceux que peuvent affecter les politiques et programmes surtout—ne sont pas bien compris.

**Méthodes:** En 2001-2002, des enquêtes, entrevues en profondeur et discussions en petit groupe ont été menées auprès des femmes mariées de six villages ruraux du Bangladesh dans le but d'examiner les types et la gravité de la violence familiale, ainsi que d'explorer les voies par lesquelles les circonstances socioéconomiques des femmes peuvent influencer leur vulnérabilité à la violence au sein du mariage. Les probabilités de violence familiale à l'encontre des femmes durant l'année précédente ont été évaluées par analyse de régression logistique.

**Résultats:** Des quelque 1.200 femmes soumises à l'étude, 67% avaient été victimes de violence familiale, et 35% l'avaient été durant la dernière année écoulée. Selon les observations qualitatives, les participantes pensaient que les femmes instruites et disposant d'un revenu supérieur étaient moins vulnérables à la violence familiale; elles croyaient (ou espéraient) du reste que l'apport d'une dot ou l'enregistrement du mariage pouvaient renforcer la position de la femme au sein du mariage. De ces facteurs potentiels pourtant, seule l'éducation s'est avérée associée à une probabilité significativement moindre de violence. En revanche, les femmes étaient significativement plus susceptibles d'être victimes de violences en présence d'un accord de dot ou de revenus personnels contribuant plus que nominale-ment au ménage. Les femmes soutenaient fortement l'éducation de leurs filles, tout en demeurant toutefois sensibles aux pressions de les marier jeunes, en partie pour éviter les coûts de dot élevés.

**Conclusions:** Aux zones rurales de Bangladesh, les circonstances socioéconomiques des femmes peuvent influencer le risque de violence familiale qu'elles courent de manières complexes et contradictoires. Les observations semblent également indiquer une discordance entre les attentes naissantes des femmes et leurs réalités.

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