***Do Unwanted Children Get Less Schooling in Matlab, Bangladesh?***

Key words: child health, schooling, family planning

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## ABSTRACT

This paper explores whether children resulting from unwanted pregnancies experience lower levels of education in Bangladesh. Previous studies have either not controlled for selection bias or used retrospective wantedness measures, which are subject to post-hoc revision bias. We use pre-pregnancy statements of fertility intentions from a 1990 household survey of 7,942 women in Matlab, Bangladesh to avoid these potential biases.

To test the effect of infant wantedness on child education, we ran OLS and Heckman regression models to predict years of secular education based on prospective wantedness while controlling for demographic and socioeconomic variables. The Heckman model controls for selection bias by predicting whether a woman would have a baby on the basis of her residence in the Matlab treatment area. Using the Heckman model we find boys resulting from unwanted pregnancies experienced a decrease in education by 0.263 years (p=0.05) and mixed effects of wantedness on education for girls.

## INTRODUCTION

When a woman states that she would not want another child, she may be stating that she simply does not want another child or she may be signaling that she would not have the resources to care for another child and, consequently, would not want an additional child. If the decision is based primarily on resource constraints, however, then an additional child who is born unwanted may face fewer available resources. Since education is consistently found to be the single best predictor of good health (Dupre, 2007; Schnittker, 2004), determining whether children resulting from an unwanted pregnancy receive less education is an important policy question. Furthermore, since intergenerational benefits of family planning are part of the impetus to subsidize contraceptives, it is important to quantify these benefits. However, current research does not adequately address these questions.

## BACKGROUND

Nearly all countries report high levels of unintended pregnancies, with the United States reporting approximately half of all pregnancies as unintended (Finer & Henshaw, 2006; Korenman, Kaestner, & Joyce, 2002; Pulley, Klerman, Tang, & Baker, 2002). The Demographic and Health Survey (DHS) provides data on unintended pregnancies from developing countries and defines unintended pregnancies as either mistimed (wanted another child but preferred different timing) or unwanted (did not want any more children). This paper will address the effect of unwanted pregnancies.

Current literature on the impact of unwanted pregnancies on children's health and education remains incomplete. Most studies face issues with measurement, sample size, or sample representativeness, potentially yielding biased results (Gipson, Koenig, & Hindin, 2008). One specific major challenge of current literature is how to identify unwanted pregnancies. Most studies obtained information on wantedness after the child was born. Because a woman may change the wantedness declaration of a pregnancy after conception or after birth—especially if the pregnancy or outcome are particularly good or particularly bad or if there is relatively strong social pressure—asking a woman after their delivery whether a child was wanted may not yield accurate information about pre-conception intentions (Casterline, El-Zanatay, & El-Zeini, 2003; Koenig, Acharya, Singh, & Roy, 2006). Since women who are more likely to revise their pregnancy intentions may be different from those who are less likely to revise, it is important to obtain pregnancy intentions pre-conception. Although some prior research has claimed that children resulting from unwanted pregnancies attain lower levels of education, most have used retrospective wantedness measures, weakening their results through potential post-hoc revision bias (Montgomery, Lloyd, Hewett, & Hueveline, 1997; Pop-Eleches, 2006).

A more recent study on data from Bangladesh used prospective wantedness and found similar negative effects on education (Chalasani, Casterline, & Koenig, 2007), but was unable to control for sample selection bias. Being born unwanted is more likely if the woman lacks agency and access to family planning but also less likely if the woman is nutritionally subfecund. Because there are population differences in being capable of either avoiding or terminating unwanted pregnancies, the sample of children resulting from unwanted pregnancies will over-represent families who were unable to avoid unwanted children. These two processes lead to selection bias. To our knowledge, there is no existing study that addresses selection bias and utilizes prospective wantedness.

## METHODS

### *Sample and Measures*

We used data from the International Centre for Diarrhoeal Research, Bangladesh (ICDDR,B) Knowledge Attitudes and Practices (KAP) household survey of 7,942 women of reproductive age in Matlab, Bangladesh starting in 1990. This survey was part of a larger intervention started in 1975 in which villages were randomized to more intensive health services or standard government health services.

In addition to asking questions about socio-demographic characteristics and attitudes toward contraception and healthcare, the KAP survey also asked about preferences for further children. If women stated that they did not want any additional sons or daughters and they were not currently pregnant, future pregnancies occurring between 9 months and 3 years after the interview date were identified as unwanted. The survey collected data via routine surveillance through January 1, 2000 and education data were obtained from the 2005 Census. Interview completion rates in both the treatment and control groups were above 90 percent. These data are particularly suited to studying the impact of wantedness because there have been no previous randomized controlled trials with an intervention that could alter wantedness.

*Analysis*

We ran OLS regressions as well as Heckman models to predict the years of secular education using prospective wantedness, child's sex, an interaction term between wantedness and sex, child's age in 2005, mother's age at interview, parents' years of schooling, household asset score, total living sons and daughters, and geographical region. If UC represents a binary variable for an unwanted child and X represents other included independent variables (child's sex and age in months, mother's age, parents' education, living children, household asset score), then the full OLS equation to predict a child's expected years of secular education is:

$$Education_i = \alpha + \beta X_i + \delta UC_i + \gamma UC_i * Sex_i + \varepsilon_i$$

The Heckman model controls for selection bias by predicting whether a woman would have a baby on the basis of her residence in the Matlab treatment region and then uses this probability to model a child's education via the inverse Mills ratio (MR). The two Heckman equations are:

Equation 1: $Mother\ Had\ a\ Baby_i = \alpha + \beta X_i + \delta Region_i + \varepsilon_i$

Equation 2: $Education_i = \alpha + \beta X_i + \delta UC_i + \gamma UC_i * Sex_i + \theta MR + \varepsilon_i$

For sensitivity analyses we ran models separately by sex, household asset quintile, and maternal education, and without key variables. We also ran models that predicted years of non-secular education only as well as models of secular and non-secular education combined.

## PRELIMINARY RESULTS

We were able to identify the wantedness of 88% of the 9,801 pregnancies that occurred during the survey period, 48% of which were determined to be unwanted. We identified wantedness for 85% of the 3,942 live births that had 2005 education information, 19% of which were unwanted. Children averaged 2.75 years of secular education, with girls having slightly more education than boys (2.96 vs. 2.55, $p<0.001$). See Table 1 for a more complete summary of the data.

When run separately by sex, the OLS regressions yielded an insignificant coefficient on the wantedness variable for girls, but for boys, being born unwanted led to a reduction of 0.255 years of schooling ($p=0.06$). When running the OLS regression with both sexes, unwanted boys are estimated to have a similar reduction of 0.286 years of education when unwanted ($p=0.015$). However, unwanted girls are predicted to have roughly six more months of education than wanted girls. Highly significant independent variables in these three OLS models include parents' years of education, total living daughters, and geographical region. See Table 2 for selected OLS results.

We ran other OLS regressions to predict years of all types of education as opposed to just secular education. In these models, the estimated impact of being unwanted on education for girls is still positive, but smaller in magnitude and significance. We ran OLS regressions that only included children with non-secular education and found that although girls were predicted to have more education than boys, both boys and girls were predicted to have less education if they were unwanted, with the unwanted penalty much larger for girls. The coefficients on wantedness were insignificant in this model, perhaps due to a much smaller sample size.

Similar to the OLS models predicting years of secular education, the Heckman models yielded an insignificant effect of wantedness for girls only and a significant negative effect for unwanted boys of 0.264 years (p=0.05). The Heckman model with both sexes also resembled the OLS model results with unwanted boys receiving 0.304 fewer years of secular education (p=0.009) and unwanted girls having approximately six more months of schooling. Similar to OLS, parents' education, the number of living children, and geographical region were significant in most models. The Heckman models fit the data well, with LR-test p-values less than 0.01 and highly significant estimated coefficients for lambda. See Table 3 for selected Heckman results.

We also ran the Heckman model with both sexes to predict total years of secular and non-secular education. Similar to the OLS results, adding in all types of education decreased the magnitude and significance of the positive effect of being unwanted on girls' education to approximately 0.4 years but the predicted education for unwanted boys remained largely unchanged (-0.278 years, p=0.018). The Heckman model could not be run on non-secular education separately due to model constraints.

The sensitivity analyses did not yield any strong patterns when evaluating asset quintiles individually, comparing the highest and lowest asset quintiles, or removing covariates individually and in groups. In most regressions, the coefficient for wantedness was insignificant.

## DISCUSSION AND CONCLUSIONS

Because the OLS results closely resemble the Heckman results, we conclude that there is minimal selection bias in this population. We also conclude that being born unwanted lowers a boy's schooling attainment by nearly 3 months in this population. Although a decrease of 0.264 years of education for boys may appear to be minimal, when compared with the mean years of secular education in this sample for children (2.75 years), mothers (1.90 years), and fathers (3.52 years), the relative magnitude can be seen.

Initially we were surprised to find that being an unwanted girl had either no effect or a positive effect on years of education. We suspect that a potential cause for this relationship is the national subsidies for girls' education during the study period. The Female Secondary School Stipend Project (FSP), which offers cash stipends to rural girls' families for attending school, became nation-wide in 1994 and expanded geography and grade levels for which stipends were offered in 1996 (Schurmann, 2009). Since we do not have more specific data on which grades were attended or whether children switched between different types of schools, we cannot easily flag specific years each girl would be eligible for the subsidy. However, results from models estimating years of all types of education or only non-secular education seem to suggest that parents might be more likely to send unwanted daughters to secular schools where they could receive government subsidies. The next step in this research is to explore ways that subsidy eligibility can be accounted for in the model to determine whether it alters the relationship between wantedness and years of education.

**Table 1: Summary of Variables Used**

| Variable | Full Model Mean (or %) | Full Model Std. Dev. | Full Model N | Girls Only Mean (or %) | Girls Only Std. Dev. | Girls Only N | Boys Only Mean (or %) | Boys Only Std. Dev. | Boys Only N |
|---|---|---|---|---|---|---|---|---|---|
| Dependent Variables | | | | | | | | | |
| Years of child's education from 2005 Census | 2.95 | 1.95 | 3942 | 3.14 | 1.94 | 1903 | 2.76 | 1.95 | 2039 |
| Child's years of secular education | 2.75 | 2.03 | 3942 | 2.96 | 2.01 | 1903 | 2.55 | 2.03 | 2039 |
| Independent Variables | | | | | | | | | |
| Don't want (==1) | 0.48 | 0.50 | 8632 | 0.22 | 0.41 | 2078 | 0.24 | 0.43 | 2178 |
| Child's age in 2005 | 11.91 | 20.30 | 5723 | 11.91 | 20.10 | 2408 | 11.89 | 20.47 | 2581 |
| Mother's age at interview | 29.87 | 8.01 | 9801 | 25.78 | 5.30 | 2408 | 25.75 | 5.30 | 2581 |
| Years of mother's education in 1996 Census | 1.90 | 2.77 | 8831 | 1.83 | 2.69 | 2281 | 1.98 | 2.84 | 2456 |
| Husband's years of schooling | 3.52 | 4.03 | 9799 | 3.20 | 3.88 | 2408 | 3.32 | 3.94 | 2580 |
| Total living sons | 1.52 | 1.37 | 9801 | 0.99 | 1.08 | 2408 | 1.05 | 1.10 | 2581 |
| Total living daughters | 1.43 | 1.33 | 9801 | 1.12 | 1.17 | 2408 | 1.07 | 1.13 | 2581 |
| Sex of the child (==1 if female) | 0.48 | 0.50 | 4989 | | | | | | |

**Table 2: OLS Regression Results for the Full Model, Girls Only and Boys Only**

*(p-values in parentheses)*

| Variable | Full Model | Girls Only | Boys Only |
|---|---|---|---|
| Don't want (==1) | -0.286** | 0.132 | -0.255* |
| | (0.015) | (0.319) | (0.063) |
| Sex*Don't want (==1 if unwanted girl) | 0.474*** | | |
| | (0.001) | | |
| Child's age in 2005 | 0.051*** | 0.054*** | 0.048*** |
| | (0.000) | (0.000) | (0.000) |
| Mother's age at interview | 0.013 | 0.034*** | -0.009 |
| | (0.142) | (0.005) | (0.503) |
| Years of mother's education in 1996 Census | 0.151*** | 0.147*** | 0.150*** |
| | (0.000) | (0.000) | (0.000) |
| Husband's years of schooling | 0.056*** | 0.048*** | 0.066*** |
| | (0.000) | (0.000) | (0.000) |
| Total living sons | -0.075* | -0.074 | -0.065 |
| | (0.072) | (0.202) | (0.273) |
| Total living daughters | -0.120*** | -0.215*** | -0.016 |
| | (0.001) | (0.000) | (0.758) |
| Sex of the child (==1 if female) | 0.297*** | | |
| | (0.000) | | |
| 2nd asset quintile | -0.035 | 0.084 | -0.145 |
| | (0.715) | (0.536) | (0.280) |
| 3rd asset quintile | -0.001 | 0.104 | -0.083 |
| | (0.992) | (0.451) | (0.552) |
| 4th asset quintile | 0.004 | 0.200 | -0.187 |
| | (0.964) | (0.134) | (0.170) |
| 5th asset quintile (richest) | 0.025 | 0.232* | -0.166 |
| | (0.799) | (0.091) | (0.254) |
| Geographic Regions: | | | |
| Block A | 0.265** | 0.308** | 0.209 |
| | (0.016) | (0.049) | (0.177) |
| Block B | 0.083 | 0.174 | 0.021 |
| | (0.308) | (0.118) | (0.856) |
| Block C | 0.187* | 0.383*** | 0.023 |
| | (0.064) | (0.004) | (0.879) |
| Block D | 0.438*** | 0.587*** | 0.318** |
| | (0.000) | (0.000) | (0.040) |
| Constant | -5.266*** | -5.983*** | -4.376*** |
| | (0.000) | (0.000) | (0.000) |
| Observations | 3,004 | 1,462 | 1,542 |
| Adjusted R-squared | 0.344 | 0.377 | 0.309 |

P-value in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

**Table 3: Heckman Regression Results for Equation 1 (mother had a baby) and Equation 2 (child's years of secular education)**

*(p-values in parentheses)*

| | Full Model | | Girls Only | | Boys Only | |
|---|---|---|---|---|---|---|
| **Variable** | **Equation 2** | **Equation 1** | **Equation 2** | **Equation 1** | **Equation 2** | **Equation 1** |
| Don't want (==1) | -0.304*** | | 0.115 | | -0.264* | |
| | (0.009) | | (0.383) | | (0.053) | |
| Sex*Don't want (==1 if unwanted girl) | 0.481*** | | | | | |
| | (0.001) | | | | | |
| Child's age in 2005 | 0.050*** | | 0.053*** | | 0.048*** | |
| | (0.000) | | (0.000) | | (0.000) | |
| Mother's age at interview | -0.013 | -0.131*** | -0.005 | -0.125*** | -0.042* | -0.129*** |
| | (0.342) | (0.000) | (0.775) | (0.000) | (0.060) | (0.000) |
| Years of mother's education in 1996 Census | 0.145*** | -0.024*** | 0.134*** | -0.034*** | 0.147*** | -0.014 |
| | (0.000) | (0.005) | (0.000) | (0.001) | (0.000) | (0.163) |
| Husband's years of schooling | 0.054*** | -0.020*** | 0.044*** | -0.020*** | 0.061*** | -0.023*** |
| | (0.000) | (0.000) | (0.001) | (0.005) | (0.000) | (0.001) |
| Total living sons | -0.102** | -0.096*** | -0.141** | -0.149*** | -0.084 | -0.070*** |
| | (0.015) | (0.000) | (0.018) | (0.000) | (0.158) | (0.003) |
| Total living daughters | -0.120*** | 0.032* | -0.212*** | 0.042* | -0.011 | 0.011 |
| | (0.001) | (0.080) | (0.000) | (0.056) | (0.826) | (0.627) |
| Sex of the child (==1 if female) | 0.293*** | | | | | |
| | (0.000) | | | | | |
| 2nd asset quintile | -0.031 | | 0.088 | | -0.137 | |
| | (0.749) | | (0.517) | | (0.307) | |
| 3rd asset quintile | 0.011 | | 0.111 | | -0.080 | |
| | (0.911) | | (0.419) | | (0.562) | |
| 4th asset quintile | 0.023 | | 0.222* | | -0.179 | |
| | (0.810) | | (0.096) | | (0.186) | |
| 5th asset quintile (richest) | 0.046 | | 0.248* | | -0.155 | |
| | (0.648) | | (0.071) | | (0.283) | |
| Geographic Regions: | | | | | | |
| Block A | | -0.103 | | -0.152* | | -0.072 |
| | | (0.127) | | (0.064) | | (0.363) |
| Block B | | -0.123** | | -0.128** | | -0.111* |
| | | (0.015) | | (0.035) | | (0.064) |
| Block C | | -0.308*** | | -0.277*** | | -0.322*** |
| | | (0.000) | | (0.000) | | (0.000) |
| Block D | | -0.419*** | | -0.446*** | | -0.381*** |
| | | (0.000) | | (0.000) | | (0.000) |
| Constant | -4.625*** | 4.307*** | -5.036*** | 3.794*** | -3.685*** | 3.823*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Observations | 6,408 | 6,408 | 4,866 | 4,866 | 4,946 | 4,946 |
| rho | 0.238 | 0.238 | 0.336 | 0.336 | 0.244 | 0.244 |
| sigma | 1.689 | 1.689 | 1.644 | 1.644 | 1.752 | 1.752 |
| lambda | 0.402 | 0.402 | 0.552 | 0.552 | 0.428 | 0.428 |
| chi-sq | 5.687 | 5.687 | 6.328 | 6.328 | 2.713 | 2.713 |
| Prob>chisq | 0.0171 | 0.0171 | 0.0119 | 0.0119 | 0.0996 | 0.0996 |

P-value in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

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