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FAMILY SIZE AND CHILDREN'S EDUCATION IN MATLAB, BANGLADESH

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Summary. This study examines the relationship between family size and children's education in Bangladesh for two periods – 1982 with high fertility and 1996 with low fertility – using data from the Matlab Health and Demographic Surveillance System of the ICDDR,B: Centre for Health and Population Research. Children aged 8–17 years (27,448 in 1982 and 32,635 in 1996) were selected from households where the mother was aged 30–49 years and the father was the head of household. Children's education was measured in terms of completed years of schooling: at least class 1 (among 8–17 year olds), at least class 5 (among 12–17 year olds) and at least class 7 (among 15–17 year olds). After controlling for all variables in the multivariate analyses, level of children's education was not found to be associated with family size during the high fertility period. The family size–education relationship became negative during the low fertility period. In both periods children of educated mothers from wealthier households and those who lived close to primary/high schools had more education, but this socioeconomic difference reduced substantially over time. Boys had more education than girls during the high fertility period but this difference disappeared during the low fertility period. As birth rates fall and the proportion of children from small families increases an increase in children's education is to be expected.

Introduction

Although it is well known that high fertility is detrimental to child survival (Hobcraft *et al.*, 1985; Koenig *et al.*, 1990; Miller *et al.*, 1992; DaVanzo *et al.*, 2004), its effect on other indicators of well-being, such as children's education, has not yet been proved universally. Studies from the United States and other economically advanced countries have documented that family size exerts a negative influence on children's educational attainment (Blake, 1989; Downey, 1995), but such a relationship has not consistently been found in developing countries. In fact, earlier studies in Taiwan (Arnold, 1976) and Guatemala (Clark, 1979) found no association between family size

and children's education, but later studies such as those in Thailand (Knodel *et al.*, 1990; Knodel & Wongsith, 1989), Taiwan (Hermalin *et al.*, 1982; Parrish & Willis, 1990) and Malaysia (Sudha, 1997) reported increasingly negative relationships.

Despite such mixed results, it is widely believed that couples with a small family should be able to invest more in their children's education. It has also been speculated that at the early stages of socioeconomic development, the relationship between family size and children's education may not exist but as society develops, a negative relationship would emerge (Mueller, 1984). In societies where the relationship is negative the primary mechanism through which fertility decline affects education has been referred to as the 'dilution effect': as the number of children in a family increases, resources available to an individual child decrease. Resources are defined as parental time, attention and emotional investment as well as material and financial assets (Blake, 1989).

Fertility has been declining in Bangladesh since the early 1980s with faster decline in the late 1980s to early 1990s. However, desired family size decreased much earlier than the decline of actual fertility and continued to decline further as actual fertility declined. This decline in fertility has been attributed to the family planning programmes in Bangladesh (Cleland *et al.*, 1994). This study examines the relationship of family size and children's education in two periods that differ in fertility level and motivation for family size desire. The study uses data from two periods from the Matlab area: 1982 with high fertility and 1996 with low fertility. In half of the Matlab study area (MCH-FP Treatment area) fertility decline was much earlier than in the other half of the area (Comparison area). So, it is possible that some women aged 30–49 years will have small families even in the earlier period.

Socio-demographic change in recent years

Although Bangladesh is considered one of the poorest nations of the world, some positive changes have been taking place in various fields over the past few decades (UNICEF, 2001). The fundamental factors behind the changes are rapid population growth, development efforts of the government and increased influence of Western values and culture.

Rapid population growth caused high population density, decline in the land–man ratio, increased rural–urban migration and growth of urban slums, increased unemployment and high incidence of poverty. On the other hand, due to development programmes, agricultural productivity has increased substantially, non-traditional employment opportunities have emerged, urbanization, industrialization and literacy have increased, mobility and women's role in the economy and society have changed, and traditional values and beliefs have been disintegrating. Alongside these changes, huge out-migration of labour and inflow of foreign aid and capital have increased the level of interaction between Bangladesh and the outside world raising the exposure of the people of Bangladesh to modern ideas and modes of living.

As a result of rapid socioeconomic transformation in recent decades the role of family is changing and the traditional family is in decline. A wave of Western 'civilization' is gradually encroaching upon Bangladeshi society, replacing the

traditional notions of strongly bonded family life with the concept of the nuclear family. The role and empowerment of women is increasing, but the vast majority of women still cannot play an effective role in making decisions within the family.

In the past, Bangladeshi women experienced high fertility and did not consider controlling their fertility because fewer children survived to adulthood. Studies conducted up until the 1970s documented that the familial, social, economic and religious conditions of Bangladesh were favourable to many rather than few children (Cain, 1977; Khuda, 1977), but subsequent KAP (knowledge, attitude and practice) surveys reported lower family size desire than actual fertility (BFS, 1978). This probably happened due to the decline in mortality after World War II, which led couples to adjust their desired family size to levels similar to the surviving children of their parent's generation.

Over the last two decades, the country has undergone a remarkable demographic transition. The total fertility rate declined from 6·3 in the mid-1970s to 3·3 in the mid-1990s (BDHS, 2005). The crude death rate also fell dramatically from 19 (per 1000 population) in 1975 to 8 in the mid-1990s. The infant mortality rate was 150 (per 1000 live births) in 1975 and fell to about 80 in the mid-1990s. Maternal mortality declined from 6·2 (per 1000 births) in 1982 to 4·4 in 1995. Life expectancy at birth was 53·4 years for males and 49·3 years for females in 1974 and increased to 63·3 and 65·2 respectively in 1995. Mean desired family size was 4·5 in the mid-1970s and declined to 3·0 in 1990 and 2·5 in the mid-1990s.

The literacy rate in Bangladesh was very low until the end of British rule (mid-1900s). In the latter half of the 20th century the then Pakistan government (East Pakistan) tried to improve the level of educational attainment of children but success was not satisfactory. The second five-year plan (1980–85) in Bangladesh introduced a universal primary education scheme (1–5 grades); no tuition and free books for all. To educate primary school drop-outs, the Bangladesh Rural Advancement Committee (a national NGO) has undertaken a programme through an informal primary education scheme since the early 1990s. The scheme provides free books and stationery and preferential enrolment is given to girls and to children from poor families. Since the mid-1990s, the Government of Bangladesh has also initiated incentive schemes in selected villages to increase enrolment in primary education.

In recent years, secondary education (6–10 grades) has been free for girls but fees are required for boys. Although many secondary institutions are private enterprises, they receive substantial government subsidies. Books have to be bought by the student and admissions and examination fees are imposed on both girls and boys. Since the mid-1990s, the Government of Bangladesh has initiated a scholarship scheme for all girls in secondary school. Entitlement to a scholarship requires 65% school attendance and maintenance of a certain grade but there are no criteria for economic exclusion. Each school receives a subsidy for each girl enrolled under this programme and the girl receives a monthly stipend. Parents of scholarship recipients are required to sign a bond guaranteeing that the girls will not be married before reaching 18 years of age. In addition to falling fertility, these public investments in education would be expected to improve school retention rates, particularly for girls.

Methods

Data for this study come from the Matlab area, where ICDDR,B: Centre for Health and Population Research has maintained a Demographic Surveillance System (DSS) of over 200,000 people since 1966. Matlab is a rural area located about 55 km south-east of Dhaka. The area is low-lying and the economy is largely based on agriculture (Ruzicka & Chowdhury, 1978).

The Matlab study area consists of the Treatment and Comparison areas. The Treatment area was exposed to a contraceptive distribution programme during 1975–77 and to maternal–child health and family planning services since October 1977. In the Comparison area, services have been limited to those provided through the conventional government programme (Bhatia *et al.*, 1980). Since the introduction of the intensive family planning programme in 1977, a remarkable decline in fertility has been observed in the Treatment area. The Total Fertility Rate (TFR) declined from 6·5 in the mid-1970s to 4·1 in the mid-1980s and to 2·7 in 1996, while the TFR in the Comparison area declined from 7·2 in the mid-1970s to 5·2 in the mid-1980s and 3·5 in 1996. On the other hand, desired family size declined from 4·3 in 1975 to 3·2 in 1990 and 2·5 in 1999 and is similar in the two areas (Razzaque, 1996; Bairagi & Datta, 2001).

Data for this study are drawn from the socioeconomic censuses of 1982 and 1996. In these censuses data were collected both at the household level (possession of items) as well as at the individual level (education, occupation etc). In both censuses completed years of schooling were recorded using the same definition and such data were collected for those children (6 years of age or more) who were currently at school and those who were not. In order to complement the census data two additional data sets were drawn. The first contains Geographical Information System data collected in 2002: distance between home and school. It is possible that some schools may not have existed in 1982 as well as in 1996, but the number is likely to be small because most of the schools were established just after the independence of Bangladesh in 1971. The second data set – pregnancy history data (number of living children) – was added to the file from the DSS database.

During the socioeconomic censuses, data were collected from individuals who were resident by DSS definitions; if a household member stays away from home they need to visit the house once in a month and stay overnight to be considered resident. The analyses were restricted to young children (those aged 8–17 years) who usually stay with the parents. So, it is unlikely that a large group would be excluded from the analysis due to the definition of resident. It is likely that some girls might be married at this age and would move to the husband's house. As mean age at marriage has increased over the period such girls might be few in number.

For this study, children were selected from those households where the father is the head of the household and the mother is aged 30–49 years. Such categories of households were selected because the aim is to study children of those mothers who were about to complete their childbearing (30–49 years) and where the father controls the household resources. The relationship between family size and children's education is expected to be strong in these households. Three education levels were analysed keeping in mind the government's programme to improve education:

Table 1. Fertility intentions and contraceptive use by study area, 1990[a]

Area	Wanted no more children (%)		Contraceptive use (%)	
	Under 30 yrs	30–49 yrs	Under 30 yrs	30–49 yrs
Treatment	21·9	83·3	51·3	73·5
Comparison	24·4	87·1	22·4	40·7

[a]Source: Koenig *et al.* (1990).

completed at least class 1 (among aged 8–17 years), completed at least class 5 (among aged 12–17 years) and completed at least class 7 (among aged 15–17 years).

Both bivariate and multivariate analyses are employed. In the multivariate analysis, logistic regressions are used. The three dependent variables are: (a) whether completed at least class 1 among those aged 8–12 years (not completed=0 and completed at least class 1=1), (b) whether completed at least class 5 among those aged 12–17 years (not completed=0 and completed at least class 5=1) and (c) whether completed at least class 7 among those aged 15–17 years (not completed=0 and completed at least class 7=1). The independent variables used in this analysis are: family size (less than 3, 3–5 and 6 or more living children), sex of the child (boy and girl), mother's education (illiterate, 1–5 and 6 or more years of schooling), household possession (none, 1–2 and 3 or more household items), distance (km) between home and primary school or high school for the household. Except for age of children and the distance between home and educational institution, all other independent variables were treated as categorical.

Results

Bivariate analysis

Table 1 describes the fertility intentions and contraceptive use in the Treatment and Comparison areas. Among women aged 30–49 years, over 80% in each area reported that they wanted no more children. Close to three-quarters of women aged 30–49 years in the Treatment area reported using contraception compared with 41% in the Comparison area (Table 1). This indicates that most women aged 30–49 years have completed their childbearing.

The distribution of children according to family size changed over the study period (Table 2). In 1982, about 8% of children were in families with 1–3 children. This increased to 20% in 1996. The percentage of children living in large families (7 or more children) declined from about 30% to 15%.

The mean age of children who completed at least class 1, 5 and 7 of schooling increased with increase in family size in 1996 (Table 3). This indicates that children from large families either started school late or repeated grades during the course of their schooling due to poor performance. In 1982 children from large families (7 or

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Table 2. Percentage distribution of children[a] (%) by family size for different age categories, 1982 and 1996

	1982			1996		
Family size[b]	Aged 8–17	Aged 12–17	Aged 15–17	Aged 8–17	Aged 12–17	Aged 15–17
1–3	8·3	8·2	7·9	23·3	20·4	18·6
4–6	61·6	61·0	59·5	63·2	65·4	66·3
7+	30·1	30·8	32·6	13·4	14·2	15·1
N	27,448	16,222	7279	32,635	18,900	8909

[a]Father head of household and mother aged 30–49 years.
[b]Number of living children.

Table 3. Mean age of children at completion of schooling[a] (class 1, 5 and 7) by family size, 1982 and 1996

	1982			1996		
Family size	Aged 8–17	Aged 12–17	Aged 15–17	Aged 8–17	Aged 12–17	Aged 15–17
1–3	13·01	15·36	16·40	12·53	14·98	16·10
4–6	13·10	15·21	16·16	13·04	15·32	16·26
7+	13·67	15·55	16·29	13·25	15·58	16·32
N	27,448	16,222	7279	32,635	18,900	8909

[a]Completed at least class 1 (among those aged 8–17 years), completed at least class 5 (among those aged 12–17), completed at least class 7 (among those aged 15–17).

more children) were usually older on average when they completed school than were those from smaller families. However, the relationship was not linear in 1982, as it was in 1996.

Completion rates for children at all three levels have increased substantially over the study period: completed at least class 1 (among aged 8–17 years) increased from 43% to 76%; completed at least class 5 (among aged 12–17 years) increased from 15% to 37%; and completed at least class 7 (among aged 15–17 years) increased from 9% to 25% (Table 4).

For all three levels of education the percentage of children who completed schooling increased with increase in family size in 1982 but this pattern was reversed in 1996 (Table 4). In 1982, the ratio of school completion of the highest and lowest family size categories was 1·2 for those who had completed at least class 1, 1·4 for those who had completed at least class 5 and 1·5 for those who had completed at least class 7. But in 1996, the ratio of school completion of the highest and lowest family size categories was 0·9 for those who had completed at least class 1, 0·7 for those who had completed at least class 5 and 0·5 for those who had completed at least class 7.

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Table 4. Completed years of schooling (%) by socioeconomic status for different age categories[a], 1982 and 1996

	Aged 8–17 years (at least class 1)		Aged 12–17 years (at least class 5)		Aged 15–17 years (at least class 7)	
Variables	1982	1996	1982	1996	1982	1996
Family size[b]						
(1) 1–3	37·7	78·4	12·3	43·6	6·9	36·0
(2) 4–6	41·3	75·3	14·0	36·2	7·8	24·0
(3) 7+	46·3	73·5	17·1	32·2	10·1	19·3
Ratio (3):(1)	1·2*	0·9*	1·4*	0·7*	1·5*	0·5*
Mother's education (years)						
(1) 0	33·1	68·4	8·4	25·3	3·3	12·8
(2) 1–5	71·7	86·5	32·8	50·8	22·7	38·1
(3) 6+	86·6	94·6	61·6	76·0	51·1	69·5
Ratio (3):(1)	2·6*	1·4*	7·3*	3·0*	15·5*	5·4*
Possession of items						
(1) None	27·4	70·3	6·3	29·3	3·0	19·6
(2) 1–3	47·9	76·6	17·1	37·1	9·2	24·1
(3) 4+	77·7	88·0	44·8	59·4	32·9	48·8
Ratio (3):(1)	2·8*	1·25*	7·1*	2·0*	11·0*	2·5*
Sex						
(1) Boy	47·2	75·9	17·9	37·2	10·8	25·3
(2) Girl	37·6	75·6	11·7	37·0	5·9	25·8
Ratio (2):(1)	0·8*	1·0	0·6*	1·0	0·5*	1·0
Primary school[c] (km)						
(1) <0·25	47·2	78·0	18·2	42·3	—	—
(2) 0·25–0·74	42·3	75·8	14·6	36·9	—	—
(3) 0·75+	40·0	72·6	13·8	32·1	—	—
Ratio (3):(1)	0·8*	0·9*	0·8*	0·8*		
High school[c] (km)						
(1) <0·75	—	—	—	—	11·7	30·9
(2) 0·75–1·4	—	—	—	—	7·6	24·2
(3) 1·5+	—	—	—	—	7·5	22·3
Ratio (3):(1)					0·6*	0·7*
All	42·7	75·8	15·0	37·1	8·6	25·5

[a]Completed at least class 1 (among those aged 8–17 years), completed at least class 5 (among those aged 12–17), completed at least class 7 (among those aged 15–17).
[b]Number of living children.
[c]Distance (km) between educational institutions and place of residence.

The difference between highest and lowest family size categories is statistically significant in both periods.

In both periods, children's education was higher for those with an educated mother and those who had higher economic status. The ratio of school completion of

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the highest and lowest mother's education categories declined from 2·6 to 1·4 for those who completed at least class 1, from 7·3 to 3·0 for those who completed at least class 5 and from 15·5 to 5·4 for those who completed at least class 7. Similarly, the ratio of school completion of the highest and lowest possession-owning categories reduced from 2·8 to 1·3 for those who completed at least class 1, from 7·1 to 2·0 for those who completed at least class 5 and from 11·0 to 2·5 for those who completed at least class 7.

Education was significantly higher for boys than for girls in 1982 but this difference disappeared in 1996. In 1982, the ratio of girl–boy school completion declined with each increase in level of education: 0·8 for those who completed at least class 1, 0·6 for those who completed at least class 5 and 0·5 for those who completed at least class 7, but the ratio of school completion for boys and girls was equal to one in 1996 for each of the three levels of education.

Children who lived close to a primary school had higher education (all three levels) than those who lived far from a school. This pattern exists in both the periods and for both primary and high school. The ratios of the highest and lowest distance from primary school (class 1 and 5) are statistically significant in both the periods. For distance to high school, a similar pattern is observed as for primary school: more education (class 7) for those living close to a high school.

Multivariate analysis

In the bivariate situation, children's education was higher for children from larger families in 1982. This relationship was reversed in 1996 for all three levels of education. However, estimation of the net effect requires multivariate analysis. Logistic regression models are fitted for those who completed at least class 1 (among aged 8–17 years), at least class 5 (among aged 12–17 years) and at least class 7 (among aged 15–17 years).

Results of the regression models for completion of at least class 1, 5 and 7 are shown in Table 5. After controlling for all the variables in the model, family size was not associated with any level of education in 1982 but was negatively associated with children's education in 1996. Those who had 4 or fewer children usually had significantly higher education than those who had 7 or more children.

In both periods, children whose mother has some education and those from wealthier households had significantly higher odds of completing education (all three levels) compared with those of illiterate mothers and those from poor households. The difference between the highest and lowest categories reduced substantially overtime. Boys had significantly higher education than girls (all three levels) in 1982 but this difference disappeared in 1996. Distance of house from primary school had a negative effect on children's education (class 1 and 5) and distance of house from high school had a negative effect on children's education (class 7); this is true in both the periods.

Discussion

This study found no relationship between family size and children's education in 1982 (the high fertility period) but documented an inverse relationship between family size

Table 5. Logistic regression model (odd ratios) of completion of school (class 1, 5 and 7) for different age categories (8–17, 12–17 and 15–17 years), 1982 and 1996

	Aged 8–17 years (at least class 1)		Aged 12–17 years (at least class 5)		Aged 15–17 years (at least class 7)	
Characteristics	1982	1996	1982	1996	1982	1996
Age (cont.)	1·27***	1·39***	1·74***	1·95***	1·95***	1·98***
Sex						
Boy	1·00	1·00	1·00	1·00	1·00	1·00
Girl	0·59***	1·05	0·54***	1·09*	0·46***	1·04
Family size[a]						
1–3	0·95	1·46***	1·10	2·00***	1·21	2·29***
4	0·99	1·24***	1·03	1·47***	0·94	1·67***
5	1·02	1·07	1·09	1·29***	1·06	1·25*
6	0·94	1·05	1·02	1·12	0·99	1·08
7+	1·00	1·00	1·00	1·00	1·00	1·00
Mother's education						
0	1·00	1·00	1·00	1·00	1·00	1·00
1–5	4·94***	3·00***	5·04***	3·44***	6·75***	3·99***
6+	10·48***	7·78***	16·80***	12·13***	22·44***	13·97***
Possession of items						
None	1·00	1·00	1·00	1·00	1·00	1·00
1–3	3·39***	1·34***	6·09***	1·50***	6·21***	1·29***
4+	10·02***	2·17***	16·68***	2·74***	19·13***	2·50***
Primary school[b] (km)	0·70***	0·60***	0·72***	0·53***		
High school[b] (km)					0·73	0·82***
Constant	− 4·44	− 3·31	− 11·98	− 11·34	− 15·45	− 13·36
− 2 log likelihood (df)	29,036·8 (11)	29,055·5 (11)	98,13·5 (11)	18,287·6 (11)	3065·6 (11)	7940·5 (11)

*$p<0·05$; **$p<0·01$; ***$p<0·001$.
[a]Number of living children.
[b]Distance (km) between educational institutions and place of residence.

and children's education in more recent years (1996, the low fertility period). The findings support the argument that the family size–education relationship is conditioned by the specific cultural and socioeconomic setting of a society (Mueller, 1984; Sudha, 1997). The adverse effects of family size on children's education, however, emerged when developmental conditions increased the importance of education (Hull & Hull, 1977). In the past, when agriculture was regarded as a prestigious occupation, schooling was usually not sought by many people. Under these conditions the accumulation of human capital through education was not important so fewer would have gone to school and education would not be associated with family size. On the other hand, during the low fertility period, the motivation for small family size became stronger (Razzaque, 1996) and the importance of schooling for socioeconomic achievement rose. In such situations the dilution hypothesis is intuitively sensible; resources available per child became an important determinant of children's education (Blake, 1989).

This study also found that the mean age of attaining certain levels of education (at least class 1, 5 and 7) was higher among those from large families than for those from small families. This could be due to delay in sending children to school in large families or repeating grades due to poor performance. An inverse relationship between academic aptitude and family size has been documented in developed countries (Blake, 1989) but it is less likely that intellectual ability would be different in these categories of family size because primary level education requires very minimum aptitude.

Children's education was higher for children of educated mothers and for those from higher economic status. However, the difference between the highest and the lowest categories declined substantially over the study period. Once poorer, less educated parents were assisted, through government and non-government programmes, to send their children to school the differences were reduced. With the decline in preference of agriculture as an occupation, the development of human capital is seen to be important by all parents, rich and poor. The socioeconomic differential, although reduced, remains due to the fact that when a family budget is limited the cost of items such as pencils and paper can be prohibitive.

Boys were more likely to complete schooling than girls during the high fertility period but this difference disappeared during the low fertility period. In the case of under-five mortality, a similar pattern has been observed in this population (boy–girl mortality differential has disappeared in recent years). Higher mortality for boys than girls in the past was explained by discrimination against girls in terms of food, health care and education. However, recent changes could be due to the fact that, as desired family size has declined, couples give equal value to both boys and girls in terms of nutrition and education. Government programmes to educate girls are believed to have a greater effect on the behaviour of parents in sending their daughters to school.

As fertility continues to decline in Bangladesh, a growing proportion of children will come from small families. This will have implications for increasing levels of education in Bangladesh. However, as the quality of education in rural schools is not improving, it is likely that those parents who are able to spend money on private tuition will get better education for their children.

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References

Arnold, F. (1976) A model relating education to fertility in Taiwan. PhD dissertation, University of Michigan.

Bairagi, R. & Datta, A. K. (2001) Demographic transition in Bangladesh: what happened in the twentieth century and what will happen next? *Asia-Pacific Population Journal* **16**, 3–16.

BDHS (2005) *Bangladesh Demographic and Health Survey, 2004*. National Institute of Population Research and Training, Dhaka; Mitra and Associates, Dhaka and ORC Macro, USA.

BFS (1978) *Bangladesh Fertility Survey 1975–76*. First report, Ministry of Health and Population Control, Population Control and Family Planning Division, Government of the People's Republic of Bangladesh.

Bhatia, S., Mosley, W. H., Faruque, A. G. & Chakraborty, J. (1980) The Matlab family planning–health services project. *Studies in Family Planning* **11**, 202–212.

Blake, J. (1989) *Family Size and Achievement*. University of California Press, Berkeley.

Cain, M. (1977) The economic activities of children in a village in Bangladesh. *Population and Development Review* **3**, 201–227.

Clark, C. (1979) Relation of economic and demographic factors to household decisions regarding education of children in Guatemala. PhD dissertation, University of Michigan.

Cleland, J., Phillips, J. F., Amin, S. & Kamal, G. M. (1994) *The Determinants of Reproductive Change in Bangladesh: Success in a Challenging Environment.* World Bank, Washington, DC.

DaVanzo, J., Razzaque, A., Rahman, M., Hale, L., Ahmed, K., Khan, M. A., Mostafa, A. H. M. G. & Gausia, K. (2004) *The Effects Birth Spacing on Infant and Child Mortality, Pregnancy Outcomes and Maternal Morbidity and Mortality in Matlab, Bangladesh.* Report submitted to CATALYST Consortium, Washington, DC.

Downey, D. B. (1995) When bigger is not better: family size, parental resources and children's educational performance. *American Sociological Review* **60**, 746–761.

Hermalin, A., Seltzer, J. & Ching-Hsiang, L. (1982) Transitions in the effect of family size on female educational attainment: the case of Taiwan. *Comparative Education Review*, June, 254–270.

Hobcraft, J. N., McDonald, J. W. & Rutstein, S. O. (1985) Demographic determinants of infant and early child mortality: a comparative analysis. *Population Studies* **39**, 363–385.

Hull, T. H. & Hull, V. J. (1977) The relation of economic class and fertility: An analysis of some Indonesian data. *Population Studies* **31**, 43–48.

Khuda, B. (1977) Value of children in Bangladesh village. In Caldwell, J. C. (ed) *The Persistence of High Fertility.* Australian National University, Canberra, pp. 681–728.

Knodel, J., Havanon, N. & Sittitrai, W. (1990) Family size and education of children in the context of rapid fertility decline. *Population and Development Review* **15**, 31–62.

Knodel, J. & Wongsith, M. (1989) Monitoring the education gap in Thailand: trends and differentials in lower and upper secondary schooling. *Asia-Pacific Population Forum* **3**(4), 10, 25–36.

Koenig, M. A., Phillips, J. F., Campbell, O. M. & D'Souza, S. (1990) Birth intervals and childhood mortality in rural Bangladesh. *Demography* **27**, 251–265.

Koenig, M. A., Rob, U., Khan, M. A., Chakraborty, J. & Fauveau, V. (1990) Contraceptive use in Matlab, Bangladesh in 1990: levels, trends and explanations *Studies in Family Planning* **23**(6), 352–364.

Miller, J. E., Trussel, J., Pebley, A. R. & Vaughan, B. (1992) Birth spacing and child mortality in Bangladesh and Philippines. *Demography* **29**, 305–318.

Mueller, E. (1984) Income, aspiration and fertility in rural area of less developed countries. In Schutjer, W. & Strokes, C. S. (eds) *Rural Development and Human Fertility*. Macmillan, New York, pp. 121–150.

Parrish, W. L. & Willis, R. (1990) Educating sons and daughters during rapid economic growth in Taiwan. Paper presented at the *Annual Meeting of the American Sociological Association, 1990*.

Razzaque, A. (1996) Reproductive preferences in Matlab, Bangladesh: levels, motivation and differentials. *Asia-Pacific Population Journal* **11**, 25–44.

Ruzicka, L. T. & Chowdhury, A. K. (1978) *Demographic Surveillance System – Matlab: Vital Events, Migration and Marriage, 1976*. Special Report No. 13. International Centre for Diarrhoeal Disease Research, Dhaka.

Sudha, S. (1997) Family size, sex composition and children's education: Ethnic differentials over development in Peninsular Malaysia. *Population Studies* **51**, 19–151.

UNICEF (2001) *State of the World's Children*. Oxford University Press, Oxford.