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The Future of Thailand's Population Policy: Potential Directions

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Labour shortages are brought about more by Thailand's rapidly growing economy and lagging education than by demographic change

Thailand's reproductive revolution has been accompanied by an economic revolution. This and other trends of modernization have transformed Thai society so much that within one or two generations, parents' attitudes towards child-bearing and child-rearing have changed almost completely, from desiring a high quantity of children to desiring a high quality of children. Currently Thailand's fertility is close to or at the replacement level and, according to several projections, it may decline in the future to below the replacement level. Thus, a critical period is approaching when Thailand must re-evaluate its long-term population goals and policies.

Many characteristics of Thailand's fertility transition are unique, mainly because of various aspects of Thai culture and because the Government has taken ility changes in Thailand

Thailand has recently experienced transitions in major demographic phenomena. Compared with other South-East and East Asian countries and areas (table 1) Thailand has had the highest rate of fertility decline among those that are not yet newly industrialized economies (NIEs). The total fertility rate (TFR), i.e. the average number of births during a woman's lifetime, declined from 6.4 in 1960-1965 to about 2.6 in 1985-1990. In other words, Thailand's fertility has dropped about 60 per cent within a period of 25 years. This percentage is higher than that of other non-NIEs in Asia (including China), and close to that of Hong Kong, Singapore and the Republic of Korea.

According to previous studies (Knodel, Havanon and Pramualrathana, 1984; Knodel, Chamratrithirong and Debavalya, 1987), Thailand's fertility transition has involved four major components: (a) rapid economic changes have been accompanied by fundamental changes in society: couples now feel that a large number of children is an unnecessary burden. In other words, fertility decisions are increasingly based on the self-fulfilment of parents (or individuals) rather than concerns for family or children (van de Kaa, 1987). Easterlin (1975) explained such a transition as a change from social concerns to individual concerns; (b) the Thai cultural setting, with its Buddhist attitudes, has facilitated the acceptance of voluntary contraception; (c) there was a latent demand among many couples for a means to control their fertility, even before modern contraceptives were readily available; and (d) the success of the Government's national family planning programme resulted in a much higher awareness of the need for fertility regulation in a modern society. Contraceptive methods, which were made easily available, were widely used.

Table 1. Total fertility rate by country or area (medium variant)

Country/area	1960-1965	1985-1990	Percentage decline	Medium projection (1990-1995)
Thailand	6.42	2.60	59.5	2.20
Cambodia	6.29	4.71	25.1	4.41
Indonesia	5.42	3.48	35.8	3.10
Lao People's Democratic Republic	6.15	6.69	-8.8	6.69
Malaysia	6.72	4.00	40.5	3.60
Myanmar	5.94	4.02	32.3	3.69
Philippines	6.61	4.33	34.5	3.91
Singapore *	4.93	1.80	63.5	1.80
Viet Nam	6.05	4.10	32.3	3.70
China	5.93	2.45	58.7	2.25
Hong Kong *	5.30	1.35	74.5	1.40

Japan	2.01	1.68	16.4	74.5
Japan	2.01	1.68	16.4	1.70
Republic of Korea *	5.40	1.73	70.0	1.65

Source: United Nations, 1991.
Note: * = NIE (newly industrialized economy).

Table 2: Total fertility rate by region of Thailand

Period	Bangkok	Cen-tral	East	West	North	North-East	South	Total (medium projection)	Total (lower projection)
1985-1990	1.90	2.15	2.41	2.55	2.17	2.99	3.84	2.60	2.60
1990-1995	1.70	1.96	2.06	2.12	1.88	2.54	3.24	2.21	2.15
1995-2000	1.65	1.81	1.89	1.94	1.71	2.30	2.80	2.03	1.97
2000-2005	1.62	1.74	1.81	1.86	1.63	2.17	2.59	1.95	1.89
2005-2010	1.61	1.70	1.75	1.80	1.62	2.09	2.45	1.90	1.82

Source: Human Resources Planning Division, National Economic and Social Development Board, 1991, Population Projections.

As Thailand's drastic decline in fertility continues, TFR is projected to approach or even fall below the replacement level in the near future. Table 2 shows the future trends of TFR in the future as projected by the Thai Government, assuming that fertility will decrease in the same way as in the past. This projection indicates that TFR will fall from 2.6 in the period 1985-1990 to about 1.9 in 2005-2010; however, its assumptions may not be justified. In particular, it neglects the socio-cultural context in which the fertility decline takes place. Moreover, the use of a macroscopic indicator such as TFR in making predictions of future demographic trends fails to provide insight into how this summation of individual fertility comes about, and how it might vary among different groups within Thai society. Furthermore, TFR measures period fertility, which may be different from cohort fertility during a time of changing fertility rates; thus the use of TFR may be misleading.

Therefore, one should not jump to the conclusion that Thailand's fertility rate will definitely fall below the replacement level in every part of the country. One important piece of evidence from previous research on which we can make that statement is that the vast majority of Thai women both prefer and expect to have a minimum of two children, and would prefer to have children of both sexes (Knodel, Chayovan and Frisen, 1988). Table 3 shows the percentage of currently married women aged 15-44 years who want no more children, compared with the women's age, the number of living children and the gender composition of their children. The results indicate that women who have at least one son and one daughter are more likely to want no more children, after controlling for the number of living children.

Table 3: Percentage of currently married women aged 15-44 years who want no more children, and percentage sterilized, by age of woman and number and gender composition of living children, 1987

Number of living children and gender composition	Want no more children			Sterilized		
	15-29 years	30-44 years	Total	15-29 years	30-44 years	Total
One child						
One daughter	24	47	29	1	11	3
One son	22	45	29	0	9	3
Two children						
Two daughters	55	74	65	20	35	27
One son, one daughter	72	85	78	26	44	36
Two sons	60	81	72	26	48	39
Three children						
Three daughters	70	80	78	23	47	42
One son, two daughters	87	91	90	43	56	53
Two sons, one daughter	86	92	91	53	51	52
Three sons	59	90	80	20	54	44

Source: Thailand Demographic and Health Survey (cited in Knodel and others, 1989).

Table 4: Mean preferred number of children for ever-married women, by current age and background characteristics, and for currently married women married less than 5 years, by background characteristics

Background characteristics	Current age of ever-married women							All ages	Women married less than 5 years *
	15-19	20-24	25-29	30-34	35-39	40-44	45-49		
Urban-rural residence									
Urban	2.0	2.2	2.3	2.4	2.6	2.8	3.0	2.5	2.2
Rural	2.2	2.4	2.7	2.8	3.1	3.2	3.6	2.9	2.3
Region									
North	2.3	2.3	2.5	2.6	2.9	2.7	3.3	2.7	2.3
North-East	2.3	2.3	2.7	2.9	3.2	3.3	3.8	3.0	2.3
Central	1.8	2.2	2.5	2.7	2.7	2.9	3.4	2.7	2.1
South	2.7	2.7	3.0	2.9	3.2	3.5	3.5	3.1	2.6
Bangkok	2.0	2.2	2.3	2.3	2.6	2.8	3.1	2.5	2.2
Education									
No education	2.5	2.7	3.1	3.2	3.8	3.4	4.0	3.5	3.0
Primary	2.2	2.3	2.6	2.7	2.9	3.1	3.4	2.8	2.3
Secondary	1.9	2.1	2.3	2.5	2.6	2.7	2.4	2.3	2.1
Higher	2.0	2.2	2.3	2.3	2.5	2.5	2.5	2.4	2.3
Religion * *									
Buddhist	2.1	2.3	2.5	2.7	2.9	3.0	3.4	2.7	2.2
Muslim	3.0	3.0	3.3	3.2	3.4	3.9	4.1	3.4	2.9
Total	2.2	2.3	2.6	2.7	3.0	3.1	3.5	2.8	2.3

*Source:*Chayovan and others, 1988, table 5.8.

Note: * = Currently married women whose first marriage occurred less than 5 years prior to interview.
* * = Excludes cases who are not Buddhist or Muslim, or whose religion is not stated.

Table 4 shows the mean preferred number of children for ever-married women versus their age (cohort), where women are classified by their residence, education, or religion. The mean preferred number of children can also be thought of as the desired family size, keeping in mind that many of the respondents had already completed their child-bearing. Several trends can be identified in this table. For each classification of women, the desired family size is lower for women of younger cohorts, possibly indicating that the desired family size is decreasing with time. Rural women in each cohort prefer larger families than their urban counterparts, but the differences have decreased greatly over time. Controlling by region of Thailand, we find that the differences have increased over time. For the latest cohorts, the central region and Bangkok have the lowest desired family size, followed by the northern and north-eastern parts of the country. The southern part of the country consistently shows a higher desired family size than the other regions (except for the oldest cohort); this is probably due to the influence of the Muslim culture in the southern provinces. With regard to women's education, groups with different levels of education show the highest differences in desired family size for the oldest cohorts. However, these differences have decreased greatly over time. Finally, religion has a consistently strong influence on the desired family size for all cohorts. Taken as a group, Muslim women show the highest desired family size of all women in younger cohorts.

Returning to the issue of whether or not TFR is likely to fall below replacement level, we note that even for the youngest cohorts of married women, aged 15-19 and 20-24, the overall number of children desired is still two children. When controlling for different regions, the desired family size is greater than two children for currently married women of all ages and from all regions, with the exception of those aged 15-19 in the central region and Bangkok. This indicates that, on average, the current generation of young mothers, which will dominate the country's fertility for the next one or two decades, prefer to have at least two children. Even if the family planning programme and similar efforts succeed in helping families to control their fertility at the desired level, TFR is likely to remain above the replacement level for some time. TFR will fall below the replacement level only if and when many couples decide they want to have

fewer than two children (assuming that the number of children they have is equal to the number they want).

How do preferences for family size change? Changes in such preferences indicate changes in underlying attitudes. As with most societal changes, attitudinal changes progress in fits and starts as new norms are introduced and take over from the old. The new norms are resisted by means of traditional mechanisms for the dissemination of values, such as "socialization processes" in the home, "transmission through institutions such as churches and schools", and the use of "reference groups" (Mosher and McNally, 1991, citing Mayer and Jenck, 1989:1441), which account for the maintenance and refinement of existing norms, but not of new norms. If these mechanisms are strong, then traditional norms will be maintained longer, but when societal changes weaken or destroy these mechanisms (e.g. by weakening religious or family authority), new norms of individual behaviour emerge more rapidly.

After achieving a certain level of influence in society, the new norms will affect the reproductive behaviour of the rest of society merely by reason of conformity and social pressure. For example, if many women participate in the labour force, so that smaller families become the norm, even non-working women will tend to have a smaller number of children.

Future policies and suggestions for future research

In view of the possibility of fertility dropping below the replacement level, the issue of what population policy Thailand should adopt becomes quite complex. In 1970, when the national family planning programme was formulated, the goal was relatively straightforward: to reduce population growth rates as quickly as possible. Voluntary contraception was promoted by expanding family planning services throughout the country. The Government's policy has been very successful, to the extent that Thailand's fertility has declined to the level at which the so-called second fertility transition occurred in western Europe in about 1965. This transition consists of a period of long-term population decline after the main demographic transition, which finally results in fertility falling well below the replacement level (van de Kaa, 1987). Designers of Thailand's population policies need to understand the implications of the second fertility transition, and whether or not Thailand is about to undergo such a transition.

The second fertility transition is generally viewed as a transition towards individualism. Even if Thailand does not experience every aspect of this Western European phenomenon, the trend towards individualism is definitely relevant to fertility trends in Thailand. In a modern society, material achievements are based on individual merit and are accompanied by social rewards (prestige and social status). Material achievement has become identified with individual talent and individual enjoyment of the rewards (Lesthaeghe, 1983).

If a country or Government is concerned about the prospect of ever-declining fertility, it can attempt to prevent further fertility decline and even to stimulate higher fertility through monetary incentives. However, in practice such incentives at best have had a small positive effect, and often a negative effect, on the fertility rate (Gauthier, 1991). Few countries, aside from several Eastern European countries and France, have explicitly expressed pro-natalist concerns. Most countries deal with the issue of low fertility in the context of social and family policies.

It is not clear that it is necessary or desirable to take action to prevent a decline in fertility below the replacement level, since such a decline is not necessarily bad for an overcrowded, developing society, and a decline below the replacement level may be prevented anyway by socio-cultural factors. That is believed to be the case for Taiwan Province of China (Feeney, 1991), which is widely believed to be experiencing a permanent transition to below-replacement-level fertility. However, recent studies have shown that period rates such as TFR reflect a temporary effect of the increasing age at child-birth, and not a behaviourial shift to zero- or one-child families (Cleland, 1992). According to Cleland, "nothing could be more disastrous than for governments to switch to pro-natalist policies under the erroneous impression that fertility would otherwise remain below replacement level".

Thailand's current Seventh Five-Year National Economic and Social Development Plan has established the goal of reducing the population growth rate from 1.47 per cent in 1992 to 1.2 per cent (with a population of 61 million) by 1996. This plan focuses on target groups in the north-eastern and southern parts of the country, and special target groups, such as various tribal groups in the northern mountains, members of distinctive cultural groups in the southern part of the country, and slum dwellers and industrial workers in urban areas. The Plan relies on a number of guidelines and measures to attain the set target. These include expanding family planning services to cover all target groups, maintaining high acceptance rates in areas where family planning services are already widely available, and carrying out public relations campaigns on family planning, and population and development.

The intention of this population policy is to set reduction of the population growth rate as the first priority

for action. Such action is emphasized in order for the Thai population to grow at a lower rate and to mitigate the effect of momentum factors owing to the increasing number of women entering the child-bearing age group.[1/] Currently, Thailand tends to accept a TFR close to the replacement level. However, there is no clear policy planning for the population growth rate or TFR after completion of the Seventh Plan period. In other words, there is no clear policy planning on whether the post-1996 population growth rate should be below 1.2 per cent per year, or how the future growth rate will be affected by trends in TFR.[2/]

Touching upon the consequences of population change which may affect population ageing and labour shortages, one can say that the topic is beginning to be highly ranked in discussions of future population policy adjustments. However, the following points concerning population ageing and labour shortage do not support a pro-natalist approach of policy adjustment:

Firstly, the phenomenon of population ageing has already begun in Thailand and will persist in future decades. It is mainly a consequence of the transition from high to low fertility that started approximately in 1970. However, the effect of the fertility decline on the absolute size of the elderly population (60 or more years of age) will be manifested only 60 years later when the birth cohorts affected begin to enter the elderly age group.

For example, the population aged over 60 will reach 20 million by the middle of the next century regardless of fertility trends in the intervening decades. Thus, a policy to influence fertility levels will have no immediate impact upon the size of the elderly population. This notion is accepted among scholars, but usually is overlooked by others in arguments advocating pro-natalist policies to mitigate population ageing (Knodel, 1993).

There is an expectation that the fertility decline will have a negative impact upon family support for the elderly. Such a notion is based on the assumption of an association of the number of living children available with the likelihood and the extent of the elderly being supported by children. However, in the case of Thailand, Knodel (1993) suggested that such an impact will probably be relatively moderate since co-residence of the elderly with an adult child - the lynch-pin of the familial support system - is relatively insensitive to the number of children beyond a family size of two children. He maintains that "reductions in the average number of co-resident children in the elderly's households will be more pronounced but probably have limited significance in the context of the traditional Thai preference for a stem family household structure where only one married child eventually remains to care for the parents" (Knodel, 1993:10).

Secondly, a possible labour shortage is another issue usually raised in arguments advocating a policy to increase population growth. However, according to Kiranandana (1993), the issue of labour shortages is in fact induced by the following factors: an imbalance between the demand aspect of employment and the labour-force market, an unclear labour-force policy, and the rather low productivity of the labour force.

This view is also maintained by Hanenberg and Wongboonsin (1991, cited in Frisen, 1993:11):

> "At present the labour shortage appears to be primarily in the engineering and some other technical and professional fields. These needs can be met through expansion of training facilities, which is occurring but involves a lengthy time lag, or by permitting migration of qualified persons (assuming that they are permitted to depart legally and are willing to migrate) from other countries".

To the extent that smaller family size facilitates higher education, fertility decline and continued low levels of fertility may help to alleviate the labour shortage problem rather than exacerbate it (Knodel, 1992). Moreover, in the case of unskilled and semi-skilled workers in Thailand, they are often unwilling to take on jobs of the following nature: menial or dangerous jobs, or those offering substandard conditions or wages. Such jobs are left to illegal migrants from poorer neighbouring countries or areas (Frisen, 1993).

Such a situation implies that the problem of labour shortages in Thailand is more attributable to the demand than to the supply aspect of the labour force. In other words, it is not so much the result of demographic change as of the rapid growth of the economy and lagging educational levels of the population.

With these points in mind, there are several policy alternatives concerning Thailand's population size and growth. Jones (1992) suggests that there are four possible objectives. The first objective would be to force the continuation of the fertility decline regardless of the ultimate result. If the fertility rate does fall below the replacement level, this policy may eventually result in a decline in the actual population size.

The second possible objective is to reach zero population growth as soon as possible, and to then maintain a stationary population afterwards. The main difficulties with this approach are in implementing the policy to (a) rapidly push fertility to below the replacement level in order to reach zero population growth immediately, and then (b) ensure that fertility rises back to the replacement level later so as to maintain a stationary population. Note that the Thai Government has been successful in promoting a fertility decline mainly because it made contraception more widely available, which helped families to achieve their desired number of children, and because socio-economic changes have put pressure on families to have fewer children. It would be much more difficult to suddenly stop the fertility decline if socio-economic factors continue to encourage a fertility decline. If that were the case, parents would have to be persuaded to have more children than they desire, which is almost antithetical to the past and present policy of improving the status of women and their ability to make their own fertility choices.

A third possible objective is to concentrate on keeping the number of births stable, which may lead to problems of a very large increase in population size. Aside from the obvious disadvantages of such an increase, difficulties would be encountered in manipulating fertility to maintain a fixed number of births.

The fourth and final option presented by Jones (1992) is to set an optimum population size, and to attempt to reach such a size as quickly as possible. In our opinion, it seems inappropriate to define an "optimum population size" as an arbitrary number of people. The optimum population size could be defined as that which is necessary for or can be sustained by a country's resources, economy etc. Thus, if one wants to define an optimum population size, one needs to consider many factors, such as trends in infrastructure, pressures on the environment, trends of economic growth, social welfare and the population's quality of life. While optimum population size may be a useful theoretical concept, it is difficult to define, much less to attain, such a goal.

In deciding between these various policy options, one important type of information which we need relates to the attitudes and behaviour of individuals with respect to fertility. As socio-economic pressures continue to discourage a large family size, are an increasing number of parents choosing to have fewer than two children? If not, then the fertility rate will eventually stabilize near the replacement level. Otherwise, it is likely to drop below that level, which would result in major changes in Thailand's population growth rate and age structure.

Armed with such information, we could construct more reliable projections of fertility behaviour in the future and make predictions based on the resulting age structure and population growth rates. Aside from the general applications of such predictions, an understanding of parents' attitudes towards fertility would be particularly useful in that it would help the Thai Government to decide between fertility policy alternatives such as those discussed above. In addition, such information would be useful in formulating policies concerning the improvement of human resources and the quality of life (e.g. concerning the education system, support for the elderly, child care and health care).

Socio-cultural factors affecting the fertility decline and the end levels that eventually emerge are often neglected in conventional theories, which stress the role of mortality and modernization. However, the Thai fertility experience has shown the importance of such factors (Knodel, Chamratrithirong and Debavalya, 1987), and hence the need for socio-cultural research. For example, the status of women, which depends on the surrounding society and culture, is believed to have direct and indirect influences on the fertility level. More research is needed on this topic (Mason, 1989).

There are two basic assumptions in the socio-cultural approach. Firstly, as society evolves, there is an "incompatibility", or tension, between the traditional family and the industrialized society (Davis, 1986). This tension is borne mainly by women, who must reconcile their roles as housewives or mothers with their ever-increasing role in the workplace. Also, an industrial economy encourages competition and mobility and rewards individual achievements, whereas the concept of a family hinges on togetherness and stability. Secondly, this tension results in new behaviour as changes occur in social norms and family norms. The latter are particularly relevant to the process of fertility (Preston, 1986, cited in United Nations, 1992:61).

How does the crucial decision of whether or not to accept fewer than two children depend upon the cultural context, e.g. rural or urban residence, religion, or ethnicity? If parents do desire fewer than two children, do their attitudes about gender preference then change? How do they reconcile a decreasing number of children with the cultural expectation that they will be cared for by their children when they grow old? To answer these questions, we must study details such as the distribution of and attitudes towards family sizes, which are essential to understand these issues in order to realistically project macroscopic indicators such as TFR.

If we can find specific reasons why individuals in various segments of society do or do not intentionally

reduce their fertility, and why they select the family size they achieve, then these reasons can be addressed by specific policies. With a knowledge of the socio-cultural determinants of individual fertility decisions, one can predict, or even design, policies to influence aggregate fertility trends.

Further research should give particular attention to the status of women and its relationship with fertility. Understanding this relationship is important for designing effective human resource development programmes and family planning policies. For example, a declining fertility rate or an increasing tendency not to have children at all could cause a significant increase in the number of women who want to work, or who obtain advanced education or training so as to pursue a long-term career. Similarly, aspects of women's status, such as their autonomy and labour-force participation, are likely to affect individual decisions concerning family formation (when and whether or not to marry) and fertility behaviour, which lie at the root of the aggregate, macro-level demographic trends. The need for research on this topic has been stressed by the United Nations Population Fund (UNFPA, 1991). Moreover, future research should study newly married couples, since their attitudes and preferences will be particularly critical in determining the levels of fertility in the future and the demand for children.

Conclusion

Previous projections indicate that Thailand's fertility rate will probably approach or even fall below the replacement level in some parts of the country in the near future. In anticipation of this occurrence, the issues of population ageing and labour shortages have arisen in arguments advocating the pro-natalist approach of policy adjustments. However, there is a very long time lag before a fertility decline affects the absolute size of the elderly population, an issue usually lost sight of in arguments appealing for policies to slow population ageing. As for the issue of labour shortages, previous studies suggest that such shortages are brought about more by Thailand's rapidly growing economy and lagging education than by demographic change. Moreover, previous research also shows that the mean desired family size of married couples is still about two children. This suggests that the fertility rate is unlikely to fall below the replacement level unless there is a substantial change in the country's social and cultural context. Thus, Thailand is approaching a critical time when its long-term fertility goals and policies need to be evaluated. One important tool for designing such policies is the socio-cultural approach to investigate fertility and family formation behaviour.

Footnotes

1. According to population projections made by the National Economic and Social Development Board (NESDB) (1992), women aged 15-45 years who were estimated at 14.010 million (50.1 per cent) of the population in 1990, will increase to 17.482 million in 2010, followed by a slower rate of growth in 2011.

2. According to NESDB, Thai TFRs will be 2.03, 1.95 and 1.90 in 1995-2000, 2000-2005 and 2005-2010, respectively.

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Factors Affecting the Use of Contraception in Bangladesh: A Multivariate Analysis

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Improvement of the status of women and enhancement of contraceptive supply through visits by field workers would make the family planning programme more effective and successful

Since independence, the Government of Bangladesh has attempted to strengthen the national family planning programme through increased allocation of resources for family planning activities, extended use of the multisectoral approach, the use of mass media campaigns and the promotion of increased participation of voluntary and private agencies in the national population programme. In addition, the family planning programme has been expanded to include field workers who are trained to provide at the doorstep family planning services and information on modern contraceptive methods. The gradual process of integrating the health programme, including the family planning and maternal and child health components, began during the Second Five-Year National Development Plan (1980-1985); the aim was to achieve a reduction in fertility to the replacement level by 1990. The First Five-Year Plan (1975-1980) had focused on increasing the contraceptive prevalence rate (CPR). During that period, CPR increased from 9.6 per cent in 1975 to 14 per cent in 1980; however, the achievement fell short of the target by 21.6 percentage points. During the Second Five-Year Plan, CPR increased from 14 per cent in 1980 to 25 per cent in 1985 with the shortfall being 33 percentage points (MIS, 1981; Mitra, 1987). By 1989, CPR increased to 31 per cent, which was still far below the programme target (Huq and Cleland, 1990). Thus, neither the First nor the Second Five-Year Plans succeeded in achieving their demographic targets.

With the expansion of the family planning programme and the continuing wide gap between the set target and actual achievement of the family planning programme, there has been considerable interest in determining what factors influence couples' decision to use contraception. Several research studies in Bangladesh have revealed a number of relevant socio-economic, demographic and cultural factors. However, most studies used bivariate analysis to determine the relationship of two variables rather than multiple variables. The important questions that remains are: what is the relative importance of these different factors in relation to family planning practice? To what extent does contact with family planning workers affect contraceptive use? How important is this factor in relation to other socio-economic and demographic factors.

Using multivariate logistic regression technique, this study examines 15 socio-economic and demographic variables and assesses their relative importance in relation to current contraceptive use.

Data and methodology

This study utilizes data extracted from the 1989 Bangladesh Fertility Survey (BFS) which was conducted during the period December 1988 to April 1989 by the Bangladesh National Institute of Population Research and Training (NIPORT) with funding from the World Bank.

This national sample survey utilized a two-stage probability sample design to select a sample of 175 rural and 100 urban clusters. At the second stage, a nationally representative sample of 11,729 households was selected, of which 11,236 households (7,984 rural and 3,202 urban) were successfully interviewed. Among the successfully enumerated households, a total of 12,096 ever-married women under 50 years of age were identified as eligible for individual interviews. Of these, 11,906 women (8,467 rural and 3,439 urban) were successfully interviewed and these constituted our reference population.

The 1989 BFS used two basic questionnaires: a household questionnaire which recorded information on all household members, and an individual questionnaire which recorded detailed information on eligible women who were identified from the household questionnaires. The final individual questionnaires collected information on the respondent's fertility behaviour and intentions, knowledge and practice of contraception, and availability and accessibility of contraceptives. Information on socio-demographic characteristics, such as education, religion, husband's occupation, household assets, and modern health care practices, among others, was also collected in the individual questionnaire.

An interesting method that does not require any distributional assumptions concerning explanatory variables is Cox's linear logistic regression model (1970). That logistic regression model can be used not only to identify risk factors but also to predict the probability of success. The general logistic model expresses a qualitative dependent variable as a function of several independent variables, both qualitative

and quantitative (Fox, 1984).

If P is the probability of use of contraception, the

$$P = [1+ \exp(-ßX)]^{-1}$$

where ß is a vector of the unknown coefficient and X is a vector of covariates that affect the use of contraception. The general logistic regression model can thus be expressed as:

$$\text{Log}_e \frac{P_i}{1-P_i} = \beta X = \sum_{j=0}^{k} \beta_j X_{ji}$$

which express the log odds of current users as a linear function of the independent variables.

In this analysis, the input data were matrices tabulating the current use status of contraception by independent variables. The dependent variable is a dichotomous response variable that was assigned the value of 1 if the respondent was using any contraceptive method and 0 for not using a method. In performing stepwise the regression method for the determination of significant variables, 15 variables were initially selected for logistic regression analysis. The results are presented in the form of logit regression coefficients, odds ratios, and P values. If the odds ratio is greater than unity, the probability of being a current user is higher than that of being a non-user. The P value is used to identify the significant effects to assess the relative importance of the selected variables in the logistic regression method.

Results

Bivariate analysis

Although contraceptive use was low (31.1 per cent) among the women studied, there were significant variations in use among women with different socio-economic and demographic characteristics. Table 1 shows the results of the bivariate analysis. The current use rate was found to be directly associated with the respondents' age, number of living children and duration of marriage. However, the relationship does not seem to be linear but rather curvilinear. The level of education of both the respondents and their husbands seems to have a positive effect on the current use of contraception. Urban residents surpass rural residents in current use of contraception. The experience of child loss has a negative effect on contraceptive use. Those who do not desire additional children are more likely to be current users than those who desire additional children. Husband-wife communication also has a positive effect, showing the highest use rates among those women who took a decision about family size jointly with their husbands. With an increase in the frequency of visits by family planning workers, contraceptive use increases rather rapidly. Non-Muslims had higher current use rates than Muslim women. Administrative division also had a substantial effect on contraceptive use: a lower use rate was observed in the Chittagong division.

Table 1: Percentage of currently married women under 50 years of age currently using contraception by selected demographic and socio-economic characteristics, Bangladesh, 1989

Characteristics	No. of cases	Percentage currently using contraceptives	Chi-square (d.f.) * * *
All	10,906	31.1	
Age of respondent			
Less than 25 years	4,201	20.8	* * 342.14(2)
25-34 years	3,752	38.7	
35 or more years	2,953	36.0	
Number of living children			
No children	1,443	9.4	* * 457.64(3)
1-2	3,815	29.6	
3-4	3,055	40.3	
5 or more	2,593	34.7	
Experience of child loss			
No	4,903	36.5	* * 31.91(1)
Yes	4,766	31.0	
Sex-composition of living children			

All daughters	1,632	22.9	* * 158.23(2)
All sons	1,897	30.6	
Children of both sexes	5,934	38.8	
Duration of effective marriage			
Less than 10 years	4,446	21.9	* * 306.06(2)
10-19	3,503	39.1	
20 or more years	2,957	35.3	
Education of respondents			
No school	7,413	27.2	* * 240.78(3)
Lower primary	1,495	32.4	
Upper primary	910	39.0	
Higher	1,088	49.0	
Education of husbands			
No school	5,499	27.2	* * 150.58(3)
Lower primary	1,462	29.0	
Upper primary	889	30.1	
Higher	3,008	39.8	
Occupation of husbands			
Labourers/farmers	3,368	27.7	* * 62.39(2)
Land-owners	3,124	29.2	
Sales/service/production workers	4,075	35.7	
Religion of respondents			
Muslim	9,358	30.2	* * 21.85(1)
Non-Muslim	1,548	36.3	
Desire for additional children			
Want more	4,948	16.3	* * 283.38(1)
Want no more	4,870	30.7	
Family planning decision-making			
Husbands	2,716	17.4	* * 315.10(1)
Husbands and wives jointly	8,190	35.6	
Visits of family planning workers			
No	5,955	26.8	* * 130.65(1)
Yes	4,553	37.3	
Electricity available in the household			
No	9,394	29.4	* * 93.45(1)
Yes	1,510	41.8	
Place of residence			
Rural	10,091	29.8	* * 109.11(1)
Urban	815	47.4	
Administrative division			
Chittagong	2,662	20.9	* * 201.99(3)
Dhaka	3,326	31.5	
Khulna	2,305	34.1	
Rajshahi	2,613	38.3	

Notes: * * * = degrees of freedom.
* * = $p < .01$
* = $p < .05$

Multivariate analysis

Logistic regression analysis shows that the significant variables are the respondents' level of education, participation in family planning decision-making, the administrative division where they live, their desire for additional children, frequency of visits by family planning workers, occupation of husbands, experience

of child loss, sex composition of living children, place of residence, duration of effective marriage, age of respondents, and availability of electricity in the households. The remaining explanatory variables, namely the number of living children, religion of respondents and education of husbands, do not seem to have significant independent effects on the current use of contraception.

The effect of the respondents' education on current contraceptive use was found to be the most important one. In the 1989 BFS, the women with the highest level of education (secondary and higher level) were almost three times as likely to practise contraception as those who had no education (table 2). As expected, education increases receptivity to "new technologies", including awareness and use of contraception. Educated women also may desire fewer children than their less educated counterparts because of the incompatibility between formal-sector employment and child care (Choe and Tsuya, 1991).

Table 2: Logistic regression of current use of contraception on some selected demographic and socio-economic factors among currently married women under 50 years of age, Bangladesh, 1989

Variables	Logistic coefficient (ß)	Odds ratio	P value
Education of respondents			
(No school)	-	1.000	-
Lower primary	.385	1.470	.000
Upper primary	.660	1.934	.000
Higher	1.062	2.892	.000
Family planning decision-making			
(Husbands)	-	1.000	-
Husband and wives jointly	.763	2.145	.000
Administrative division			
(Chittagong)	-	1.000	-
Dhaka	.325	1.383	.000
Khulna	.550	1.732	.000
Rajshahi	.684	1.982	.000
Desire for additional children			
(Want more)	-	1.000	-
Want no more	.614	1.848	.000
Visits of family planning workers	.218	-	.000
Occupation of husbands			
(Laboures/farmers)	-	1.000	-
Land-owners	.392	1.480	.000
Sales/service/production workers	.484	1.623	.000
Experience of child loss	-.127	-	.000
Sex composition of living children			
(All daughters)	-	1.000	-
All sons	.165	1.180	.074
Mixed children	.379	1.461	.000
Place of residence			
(Rural)	-	1.000	-
Urban	.429	1.535	.000
Duration of effective marriage	-.048	-	.000
Age of respondents	.033	-	.018
Electricity in the household			
(No)	-	1.000	-
Yes	.202	1.224	.021
Constant	-3.670	-	.000
Model chi-square	1088.751		
Degrees of freedom (d.f.)	18		
Probability	.000		

Note: Reference category is in parentheses.

The results also indicate that husband-wife communication about family planning decision-making has a net significant effect on current use. Couples who discussed family size matters were more likely to be current users of contraceptives, the odds being 2.1 times higher for such couples compared with those who did not discuss family planning methods among themselves. The analysis further shows that region of residence plays an important role in current use. The odds ratio for the administrative division shows that the chance of women from Rajshahi division being a contraceptive user is almost twice (1.98) as high as that of women from Chittagong division. (For a discussion of reasons for difference, see p. 42.)

The results suggest that desire for additional children also plays an important role in the dicision-making process concerning contraceptive use. The multivariate analysis indicates that the probability of being a current contraceptive user is also almost twice (1.84) as high among women who did not want more children compared with those who did want more.

The logistic regression analysis shows that frequency of visits of family planning workers is significantly and positively related to current use of contraceptive methods. It is likely that the visits of family planning workers provide opportunities to motivate women by providing them with counselling on family planning methods and family planning services, and distributing supplies on a widespread scale increases their availability (Muhury and Islam, 1985; Kabir and others, 1988).

Husband's occupation also has a significant net effect on the current use of contraceptives. The highest use prevalence was found among sales/service employees, followed by land-owners and agricultural labourers.

The experience of child loss also has a significant independent effect on the current use of contraception. The negative sign of the regression coefficient (ß) suggests that, with every increase in the number of children lost, current use of contraceptives decreases among currently married women.

The prevalence of current contraceptive use varies with the sex-composition of living children. Couples who have only daughters are less receptive to the idea of family planning and contraceptive use than their counterparts who have at least one son in addition to daughters.

As expected, there is a significant relationship between the place of residence and current use. Urban areas in Bangladesh are often associated with higher education, better access to medical care as well as family planning and other social services. Consequently, rates of contraceptive use are expected to be higher in urban than in rural areas (Oni and McCarthy, 1986). Our analysis confirms that the chance of urban women being users of contraception were almost one and a half times higher than that of rural women.

Among other factors, duration of marriage of the respondent emerged as one of the important determinants of current use of contraceptives. A negative relationship between this factor and contraceptive use indicates that women whose marriage was of a shorter duration were more likely to be using contraceptives than women whose marriage duration was longer.

The age of the respondent was the last important variable to contribute positively to the current use of contraceptives: relatively higher prevalence rates were found among older women who had probably attained their desired family size (Lassner and others, 1986).

Discussion

This study examines the use of contraception among currently married women of reproductive age in Bangladesh, with particular focus on the extent to which socio-economic and demographic factors exert independent influence on contraceptive use. It appears from the present study that, while knowledge of family planning has been conveyed to the majority of couples in Bangladesh, the current rate of contraceptive use in Bangladesh is still low (31.1 per cent) among the younger and low parity women whose reproductive behaviour needs to be modified if any significant change is to be made in the population growth rate.

With regard to the selected demographic and socio-economic factors related to contraceptive use, the results from the 1989 Bangladesh Fertility Survey (BFS) support the hypothesis that women's education is the most important factor; it is followed in importance by women's participation in family planning decision-making. Both influence the current use of contraception positively. Administrative division, desire for additional children and visits of family planning workers have emerged as successively important factors. All were found to be significantly and positively associated with the current use of contraception.

Husband's occupation also shows a strong association. Child loss was found to be negatively associated with current use of contraception. Sex-composition of living children comes as the next significant variable. The positive sign of the regression coefficient (ß) corresponding to the variable place of residence shows that urbanized women are more likely to practise contraception as compared with their rural counterparts. The negative sign of the ß coefficient corresponding to the respondent's marriage duration indicates decreased use of contraception as marriage duration increases. Although the age of the respondent and the availability of electricity in the household are also significant in terms of contraceptive use, they are less importantly so. Among the demographic and socio-economic factors, the number of living children, the religion of the respondents and the education of husbands were not found to have any significant net effect on current use of contraception.

The findings have important policy implications. They suggest that husband-wife discussion about family planning and a more equal status relationship between husband and wife are important intervening variables through which demographic and socio-economic factors affect fertility. In most families in Bangladesh, the husband's consent is required before his wife can accept a contraceptive method. Many women are afraid or unwilling to discuss with their husbands about limiting the size of their families. Efforts should be made, therefore, to encourage greater participation of women in all family decisions. Women should also be informed about their rights and privileges as well as about family law. Higher levels of education and wider employment opportunities for women as well as higher family socio-economic status may directly influence egalitarian decision-making in family life, leading in turn to more effective contraceptive use. This study found a persistent, strong relationship between women's education and contraceptive use, but education makes less difference to contraceptive use where family planning programmes are strong. The survey data documented the contribution of health and family planning field workers in rural areas of the country and the commercial sections in urban areas as sources of non-clinical methods. A more systematic approach to family planning service delivery programmes could increase contraceptive prevalence rates in Bangladesh. Improvement of the status of women in the family and society in general, and enhancement of contraceptive supply through visits by field workers to the couple's home in particular would make the Bangladesh family planning programme more effective and successful.

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Factors Influencing Child Mortality in Bangladesh and Their Implications for the National Health Programme

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The Government should consider strategies to reduce poverty,expand schooling, particularly for girls, and help to strengthen women's ability to care for their families

Infant mortality, that is mortality during the first year of life, is an important indicator for describing the overall social and economic well-being of a country. Infant and child mortality in Bangladesh has long been a topic of interest to population researchers because of its apparent relationship with fertility and indirectly with the acceptance of modern contraception. The 1989 Bangladesh Fertility Survey (BFS) collected birth history data from which direct estimates of infant and child mortality levels and age patterns can be obtained. Analysis of the 1989 BFS maternity history data shows a decline in infant mortality between 1975 and 1989. Analysis of birth history data, which show erratic fluctuations that may be attributed to sampling fluctuations, indicate that the underlying levels of infant mortality between 1980 and 1984 appear to be about 121-125 infant deaths per thousand births (Huq and Cleland, 1990; Kabir and Chowdhury, 1992; Kantner and Noor, 1991). Following the year 1985, there was a sharp fall in infant mortality. A key question is whether this downward trend in infant mortality is genuine or also reflects data errors. By contrast, child mortality remains very high although a decline is also evident.

According to the 1989 BFS, infant mortality was in the neighbourhood of 100 deaths per thousand live births (Kabir and Chowdhury, 1992). The decline in mortality may be attributed to the Government's efforts to implement a public health programme, including the immunization of children. Successive five-year national development plans have been emphasizing reductions in infant and child mortality, with varying targets. This emphasis has been reflected in increased budgetary allocations for the health sector as well as the development of the infrastructure at the lowest administrative level, such as health and family welfare centres, and the establishment of satellite clinics in outreach areas. In addition, a large number non-governmental organizations (NGOs) have also been active in the areas of health and family planning.

However, despite all these efforts, health care facilities in Bangladesh remain limited and inadequate; besides a lack of health personnel, medicines and other facilities are not uniformly available. Mortality differentials clearly emerge according to the type of place of residence, i.e. urban mortality is lower than rural mortality, which may be attributed to the differential accessibility and availability of health services. In addition, social and economic factors such as the mother's education, the father's occupation and the family's economic condition are strong correlates of infant and child mortality.

Besides the data obtained from the 1989 BFS, a number of contraceptive prevalence surveys (CPS) were conducted between 1975 and 1991. Each of these surveys also provides data that can be used for the indirect estimation of levels and trends of infant and child mortality from the survival status of the children. They also enable the study of correlates of infant and child mortality.

The methodology used in this study for examining the determinants of child mortality was developed by the United Nations (United Nations, 1991). It was developed in order to improve understanding of socio-economic mortality differentials, with a view to helping Governments of developing countries to design policies aimed at reducing mortality inequalities among all population groups within their countries. The present article represents application of the methodology to assess the situation in Bangladesh. The methodology was first tested in six other countries: Costa Rica, Honduras and Paraguay in Latin America; Jordan in the Middle East; Kenya in Africa; and Thailand in Asia. These countries represent a wide range of mortality levels and levels of development. For all six countries tested, the period under review extended from the late 1960s or early 1970s to the late 1970s. During that period, substantial declines in child mortality were observed in all the countries, even though the level of mortality and the pace of the decline varied from case to case. Among the six countries, the highest levels of mortality were observed in Honduras and Kenya, with probabilities of dying by five years of age as estimated for that study, of 149 per thousand around 1974 in Kenya and 117 per thousand around 1979 in Honduras. The lowest level was observed in Costa Rica, where child mortality was estimated to be 23 per thousand around 1979. During the 1970s, the pace of economic development in the six countries varied but, in general, the levels of

economic and social development increased, as attested by the higher educational levels for the populations of those countries, better material living conditions and better nutrition.

Trends in infant mortality

Table 1 shows infant and child mortality rates in Bangladesh estimated from various sources, which differ significantly. Since there is no vital registration system in Bangladesh, estimates of infant and child mortality are dependent on retrospective information on child survival. In 1980, the Government introduced a sample vital registration system; however, very little is known about the quality and completeness of the sample data collected.

A close investigation of the available information on childhood mortality suggests that it has been declining, but the overall level is difficult to establish because the estimates vary considerably from one survey to another. Similarly, infant mortality estimates also vary, although a declining trend in infant mortality is evident from the information. It can be argued that the mortality of children under five years of age declined from 250 per thousand births in the mid-1970s to about 200 per thousand births in the late 1980s. Similarly, infant mortality declined from 150 per thousand births in the mid-1970s to about 100 per thousand births in 1989. Examination of the information reveals that infant mortality has been declining at a faster rate than child mortality.

Table 1: Proportions of children dead by age of women; data obtained from different sources

Age<	1974 BRSFM<	1976 BFS<	1982 DSS<	1983 CPS<	1985 CPS<	1987 DMTS<	1989 CPS<	1989 BFS<	1991 CPS<
15-19<	.186<	.233<	.184<	.192<	.249<	.149<	.164<	.150<	.139<
20-24<	.204<	.217<	.209<	.192<	.205<	.172<	.153<	.162<	.143<
25-29<	.213<	.214<	.241<	.201<	.195<	.200<	.179<	.175<	.158<
30-34<	.228<	.246<	.274<	.221<	.240<	.216<	.191<	.199<	.192<
35-39<	.240<	.254<	.287<	.242<	.256<	.242<	.220<	.215<	.201<
40-44<	.263<	.282<	.326<	.273<	.262<	.242<	.229<	.235<	.226<
45-49<	.284<	.299<	.360<	.268<	.294<	.289<	.265<	.265<	.252<

Note: **BFS< = Bangladesh Fertility Survey<**
BRSFM< = Bangladesh Retrospective Survey of Fertility and Mortality<
CPS< = Contraceptive Prevalence Survey<
DMTS< = Diarrhoeal Morbidity and Treatment Survey<
DSS< = Demographic Surveillance System<

Proximate determinants of child survival

Various factors influence the levels of infant and child mortality. For instance, childhood illness and death are much higher in the poorer strata of society. Illiteracy of mothers, culturally determined attitudes with respect to health and medical care, lack of basic knowledge and awareness of health problems, poverty and the inaccessibility of health facilities, all contribute to these high rates. Education of women, awareness of the importance of hygiene, the use of techniques such as oral rehydration therapy (ORT) in managing diarrhoea, and the importance of timely immunization are factors that could save the lives of many children. Research on infant mortality is increasingly oriented towards the measurement of the direct and indirect effects of different socio-economic variables and the interpretation of specific relationships. Numerous factors are correlates of infant survival (Mosley and Chen, 1984). In terms of these effects, the factors that have received the most attention are maternal education, sanitation, access to safe drinking water and maternal and child health care services. Various studies conducted in recent years have demonstrated that improved sanitary conditions and access to safe drinking water are important factors contributing to a decline in infant mortality (Martin and others, 1983; Peterson, 1986; DaVanzo and Habicht, 1986). In addition, the nutritional status of children is also an important determinant of child survival. Owing to widespread malnutrition, children in developing countries frequently suffer from diseases such as diarrhoea, among others.

Demographic factors

Infant and child mortality are also affected by birth order, the sex of the child, and length of interval between births. Child mortality shows different levels by birth order: starting high, then falling and rising again. Nutrition and economic factors may explain the differential mortality by birth order. A mother's poor health and poor nutritional status may also have post-natal consequences, such as impaired lactation (Retherford, 1989) and render her unable to give adequate care to her children. The 1989 BFS data show that infant mortality is higher for boys than for girls, but child mortality is lower for boys (Huq and Cleland, 1990; Kabir and Chowdhury, 1992). However, this is not always the case. D'Souza and others (1980) and Chen and his colleagues (1981) showed from data obtained by the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) that, in the neonatal period, male mortality exceeds female mortality, a sex differential consistent with the higher biological risks faced by male children. During the post-neonatal period and childhood (1-4 years), the pattern is reversed, with female death rates exceeding those for males. The lower mortality among boys has been attributed to the better care they receive compared with girls in terms of the distribution of food and preference for health care when they become ill (Chen and others, 1981).

Many studies have demonstrated increased mortality risks among children born after short birth intervals (Hobcraft and others, 1985). Maternal depletion is often cited as the primary mechanism responsible for the adverse effects of short birth intervals. Women with short intervals between two pregnancies have insufficient time to restore their nutritional reserves, a situation which is thought to adversely affect fetal growth. Competition among siblings is considered a plausible mechanism in the association between birth intervals and child survival: the newborn child has to complete with another young sibling for household resources and mother's care. The situation may have a bearing on the nutrition of the youngest child (Winikoff, 1983; Boerma and others, 1992). First-born children of very young mothers are at risk of dying while infants because of their mother's physical immaturity (Gubhaju, 1986). Also infants born to mothers who have experienced losing a child are at greater risk of dying while infants (Cleland and van Ginneken, 1988). Similarly, infants born to mothers who are less than 19 years of age, or 35 or more years of age are also at higher risk of dying while infants (Galway and others, 1987). Breast-feeding could potentially be a confounding factor, since it affects both child survival and the length of the birth interval. Children with short preceding birth intervals are less likely than others to have ever been breast-fed (Retherford, 1989).

Social and economic factors

Infant and child mortality levels also show substantial differences according to the social and economic characteristics of the population. Religious differentials in mortality have been confirmed in many societies. The 1989 BFS data show that Muslims have a lower child mortality rate than Hindus in Bangladesh. The level of the mother's education shows a distinct influence on infant and child mortality, the rates being lower for mothers with some schooling. This phenomenon may be attributed to children of educated mothers enjoying better diets and better overall care than the children of non-educated mothers (Bairagi, 1980). This is consistent with the view that factors such as nutrition and hygiene, which are related to the education and socio-economic status of the parents, are important determinants of child survival. Gender differentials in infant and child mortality are associated with cultural values (Chen and others, 1981).

Data and methods

Using the 1989 BFS data, infant and child mortality rates were estimated from child survivorship data using an indirect method. Direct estimates of infant and child mortality were also derived from maternity history data to assess consistency and to arrive at reasonable conclusions concerning the levels and trends of infant and child mortality. The Brass method estimates q_x, i.e. the probability of a child dying between birth and exact age x, from the proportion of children dead among those ever born to women in different age groups by allowing for differing exposures to the risk of dying (Brass, 1964). On average, the older the woman, the longer would be the amount of time that would have elapsed since her children had been born and the greater would be their exposure to the risk of dying (United Nations, 1983). For the age pattern of mortality, the United Nations South Asian Model Life-Table was used, along with multiple regression analysis for the determinants of child mortality (United Nations, 1991). The regression model expresses child mortality as a linear function of a set of explanatory variables. The dependent variable, mortality in the first years of life, is represented by the indicator, *M*, of the mortality of each woman's children in relation to the national mortality level, standardized by the duration of exposure to risk.

The independent variables refer to the type of place and region of residence, duration of the mother's and father's schooling, father's occupation, living conditions and access to potable water, lavatory facilities etc. and cultural characteristics, such as ethnicity and religion. These variables are often indicators of a number of possible determinants of child mortality that are not directly observed because of the limitations of the

data sources. As a result, potentially important factors, acting at the community, household or individual level, are not included in the model. This model thus remains limited, even though it does provide useful guidance in the study of determinants of child mortality.

The form of the regression equation is:

$$M = a + \sum_{k=1}^{K} \sum_{j=1}^{J_k-1} b_{jk} X_{jk} + e \quad ,$$

where M =mortality indicator;

a = regression constant;

b_{jk} = regression coefficients of category j of variable k;

X_{jk} = independent variable, representing category j of variable k;

J_k = total number of categories of variable k;

K = total number of variables;

e = error term.

M is a continuous variable with a mean of approximately one, while all independent variables are categorical. In this study, the model is estimated using the ordinary least squares regression technique. In the regression model, each woman is weighted by the number of her children ever born; thus, the child, and not the woman, is treated as the unit of analysis. The mortality indicator M, which is the dependent variable in the model, is obtained for each woman with at least one live birth. It represents the mortality of each woman's children in relation to the national mortality level, standardized by the duration of exposure to risk.

For each woman in the sample, the data set provides information on the number of children ever born and the number of children who had died. Thus, the proportion of children dead among those ever born can be calculated for each woman. For a large group of women, the proportion dead of children ever born is mainly a function of two factors: the underlying level (and to some extent the age pattern) of child mortality; and the children's average exposure to risk of dying (and to some extent its distribution). Exposure can be taken into account by classifying women by age group or duration of marriage, thus making it possible to relate the proportions dead to the probabilities of dying in childhood. It is this principle that underlies the well-known Brass method for estimating child mortality from the proportions dead among children ever born (Brass, 1964; United Nations, 1983).

Trussell and Preston (1982) proposed using this process in reverse for studying the correlates of child mortality using individual-level data. Given estimates of probabilities of dying in childhood, generally obtained from an aggregate-level analysis of proportions dead among children ever born, the Brass procedure is used in reverse to estimate, for each age group or duration of marriage, an expected proportion who had died among the children ever born. This proportion is thus standardized for the average exposure to risk of the children of mothers in the group, given the overall estimates of child mortality risks. For each woman, an expected number of children dead is calculated by multiplying her parity by the standard proportion dead for her exposure group.

The mortality indicator M is then calculated as the ratio of the actual number of dead children a woman reported divided by the expected number for her exposure group. Thus, for each woman, i, the mortality level, M_i, can be expressed as:

$$M_i(e) = PD^0 i(e)/PD^e(e)$$

where $PD^0 i(e)$ = the observed proportion of children dead for woman i, in exposure group e. This is obtained by dividing her number of children dead by total number of live births.

$PD^e(e)$ = the expected proportion of children dead for a woman in exposure group e if her children's mortality conformed to the national level. The expected proportion of children dead is obtained by applying in reverse the Brass procedure for estimating probabilities of dying from the average proportions:

$$PD^e(e) = q_s(a)/k$$

where q_s *(a)* = the standard probability of dying from birth until age *a* of a model life-table (here the South Asian Model Life-Table) selected to represent the level and structure of mortality by age of the population studied.

k = the multiplier for converting, in the Brass method, the proportion of children dead into probabilities of dying. Each *k* is specific to an exposure group of the women and to age of the children.

Results

Table 1 shows the proportions of children dead by the age of women for various survey years. Although these data are subject to various types of error, there is a declining trend in the proportions of children dead over time. Results from the direct and indirect estimation (table 2) indicate that direct estimates are lower than the indirect estimates. Indirect estimates obtained from the 1989 BFS imply that infant mortality was in the range of 121-127 per thousand births during the period 1980-1986. The 1975 BFS data estimated infant mortality in the neighbourhood of 150 per thousand births (table 1). This result indicates that infant mortality has been declining since 1975. Between 1975 and 1989 both infant and child mortality have fallen substantially (BFS, 1975; BFS; 1989; Huq and others, 1990). On the basis of these results and comparison of the CPS and ICDDR,B data with the BFS data, it can be reasonably concluded that infant mortality was high in the early 1980s, presumably in the range of 121-125 infant deaths per thousand live births. The current level of infant mortality is in the neighbourhood of 100 deaths per thousand live births. The fall in infant mortality may be attributed to the large-scale immunization of children from the early 1980s, development of the health infrastructure at the grassroots level and increased awareness of health care issues among the population through the intervention of mass communications channels.

Table 2: Infant and child mortality estimates from various sources: Bangladesh

Year<	**Source<**	**Method<**	**Infant mortality ($_1q_0$) per 1000<**	**Child mortality ($_5q_0$) per 1000<**
1951<	Census<	Indirect<	168<	-<
1962-1965<	PGE<	Direct<	144<	-<
1969-1970<	Impact survey<	Indirect<	152<	-<
1974<	BRSFM<	Indirect<	153<	250<
1975<	BFS<	Indirect<	153<	245<
1983<	CPS<	Indirect<	140<	227<
1985<	CPS<	Indirect<	147<	240<
1987<	DMTS<	Indirect<	137<	222<
1989<	CPS<	Indirect<	124<	196<
1989<	BFS<	Indirect<	128<	200<
1989<	BFS<	Direct<	100<	175<
1991<	CPS<	Indirect<	123<	124<

Notes:< For abbreviation, see table 1; PGE = Population Growth Estimation. The estimates of infant and child mortality were taken from various sources: Kantner and Noor, 1991, table 8; Mitra and Associates, 1988, table 14; Kabir and Chowdhury, 1992, tables 7.4 and 7.7; and Hill and others, 1987, table 6.<

Table 3: Estimated infant and child mortality based on reported proportion dead: Bangladesh Fertility Survey, 1989

		Indirect<		**Direct<**	
Age (X)<	Probability of dying before age X<	Equivalent infant mortality (per 1,000)<	Reference year<	Infant mortality (per 1,000)<	Year<
3<	.176<	127<	1986<	102<	1986<
5<	.205<	123<	1984<	114<	1985<
10<	.223<	128<	1982<	121<	1984<
15<	.240<	130<	1980<	128<	1983<
				129<	1982<
				124<	1981<

127< 1980<

Multivariate analysis

Multiple regression analysis was used to identify the determinants of infant and child mortality (United Nations, 1991). The independent variables which influence infant and child mortality are mother's and father's education, father's occupation, place of residence, region of residence, religion, availability of water, sanitary facilities and practice of personal hygiene. These variables were chosen because they are similar to the variables used in the analysis of the previously referred to United Nations study. They would help in understanding the relative contribution of the regression coefficients and their effects in the context of the other countries studied. The use of multivariate regression analysis makes it possible to study the mortality risks associated with each variable independently of the influence of all other variables. The regression coefficients reflect the excess mortality of a given category in relation to the reference category of a variable, once the effects of all other variables are controlled.

Table 4 shows the regression coefficients for the categories of variable studied. Parental education was found to have a major influence on child mortality. With respect to the education level of parents, the relative risk of children dying is high when the mother and father are illiterate. The risk is low for children whose parents were educated at the primary and higher levels. Similarly, children of white-collar workers have a lower risk of mortality. The regression coefficients by type of place of residence show rural-urban differentials. Once other effects are controlled, Rajshahi and Khulna are shown to have lower mortality than Chittagong and Dhaka. Religious differentials appear to be low and not significant; however, there is an indication that child mortality was higher among Mulsim families in this context.

Living conditions, especially water supply and sanitary conditions, directly affect contamination of the household environment and thus may facilitate the dissemination and incidence of various infectious diseases, particularly diarrhoea. The likelihood of contracting certain diseases and the persistence of those diseases are directly associated with the material conditions of life in which the child is born. Adequate housing, safe drinking water within the dwelling and good sanitary facilities favour the creation of a hygienic environment, which helps to prevent disease and enables the child to survive.

The results of the regression coefficients indicate that access to tube-well water is associated with low mortality risks. Similarly, households with sanitary latrines have lower risks of child mortality. For instance, if we assume that the infant mortality of the population is 100 per thousand births, while controlling the effects of other variables, the child mortality level of the households with access to sanitary latrines would be 25 per cent lower than that of households with no access to such facilities. Washing of the hands with soap, or mud or ash after using the latrine is also associated with lower risk of mortality. In controlling the effects of the other variables, child mortality would be about 12 per cent lower if the household members used water and soap, mud or ash after using the latrines than for those who use water only.

Table 4: Multivariate regression analysis of child mortality by socio-economic characteristics, Bangladesh, 1989

Socio-economic characteristics<	**Coefficient<**
Mother's education<	
No education<	.2549 * <
1-3 years<	.2026 * <
4-5 years<	.1106 * <
Father's education<	
No education<	.2352 * <
1-3 years<	.2617 * <
4-5 years<	.1342 * <
6-8 years<	.1369 * <
Father's occupation<	
Production worker<	-.0402<
Non-agricultural labourer<	.0217<
Agricultural labourer<	.0374<
Sales/services<	-.0621 * <
Agriculture<	-.0483 * <

Religion<	
Muslim<	.0519<
Hindu<	.0437<
Type of place of residence<	
Urban<	.0675 * <
Rural<	.1080 * <
Region of residence<	
Rajshahi<	-.0471 * <
Khulna<	-.0444 * <
Dhaka<	-.0132 * <
Chittagong<	-.0084<
Household water supply<	
Piped outside<	.0524<
Tube-well<	-.0075<
Pond/river<	.0233<
Household toilet<	
Sanitary latrine<	.0707<
Other latrine<	.1581 * <
Open toilet/other place<	.1464 * <
Wash after using toilet<	
Water only<	.1234 * <
Water plus soap, mud or ash<	.1080 * <
Other<	.8269 * <
Constant<	.2987 * <
M<	.9970<
R^2<	.0405<

Note: * = Significant at p.001. Discussion

Mosley and Chen (1984) found that the major determinants of child survival are the proximate variables. The education of mothers is one of the strongest correlates of infant and child mortality because education provides women with decision-making power, making them more aware of their children's welfare, and increasing their knowledge about childhood diseases and their ability to understand illness and provide timely treatment (Cleland and van Ginnaken, 1988).

Multivariate regression analysis shows that parents' education, father's occupation, source of water and sanitary conditions are associated with risks of child mortality.

The application of the United Nations methodology to other developing countries in the previously mentioned study, namely Costa Rica, Honduras, Jordan and Thailand, also indicates that, besides the aforementioned socio-economic factors, the important determinants of child mortality were expansion of the public health system, mainly as a result of implementing a programme of primary health care; access to safe drinking water; the presence of sanitary facilities and good quality housing.

The results of the regression analysis also show that both water supply and availability of sanitary facilities have a strong association with child mortality, even after controlling for the effects of the socio-economic and geographical variables. The regression analysis suggests that the most important factors are the source of water supply and availability of safe drinking water. The availability of sanitation in a household is strongly associated with gains in infant survival, especially child survival, even after controlling for a number of socio-economic factors. Health interventions such as immunization programmes might have had an effect on lowering infant and child mortality in Bangladesh in recent years. However, although the existence of health services may have brought about a lowering of the mortality rate, the use of such services remains subject to various cultural and other biases that are likely to exist within a society.

Summary and conclusion

Analysis of child survivorship data from the 1989 BFS suggests that substantial reductions in infant mortality occurred between 1975 and 1989. During this period, child mortality also declined but the decline

in infant mortality was faster than that of child mortality. The level of infant mortality was in the neighbourhood of 100 per thousand live births while child mortality was about 200 per thousand live births in 1989 (table 2). Analysis of children born in different birth cohorts also supports evidence of a reduction in child mortality from the mid-1970s (Kabir and Chowdhury, 1992). The introduction of public health measures, particularly clean water, sanitation and immunization, certainly contributed to the decline in child mortality in Bangladesh.

With a view to achieving a steady decline in infant and child mortality, particularly among certain socially and economically disadvantaged groups, basic facilities such as access to safe drinking water and sanitary facilities must be developed in addition to the provision of direct health care activities. The need for health care services starts at pregnancy. Pre-natal care, the conditions surrounding the delivery of a child and type of person attending the delivery are all associated with risks to maternal and child health and survival. Untrained birth attendants and unsanitary deliveries can put the new-born child at risk. These are commonly reported reasons for high infant mortality at the neonatal stage. Thus, policies aimed at improving the availability and accessibility of primary health care services, such as immunization, ante-natal care for pregnant mothers and family planning services, coupled with health education for rural residents would in all likelihood lead to major improvements in child survival in the near future.

Policies to expand educational opportunities, particularly for girls, would increase the access of people to information and improve their ability to make good use of it in order to lead healthier lives. The same goes for policies that work to ensure effective and accessible health services for all. Because people's ability to improve their health depends so much on economic conditions and education, the policy implications are clear: the Government should consider strategies to reduce poverty, expand schooling (particularly for girls), and help to strengthen women's ability to care for their families.

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Does the Gender of the Child Affect Acceptance of the One-child Certificate? The Case of Shaanxi Province, China * (Demographers' Notebook)

By Jingshan You *

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Since the late 1970s, the Chinese Government has promoted the "one couple, one child" population policy to slow the rate of population growth. Couples with one child are encouraged to apply for a one-child certificate that is offered nationwide for those applicants who have signed a contract with a local family planning agency promising to have only one child. In return, they receive a monetary bonus and preferential assignment of housing and employment. Chen (1985:55) found that a total of 42 per cent of women with one child in the 1982 One-per-Thousand Population Fertility Sampling Survey had obtained a certificate; 78 per cent of those were in urban areas and 31 per cent resided in rural areas.

Persistent son preference in China is a manifestation of the strong Confucian influence that exists among Chinese families despite attempts to reduce it. Even before family planning programmes were introduced in China, son preference was evident in the better care and higher education received by sons as compared with daughters. After the introduction of family planning, especially the one-child per family campaign, conflicts between individual and social interests emerged. Most families wanted to have at least one son, but were requested to restrict their family size regardless of its sex composition. Although the Government's population policy has been remarkably successful in overriding the effects of socio-economic factors on fertility, it has been unable to eliminate son preference and persuade the majority to accept the one-child certificate. People continue to achieve their preferred family sex composition despite the "one-child policy". Son preference thus has a negative impact on the population control goal. Ching (1982:209) found that about two-thirds of the one-child certificate holders in 1981 had a boy.

Despite this, the one-child certificate has proved to be an effective method for encouraging the one-child family (Ching, 1982:209). Those who accept the one-child certificate gain specified benefits, while those who have more than one child face financial and social penalties. In addition, the one-child certificate is a psychological disincentive that helps to discourage people from having more children. The policy is carried out by ideological education (persuasion), supplemented by economic and administrative incentives and disincentives.

Previous studies have indicated a strong son preference among Chinese parents (Ching, 1982:210; Arnold and Liu, 1986:221). Wen (1992:38) documented a strong son preference at high birth orders which persisted even during the period when the family planning programme was being strongly implemented in Shaanxi Province. However, few studies have focused on gender preference and the one-child programme. Does the gender of the child affect acceptance of the one-child certificate and contraception? If it does, to what extent? If it does not, why? These are the issues explored in this study.

Data and methods

Data for this study were collected during the 1988 Two-per-Thousand National Fertility Survey in Shaanxi Province. The survey was conducted by the Chinese State Family Planning Committee in collaboration with the National Bureau of Statistics and National Planning Committee. Two types of questionnaire were used: one for households, the other for individuals. The household questionnaire recorded all members of the selected households who were in the house on the day before the interview. Information obtained included household members' religion, migration, marriage status, deaths in the household since 1981, and one-child certificate status. The questionnaire for individuals, which covered all ever-married women aged 15-57, included information on reproduction, contraception and breast-feeding. The survey adopted stratified, systematic, random-cluster sampling procedures, with villager groups, residence groups and institutional households as the sampling units. A total of 13,466 units were sampled nationally, distributed over 95 per cent of China's 2,707 counties. A total of 485,235 households and 2,151,212 persons were surveyed, accounting for about two per thousand of China's total population.

A 10 per cent sample of the data for Shaanxi Province was used in this study, the sample size being 7,495. The target population comprised couples who had one child, where the women were aged 15-49 years. A total of 332 households fell into this category. More than 70 per cent of women had married after 1979, that is, after the one-child family campaign had begun. Nearly 90 per cent of the women below 35 years of age were interviewed during the survey.

Multiple classification analysis (MCA) was used to analyse the association between acceptance of the one-child certificate, as the dependent variable, and the gender of the child, place of residence, age of the child, mother's education and age, as independent variables.

Results

Certificate status by the child's gender and residence

A significant association was found between acceptance of the one-child certificate and rural-urban residence; 11 per cent of rural residents and 62 per cent of urban residents, respectively, accepted the one-child certificate.

Approximately 30 per cent of couples who had a boy were certificate holders, compared with 20 per cent of those who had a girl. The sex ratio of one-child certificate holders was 159 compared with 97 for non-certificate holders. It has been suggested that rural-urban status plays an important role in the acceptance of the one-child certificate (Goodstart, 1982:37). After controlling for rural-urban residence, the sex ratio of the certificate holders was found to be much higher for rural couples than for urban couples, suggesting that couples who had a boy were more likely to accept the certificate than those who had a girl. However, there was no statistically significant difference between the child's gender and certificate-holding in either rural or urban areas.

Table 1: One-child certificate status by gender of child and selected characteristics, Shaanxi Province, 1988 (percentage)

	Holder	**Non-holder**	**Total (N)**
Residence			
Rural	11	89	100 (244)
Urban	62	38	100 (88)
Chi-square = 87 *		degrees of freedom = 1	
Gender and residence			
Total			
Boy	29	71	100 (175)
Girl	20	80	100 (157)
Chi-square = 3.8		degrees of freedom = 1	
Rural			
Boy	15	85	100 (123)
Girl	8	92	100 (121)
Chi-square = 2.4		degrees of freedom = 1	
Urban			
Boy	64	36	100 (52)
Girl	61	39	100 (36)
Chi-square = 0.05		degrees of freedom = 1	
Year of child's birth and residence			
Total			
1984-1988	14	86	100 (232)
1970-1983	53	47	100 (95)
Chi-square = 34 *		degrees of freedom = 2	
Rural			
1984-1988	4	96	100 (190)
1970-1983	41	59	100 (49)
Chi-square = 52 *		degrees of freedom = 2	
Urban			

1984-1988	60	40	100 (42)
1970-1983	65	35	100 (46)
Chi-square = 0.3		degrees of freedom = 1	
Mother's education			
Senior school	49	51	100 (83)
Junior school	25	75	100 (134)
Primary school	6	94	100 (70)
Illiterate	9	91	100 (45)
Chi-square = 46 *		degrees of freedom = 3	
Mother's age			
24 and below	4	96	100 (114)
25-29	27	73	100 (112)
30-34	47	53	100 (58)
35+	44	56	100 (48)
Chi-square = 49 *		degrees of freedom = 3	

Source: China 1988 fertility and contraceptive data tape, Shaanxi Province.

Note: * = The association between the independent variable and acceptance of the one-child certificate is statistically significant at the $p<0.001$ level.

Certificate status by mother's age and education status

Women's age is one of the most important factors among the intermediate variables affecting fertility (Bongaarts, 1983). Women who have had their first birth at younger ages are likely to have a subsequent child more rapidly, resulting in a larger family for these women than for those who start their reproductive career at older ages. Easterlin (1979) and Cochrane (1983) have argued that high educational attainment for women is associated with fertility delay and higher contraceptive prevalence rates. Analysis of the Shaanxi data also indicated that mother's age and education were both positively related to acceptance of the one-child certificate. The relationship was statistically significant at the $p < 0.001$ level.

Certificate status by the gender of child and the year of the child's birth

The one-child family campaign began in late 1979. After four years of enforcement and much controversy, in early 1984, "important but little-noticed changes had occurred" (Greenghalgh, 1986:491). The modified one-child policy allowed couples to have more than one child under certain circumstances (Hull, 1991:27). Since then further provincial regulations on second children have been issued. The reasons for allowing a second child differ among provinces. In Shaanxi Province, there are nine separate regulations about the circumstances in which a second child may be permitted as listed below:

1.The couple's first child suffers from a non-hereditary disease or disability and is unable to become a normal worker.

2.One spouse is a handicapped veteran whose disability is of a specified degree.

3. The couple lives in mountainous areas where population is sparse.

4. Both spouses belong to an ethnic minority group.

5. Both spouses are returned overseas Chinese.

6. The first child of an uxorilocally married couple is a girl.

7.Only one of the male children in a family is able to reproduce.

8. Pregnancy occurs after a couple which has remained childless for many years adopts a child and the wife is at least 35 years old.

9.One spouse in a second marriage has never had children and the other has only one child from a previous marriage.

(Greenhalgh,1986:496-497)

Thus, because the year of a child's birth was likely to be related to acceptance of the one-child certificate, it was necessary to divide children into two groups for this study. One group included all children born between 1984, the year in which the one-child policy was modified, and 1988, the time of the survey. The second group comprised all children born before 1984. Among couples whose children were born after 1984, the percentage of certificate holders was extremely low, while among couples whose children were born before 1984, the level of acceptance of the one-child certificate was higher, over 50 per cent. The chi-square test showed the association to be significant.

The low level of certificate acceptance among families with children born after 1984 indicated that the Government's population policy has strongly affected the implementation of the one-child-per-family programme. Under the more flexible policy, couples with one child seem to have waited instead of accepting the certificate, regardless of whether they had one boy or one girl. By contrast, among couples with a child born before the one-child policy was relaxed, the level of acceptance was much higher. When residence was controlled, a large difference (10 times) was found between the two groups in rural areas. The chi-square test showed a significant association between the year of the child's birth and certificate status among rural couples only, while acceptance of the certificate differed little between the two groups for urban couples. However, the number of acceptors in the group of urban families with children born after 1984 was still over 50 per cent, compared with only 4 per cent for similar families in rural areas.

Child's age at the time of acceptance of the one-child certificate, by residence

About half of the urban couples applied for the one-child certificate within one month of their children's birth, compared with only 11 per cent of rural couples. The majority of rural acceptors applied for the certificate after their children were more than three months old.

Urban couples were more likely to accept the certificate soon after their children were born, suggesting a conscious decision not to have another child and probably reflecting the low infant mortality threat in urban areas. Their more prompt acceptance also reflects the attraction to urban families of the certificate's benefits. By contrast, the largest proportion of rural acceptors applied for the certificate at least three months after their children were born. This may be accounted for by rural couples' fear of a still high infant mortality; they may have waited to ensure that the child survived before accepting the certificate. Traditionally, the survival of a child to 100 days has been a big event in China to be marked by family celebrations. Parents usually hold a ceremony for the child and take a photograph of it that is usually known as the "100-days-photo". This tradition reflects the threat of high infant mortality. Perhaps partly because of this lingering fear of infant deaths, the incentives and disincentives for acceptance of the one-child certificate were apparently not sufficiently attractive to cause farmers to become immediate acceptors.

Table 2: Age of child at time of acceptance of the one-child certificate

Age (months)	**Rural (%)**	**Urban (%)**
0	4	22
1	7	24
2	14	9
3-11	46	27
12+	29	18
Total	100 (N = 28)	100 (N = 55)
Chi-square = 10.4 *	degrees of freedom = 4	

Source: China 1988 fertility and contraceptive data tape, Shaanxi Province.

Note: * = The association between child's age and parents' acceptance of the one-child certificate is statistically significant at the $p<0.05$ level.

Multiple classification analysis of acceptance of the one-child certificate among couples with one child

The preliminary analysis by cross tabulation showed that residence status, the year of the child's birth, mother's education and mother's age were associated with acceptance of the one-child certificate. To classify the net effects of each of these variables, multiple classification analysis was applied with each of the above variables as an independent variable, and acceptance of the one-child certificate as the dependent variable.

Resident status and mother's education were indicated by previous studies as the important factors affecting fertility (Bongaarts, 1983, Cochrane, 1983) and acceptance of the one-child certificate (Ching, 1982). Therefore, the two variables were selected as background variables in a separate MCA model (see table 3, column 2). To examine whether these two primary variables affected acceptance of the certificate through selected "intervening" variables, the year of the child's birth, mother's age and gender of child were successively introduced into the model in columns 3, 4 and 5.

Table 3: Effects of the gender of the child and selected characteristics of mother on acceptance of the one-child certificate

Variables	Unadj (1) Gross	Adj (2) (ResEd)	Adj (3) (YOCB)	Adj (4) (MA)	Adj (5) (GOC)	No.
Grand mean = .25						
Residence						
Rural	-.14	-.12	-.10	-.10	-.10	244
Urban	.38	.33	.27	.27	.27	88
Eta/Beta	.52 *	.46 *	.38 *	.37 *	.37 *	
Mother's education						
Senior school	.24	.05	.06	.04	.04	83
Junior school	.00	.03	.04	.04	.04	134
Elementary	-.19	-.09	-.08	-.07	.06	70
Illiterate	-.16	-.05	-.11	-.10	-.11	45
Eta/Beta	.37	.12	.15	.14	.14	
Year of child's birth						
1984-1988	-.11		-.08	-.07	-.07	232
1970-1983	.25		.18	.17	.17	100
Eta/Beta	.38 *		.27 *	.25 *	.25 *	
Mother's age						
Below 24	-.21			-.05	-.05	114
25-29	.02			.04	.04	112
30 and above	.20			.01	.01	106
Eta/Beta	.39			.08	.08	
Gender of child						
Boy	.04				.03	175
Girl	-.05				-.03	157
Eta/Beta	.10				.07	
R2		.283	.347	.353	.357	

Source: China 1988 fertility and contraceptive data tape, Shaanxi Province.

Notes: (1) = the gross or unadjusted deviations from the grand mean.
(2) = deviation from the grand mean after adjusting for residence and mother's education.
(3) = adjusted deviations from the grand mean with the year of child's birth introduced into the model as a third independent factor.
(4) = adjusted deviations from the grand mean with mother's age introduced into the model as a forth independent factor.
(5) = adjusted deviations with gender of child and all factors.
* = The association between the independent variable and acceptance of the one-child certificate is statistically significant at the $p<0.001$ level. The interaction is found in model 2 (column 3) only.
Abbreviations: Unadj = unadjusted; Adj = adjusted; No. = number; ResEd = residence and mother's education; YOCB = year of child's birth; MA = mother's age; and GOC = gender of child.

In column 2, the two primary variables of residence status and the mother's education explained about 28.3 per cent of the total variation in acceptance of the certificate. Residence can be seen to be an important factor in the model here; urban residence was strongly and positively associated with acceptance of the one-child certificate.

With the introduction of the year of the child's birth as an intervening factor (in column 3), the total amount

of variation explained by the three variables reached 34.7 per cent. The year of the child's birth alone, therefore, adds 6.4 per cent to the total variation explained. At the same time, the effect of residence was reduced. Entering the mother's age and child's gender into the model increased the variation explained by only 1 per cent. This indicates that the year of the child's birth (as a proxy for the strength of the Government's population policy) was an important intervening factor in acceptance of the one-child certificate. Couples with a child born after 1984 were significantly less likely to accept the certificate. By contrast, the gender of the child has only a small effect on acceptance of the one-child certificate.

Multiple classification analysis of current use of contraception, according to the certificate status, gender of child and selected characteristics among couples with one child

In this section, the current use of contraception among couples with one child is examined to investigate the effects of the gender of the child and certificate status on current use of contraception.

Previous studies have argued that mother's age, residence and education are determinants of contraception (Cochrane, 1983:125). Ching (1982) argued that the one-child certificate had an impact on contraceptive prevalence among couples who have one child. Table 4 indicates that certificate status, residence, mother's age and education were significantly associated with the use of contraception.

In table 5, the above MCA procedure is repeated for contraception as the dependent variable. It was observed that in column 1, contraception was strongly associated with certificate status and moderately associated with mother's age and residence. There was some variation in contraception according to mother's education and gender of the child, but no significant relationship was found between those variables and current contraceptive status in the model.

Table 4: Current use of contraception by gender of child and selected characteristics of mother and child (percentage)

	Use	**Non-use**	**Total (N)**
Certificate status			
Holder	93	7	100 (83)
Non-holder	45	55	100(249)
Chi-square = 57 *		degrees of freedom = 1	
Residence			
Rural	48	52	100(244)
Urban	84	16	100 (88)
Chi-square = 33 *		degrees of freedom = 1	
Gender and residence			
Boy	62	38	100(175)
Girl	48	52	100(157)
Chi-square = 3.0		degrees of freedom = 1	
Year of child's birth and residence			
1984-1988	47	53	100(232)
1970-1983	86	14	100 (95)
Chi-square = 50 *		degrees of freedom = 2	
Mother's education			
Senior school	76	24	100 (83)
Junior school	56	44	100(134)
Primary school	47	53	100 (70)
Illiterate	42	58	100 (45)
Chi-square = 19 *		degrees of freedom = 3	
Mother's age			
24 below	37	63	100(114)
25-29	59	41	100(112)

30-34	85	15	100 (58)
35+	69	31	100 (48)

Chi-square = 39 * degrees of freedom = 3

Source: China 1988 fertility and contraceptive data tape, Shaanxi Province.

Note: * = The association between the independent variable and use of contraception is statistically significant at the p < 0.001 level.

Table 5: Effects of selected characteristics on current use of contraception

Variables	Unadj (1) (Gross)	Adj (2) (ResAge)	Adj (3) (MEdu)	Adj (4) (Certs)	Adj (5) (GOC)	N
Grand Mean = .57						
Residence						
Rural	-.10	-.07	-.06	-.02	-.02	244
Urban	.27	.19	.16	.07	.07	88
Eta/Beta	.33 *	.23 *	.19 *	.08 *	.08 *	
Mother's age						
Below 24	-.20	-.15	-.16	-.12	-.12	114
25-29	.02	.01	.00	.00	.00	112
30 and above	.20	.15	.17	.13	.14	106
Eta/Beta	.33 *	.25 *	.27 *	.21 *	.21 *	
Mother's education						
Senior school	.19		.03	.02	.02	83
Junior school	.01		.03	.01	.01	134
Elementary	-.10		.00	.02	.03	70
Illiterate	-.15		.14	.11	-.12	45
Eta/Beta	.24		.12	.09	.10	
Certificate status						
Holder	.36			.24	.23	93
Non-holder	-.12			-.08	-.08	45
Eta/Beta	.41 *			.28 *	.27 *	
Gender of child						
Boy	.04				.03	175
Girl	-.05				-.04	157
Eta/Beta	.10				.07	
R2		.158	.170	.222	.227	

Source: China 1988 fertility and contraceptive data tape, Shaanxi Province

Notes: (1) = the gross or unadjusted deviations from the grand mean.
(2) = deviation from the grand mean after adjusting for residence and mother's age
(3) = adjusted deviations from the grand mean with education of mother introduced into the model as a third independent factor.
(4) = adjusted deviations from the grand mean with certificate introduced into the model as a fourth independent factor.
(5) = adjusted deviations with gender of child and all factors.
* = The association between the independent variable and acceptance of the one-child certificated is statistically significant at the p <0.001 level. No interactions are found in models.
Abbreviations: ResAge = residence and mother's age; MEdu = mother's education; Certs = certificate status; for the others, see abbreviations for table 3.

In column 2, only two primary variables, residence and mother's age, were entered, which together explain 15.8 per cent of the total variation in current contraception. With the introduction of mother's educational status (column 3), a slight increase of 1.2 per cent was observed in the amount of variation in current contraception explained by residence and mother's age. When certificate status was introduced into the model, the total amount of variation explained by all variables reached 22.2 per cent. Holding a certificate has a large positive effect on contraceptive use (column 4), implying that certificate holders were more likely than non-holders to use contraception to prevent further pregnancy. Meanwhile, the net effect of residence

status was reduced by almost 50 per cent with the acceptance of the certificate. Again, the gender of the child has only a weak effect on the current use of contraception in the model.

Discussion and conclusion

In contrast with Wen's finding (1992:34) of a strong, pervasive son preference on subsequent fertility among Shaanxi and Hebei couples (based on the 1985 China In-depth Fertility Survey, Phase I), we found a weak association between the gender of the child and acceptance of the one-child certificate by Shaanxi couples in both the cross-classification and multiple classification analyses of the 1988 Two-per-Thousand Survey data. However, it cannot be concluded that son preference among Shaanxi couples has vanished. It remains a clear tendency in rural areas, but the low proportion of the one-child certificate acceptors reflects the existence of stronger preferences for larger family size and specific sex composition. Wen (1992: 38-39) found that attitudes towards male superiority "did not prevent the average number of children per family from decreasing from as high as six children to around three children, partly because the impact of son preference is relatively weak among higher birth orders. It will have a more powerful influence on fertility as the average family size decreases further". However, we found that son preference does not emerge among rural couples with one child, regardless of whether the child is a boy or a girl. Such couples want another child and therefore they did not accept the certificate. The economic and social benefits of holding the certificate were not sufficiently attractive to farmers in comparison with the perceived benefits of additional children. Conversely, the threat of penalties was not sufficiently strong to outweigh those benefits.

By contrast, the high percentage of urban acceptors of the one-child certificate, regardless of the gender of the child, implies that son preference has decreased in urban areas of Shaanxi Province. The traditional Chinese belief in "more sons, more happiness" has apparently begun to fade among urban residents as more young couples have accepted the notion of having only one child with "more intelligence, more health". Another reason for urban couples accepting the "one child per family" policy is that the cost of a child in urban areas is much higher than in rural areas. Child care and education expenses are higher, as is the opportunity cost of childbearing owing to high labour-force participation rates among women. More children, therefore, mean more economic and psychological burdens for urban parents. Furthermore, the one-child campaign has been much more strictly enforced in urban areas than in rural ones, partly due to the greater ease with which economic and social sanctions can be imposed in urban areas. Urban couples who have a second child without an assigned quota face serious punishment. For instance, they could lose their jobs or be demoted. Hence, urban couples with one child are both discouraged by these penalties from having more children and encouraged to apply for the one-child certificate by the benefits it offers.

The significant difference in acceptance of the one-child certificate between parents of children born before and after 1984, the year in which the one-child policy was modified in rural areas, suggests that the influence of population policies is a significant factor influencing acceptance of the one-child certificate among rural couples. By contrast, little difference was found in urban areas, reflecting both the differential enforcement and impact of the one-child policy between urban and rural areas (Tu, 1989:341). Certificate status was a major factor related to contraception, suggesting that it is an effective method of persuading couples with one child to use contraception and presumably to cease bearing children.

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