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Mongolia: Recent Demographic Trends and Implications

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questionable aspect of the country's population dynamics is the preponderant role that abortion plays in fertility decline

Modern Mongolia is a well-structured society with a population of approximately 2.1 million, 51 per cent of whom live in urban areas with major concentrations in the three industrial cities of Darkhan, Erdenet and the capital Ulaanbaatar. Traditionally, Mongolians were totally nomadic, moving seasonally with their herds over the vast lands of the country. Currently, only a small proportion of the population is semi-nomadic and the majority of the rural population is involved in animal husbandry and wheat and vegetable production on state farms.

By the end of 1989, Mongolia began to experience the transformation of its economy from a centrally controlled one to a market-oriented system and the consequent opening up of the country to international socio-economic and political forces. The country also experienced changes in political leadership and a drastic revision of its economic, social and political ideology. Mongolia has also been experiencing a deep economic crisis characterized by a substantial decline in the standard of living, high unemployment rates, inflation and severe food shortages. It has lost 80 per cent of its import/export income over the past year and per capita GNP (gross national product) fell from $US780 to $US467 between 1986 and 1990 (SSO, 1991).

The former administration considered population policy to be an essential part of Mongolia's programme for socio-economic development. Its main goal was to transform the country from a traditional nomadic society to a modern agricultural-industrial one. A policy of population expansion was seen as necessary to provide enough labourers for development and utilization of the country's resource potential. Consequently, a strong pro-natalist policy was adopted, with quite generous incentives to women who attempted to reach their maximum fecundity levels. Also, the availability of contraception was very limited. The reduction of mortality was also seen as one of the primary ways to increase the rate of natural increase. To that end, the Government stressed maternal and child care programmes and the expansion of general health care facilities to remote regions.

With regard to internal migration, rural-to-urban movements have been predominant, but without the urban "explosion" experienced by many third world countries. A policy of adjusting the pattern of spatial distribution to coincide with the country's development objectives has apparently succeeded. Drastic measures that controlled and restricted the spatial movement of the population were implemented and strictly enforced by the past administration. International migration was insignificant. There was only some temporary immigration on a contractual basis with countries of the Council for Mutual Economic Assistance (CMEA) to supplement labour resources. Emigration was limited to temporary residence of Mongolian students in countries of the CMEA (United Nations, 1989).

In spite of the pro-natalist policies, fertility began a slow but sustained decline by the middle of the 1970s, which intensified during the second half of the 1980s. Population policies have not been formally revised by the present administration. However, higher priority is given to encourage women not to begin childbearing before 20 years of age and not to continue childbearing beyond 30 years of age as well as to maintain birth intervals of not less than three years' duration. In addition, legal barriers to the import, distribution and use of contraception have been removed. Abortion was legalized in 1989. Data from 1990 suggest that the fertility decline will continue during the present decade and, because of policy changes, probably even more rapidly than in the past. On the other hand, between the 1950s and 1970s mortality experienced a substantial decline; in the 1980s, however, the pace of decline slowed down significantly. The current economic crisis that the country is experiencing will probably prevent a substantial improvement of mortality trends. In summary, the future population profile of the country will certainly be different from that which one may have foreseen only a couple of years ago.

The purposes of this article are: first, to examine the recent levels and past trends of the main demographic components of population change. No comprehensive study of Mongolia's population situation exists and an attempt is made in this article to fill this gap. The second objective is, based on the most recent population projections performed in the country, to discuss some of the most relevant consequences of the current and expected population trends and some of their policy implications. For this purpose, the most recent population projection performed in Mongolia is used (SSO/UNDESD/UNFPA, 1992). It is

important to mention that the results of this projection are also presented in the Demographers' Notebook section of this *Journal* beginning on page 61.

Sources of data

Mongolia has a fairly well-developed system of population data collection. There have been seven population censuses: in 1935, 1944, 1956, 1963, 1969, 1979 and 1989. The civil registration/vital statistics system, in its current form, has been in existence since 1951. The State Statistical Office (SSO), an autonomous institution under the Central Government, has conducted population censuses and has served as a repository of civil registration data from at least the decade of the 1950s. This institution has been responsible for the implementation of the compulsory registration of births, deaths, marriages, divorces, adoptions, changes of address and so on.

It would appear from the above that a quite strong and efficient population data network and capability exist in the country. In fact, it is estimated that registration of vital events is over 90 per cent which, compared with the situation even in developed countries, is highly satisfactory. However, there is little evidence that the data have been used for planning purposes and policy formulation. The data are not adequately tabulated and analyzed. The processing of the data is directed mainly at the production of very basic and general statistics. For example, the first four censuses contain very little demographic information since they were conducted with the exclusive purpose of counting the population. With respect to data on births and deaths, tabulations by age and sex are not available prior to 1965 and not available at all by rural and urban classification or by any relevant variable in spite of the fact that the respective registration form is quite complete. These problems certainly limit the possibility of using the available information in studies that go beyond the identification of very general trends and patterns.

The 1969, 1979 and 1989 censuses as well as the registered births and deaths for each intercensal year were recently evaluated (see SSO/ UNDESD/UNFPA, 1992). The method used was the consistent correction analysis developed by Luther and Retherford (1988). This procedure gives estimates of correction factors for intercensal registered births, deaths and migration as well as for each age group in the respective censuses. It also provides life tables such as the corrected number of births, deaths and migrants, the age distribution and the life tables are mutually consistent, that is, a specific set of intercensal demographic balancing equations is exactly satisfied.

As expected, the completeness of census enumeration and deaths and births registration is comparatively high. Completeness of birth registration varied between 95 and 96 per cent during the period under consideration and completeness of mortality registration between 90 and 92 per cent. No major differences were observed between males and females. Since international migration has been negligible in Mongolia during the past three decades, this variable was not included in the analysis. Under-enumeration in the 1969 census was 1.5 per cent; in the 1979 census, it was 3.5 per cent and in the 1989 census, 6.5 per cent. Most of the data used in this work were conveniently adjusted using the results of this analysis.

Past and recent population trends

Background

Mongolia is a land-locked country located in the northern part of Central Asia bordering the Russian Federation in the North and China in the South, East and West. The territory covers more than 1.5 million square kilometres and is divided into three main geographical zones: mountains, steppe and desert.

This territory can be traced back to the year 1206 when Genghis Khan united Mongolian tribes into the first Mongolian state and began a process of conquest to form what later became a huge empire that included half of the known world of the thirteenth and fourteenth centuries.

Since the seventeenth century and up to the second decade of the current century, Mongolia was a backward, traditional and impoverished society. After the 1921 socialist revolution proclaiming the Mongolian People's Republic, the country began to experience a dramatic process of economic and social change. The main goal of the Government was to transform the country into a modern agricultural-industrial society. The first industries began to emerge by the end of the 1920s. Nevertheless, it was not until after the Second World War that the country reached really significant increases in development and modernization.

By the beginning of the 1950s, Mongolia began to experience a period of economic and political stability and rapid growth in its emerging industrial sector. In the early 1960s, the gross industrial output showed a

more than five-fold increase over that of 1940. According to census data, between 1969 and 1989, the percentage of the economically active population engaged in agricultural activities fell from 53.1 to 30.3 per cent.

Urbanization has also been rapid and substantial in Mongolia. According to the 1954 census, 21.6 per cent of the population lived in urban areas; Ulaanbaatar, the capital, was the only city with a population larger than 50,000 inhabitants. According to the 1989 census, 57.0 per cent of the population is urban and, in addition to the capital, two more cities have more than 50,000 inhabitants (Darkhan, with 85,700 and Erdenet with 56,100). Nevertheless, contrary to the experience of other least developed countries, urbanization was orderly, methodical and systematic. As mentioned previously, migration was strictly controlled and responded mainly to the labour-force demand both in urban and in rural areas. In the three main cities, as well as in other smaller urban centres, physical expansion was strictly planned. Dwellings consist mainly of blocks of flats each four to nine stories tall.

It is important to mention that cities are surrounded by encampments of *ger*, the traditional Mongolian dwelling tent. In a sense, they resemble a typical "shanty-town" so common in other third world cities; however, the position of their residents in the social and economic fabric of the city is somewhat different in the sense that most of them have full access to most available services. The *ger* has been the traditional dwelling of Mongolians from ancient times so it is natural enough for most of them to use it also in an urban environment.

With regard to social development, progress has been enormous. Whereas in the early 1920s few people other than priests knew how to read and write, towards the end of the 1950s the literacy problem was basically solved. According to the 1989 census, more than 90 per cent of the population is literate. The country also developed a modern and comprehensive social security system with pensions granted to men who have reached the age of 60 and women who have turned 55, provided that they have a service record of not fewer than 25 and 20 years, respectively. State pensions for agricultural association members were introduced in 1976. The country has a well-established health infrastructure which extends to the community level and, in general, seems well adapted to the needs of the country. With the exception of drugs prescribed for children over three years of age and adults outside hospitals, health care is free of charge. According to recent statistics, the number of physicians per thousand population is 2.8 and the number of hospital beds is 12.5 per thousand population (SSO, 1991).

Women have traditionally been involved in productive activities in Mongolia and it is not surprising that, since the beginning of the process of modernization, they have a high degree of participation in the labour force. During the past three decades, the percentage of women of working age who are actually working fluctuates at around 80 per cent of the total. More than 90 per cent of the female population older than 10 years of age are literate; 33 per cent have completed secondary education (SSO, 1989).

The fist winds of political and economic change began to blow in Mongolia by the late 1980s. The most important reform seems to be the privatization programme. Three "small" vouchers and one "big" voucher were allotted to every Mongolian citizen alive on 20 May 1991. The small vouchers may be used to buy, at auction, lesser assets of the State, such as cars, small shops and livestock; the big vouchers are to be exchanged for shares in approximately 500 corporations being formed from large state enterprises. The State will remain in charge of utilities, education, transport, telecommunications, health and, what is more important, it will continue to own all the land of the country. The exchange of vouchers for shares has already begun and the process of privatization is under way, but it is very difficult to predict when it will be completed. It is also quite difficult to predict its economic and social impact for the country. The role of both national and foreign investment in the creation of a private economy is also uncertain.

In the meantime, as already mentioned, Mongolia is experiencing the worst economic crisis of its recent history. The task ahead is enormous since the country will not only have to create and consolidate its private sector, but also reconstruct its existing economic base to fit in with the broader global economy. It is quite impossible to predict how long this process will take.

There is little doubt that most of the transformations that Mongolia experienced in the past and more recently have affected in one way or another the demographic changes that occurred in the country during the past two or three decades. Identifying the mechanisms through which each factor affected the different demographic variables is a major task that goes beyond the aim of this article. However, it is important to describe some of the most important changes that took place in Mongolia during recent decades so as to provide a general background to understand population changes and to foresee future demographic trends.

Population growth and composition

The first census in modern Mongolia was taken in 1935 and the population enumerated was 738,200. According to the most recent census, taken in 1989, the total population was 2,119,965 (adjusted). In 54 years, the population increased approximately 2.8 times. Compared with other least developed countries, this figure represents a modest increase. This is the result of the fact that the Mongolian population began a period of sustained and regular growth only during the second half of the present century. Before the 1950s, because of high mortality rates and a number of internal and external conflicts, population growth was extremely low. Table 1 shows the population according to the seven censuses conducted in the country and the respective intercensal growth rates.

Table 1: Mongolia: population according to the past seven censuses and intercensal rates of growth

Census date	Population (thousands)	Rate of growth (percent)
1935 (June 1)	738.2	
1944 (October 15)	759.1	0.31
1956 (February 15)	845.5	0.90
1963 (January 15)	1,017.1	2.67
1969 (January 10) *	1,196.3	2.74
1979 (January 5) *	1,602.3	2.97
1989 (January 5) *	2,120.0	2.84

Source: National Economy of the MPR for 70 Years, State Statistical Office of the Mongolia People's Republic, Ulaanbaatar, 1991.

Note: * = Adjusted data.

Actually, during the Manchu period (1691-1911), Mongolia was dying as a country. It is estimated that every second child died before its first birthday and more than 10 per cent of women died after childbirth (UNICEF/Ministry of Health, 1991). In addition, an unusually large proportion of the male population lived in monasteries and practised strict celibacy. Consequently, during this period, population growth seems to have been extremely low and it is even likely that for long intervals the population experienced negative rates of growth. After the national liberation movement of 1911 and the 1921 revolution, the population began to grow again. Nevertheless, as table 1 shows, the increase was quite slow and modest. The main reasons were the conflicts that the country experienced between 1911 and the end of the Second World War. By the beginning of the 1950s, the population dynamics of the country became similar to that prevailing in other least developed countries. A post-war "baby-boom" combined with a declining infant mortality resulted not only in unprecedented rates of population growth but also in a large and increasingly young population.

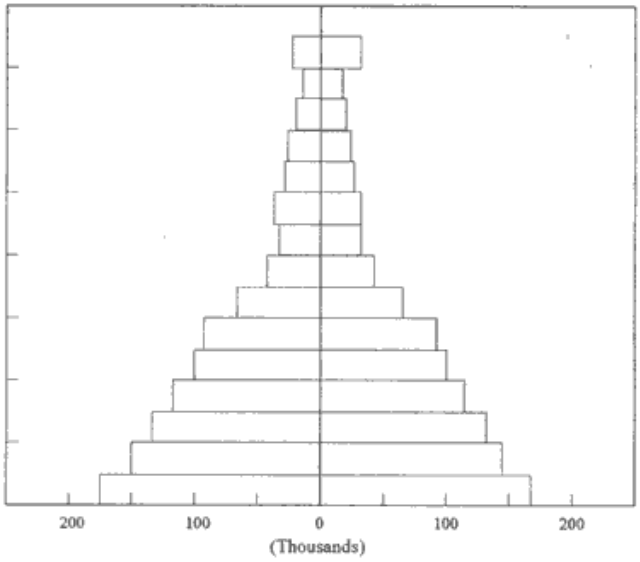
Table 2 shows a number of indicators of the age composition of the population according to the last three censuses. In 1969, the population aged 14 years and younger comprised 45 per cent of the total population, the age dependency ratio reached a value higher than 100 per cent and the median age was only 18.2 years. As mentioned previously, by the middle of the 1970s, fertility began a slow decline and the pace of infant mortality decline began to slow down. These facts prevented a further rejuvenation of the population as reflected by the decline in the proportion of the young population and by the slight increase in the median ages.

Table 2: Mongolia: age and sex composition, 1969, 1979 and 1989

	1969	1979	1989
Total	1,196,307	1,602,346	2,119,965
Males	597,138	797,310	1,057,661
Females	599,169	805,036	1,062,304
0-4 years	211,711	273,784	343,856
5-14	327,858	438,546	559,004
15-64	588,972	804,919	1,125,246
65+	67,766	85,097	91,859
% male	49.9	49.8	49.9
% female	50.1	50.2	50.1
0-4 years	17.7	17.1	16.2

5-14	27.4	27.4	26.4
15-64	49.2	50.2	53.1
65+	5.7	5.3	4.3
Females 15-49 years	231,873	336,324	487,278
% females 15-49	19.4	21.0	23.0
Sex ratio	99.7	99.0	99.6
Dependency ratio	103.1	99.1	88.4
Median age	18.2	17.4	18.4

Figure: Mongolia: 1980 population pyramid



The figure above shows the population pyramid according to the 1989 census (in absolute numbers). Up to age 35-39, its shape reflects the typical age structure of a population with high or slowly declining fertility: mountain-shape with a relatively slow descending slope. However, the profile of the upper part of the pyramid is quite irregular. This is the result of the impact of periods of political and economic instability and the Second World War.

The historical low rates of population growth help to explain why the Government during the post-war period implemented a strong pro-natalist policy. During the 1950s and 1960s, when the country became politically and economically stable, and it began to implement an economic strategy aimed at developing a mainly industrial and urban society, labour shortages occurred in some sectors of the economy, especially construction. Up to the early 1960s, the problem was solved with the temporary immigration of Chinese workers and later on with the help of the former Union of Soviet Socialist Republics. Nevertheless, most of these shortages were related more to population distribution and to the lack of skilled labour than to the size of the population, but the situation certainly influenced the Government's conception that a larger and rapidly growing population was needed to cope with the labour demands implicit in the national development plans.

Mortality

Since the end of the 1960s, there was only a modest decline in mortality in Mongolia. Table 3 shows some selected indicators. For example, in terms of the expectation of life at birth, the population gained approximately 2.6 years during the 20-year period. The infant mortality rate declined by only 12.0 per cent. Life expectancy gains at ages 20 and 60 were almost negligible. The decline in the crude death rate was more significant, falling as it did from 12.3 to 9.8 per thousand, that is, a decline of 20.3 per cent. However, these figures reveal not so much a real improvement in mortality as a rejuvenation of the population.

Table 3: Mongolia: selected indicators of mortality, 1969-1989

	1969-1974	1974-1979	1979-1984	1984-1989
Crude death rate (per thousand)	12.3	10.4	10.6	9.8
Infant mortality rate (per thousand)	71.9	71.2	68.0	63.2
Expectation of life at birth				
Male	56.3	58.3	58.0	58.5
Female	59.4	62.1	61.6	62.4
Expectation of life at age 20				
Male	45.7	46.4	46.3	46.5
Female	48.1	49.8	49.4	49.9
Expectation of life at age 60				
Male	12.5	12.8	12.9	12.6
Female	14.9	16.4	14.8	14.8

By the beginning of the second half of the present century, Mongolia experienced a substantial decline in mortality as did other least developed countries. For example, it is estimated that during the 1940s the crude death rate was higher than 30 per thousand (SSO, 1991). However, the fact is that during these past 20 years the pace of mortality decline has been much slower than in previous decades.

The age pattern of mortality is characterized by extremely high infant and child mortality. The main causes of infant death are respiratory and diarrhoeal diseases (UNICEF/Ministry of Health, 1991). Mortality at older ages is comparatively high, especially for males. Correspondingly, mortality during the prime adult ages is relatively low for males but comparatively high for females, mainly owing to maternal mortality. When compared with the United Nations model life tables for least developed countries, mortality under age 10 is quite similar to the South Asian pattern and old-age mortality to that of East Asia (United Nations, 1983).

Considering the well-established infrastructure that Mongolia has developed, favourable staffing levels and apparently adequate primary health care system as well as low levels of illiteracy and, in general, a comparatively high level of social development, mortality, especially infant mortality, is extremely high. This situation also calls attention to the fact that no major reductions in mortality rates have been achieved during the past two decades in spite of the implementation of extensive health programmes. Unfortunately no studies that can provide an explanation of this problem are available. There is an urgent need for conducting research in this area and to improve the health statistics as well as to make them widely available to health professionals at *aimak* (province) and district levels as part of an improved management information system. This necessity is especially urgent at this time when Mongolia is experiencing a deep economic crisis that will certainly have an impact on the levels of infant mortality.

Fertility

As mentioned previously, in spite of the pro-natalist efforts on the part of the past administration, fertility began a comparatively rapid decline by the beginning of the 1980s. Table 4 shows the respective information. Also included in the table are the data for 1990. The respective values suggest that fertility will certainly continue to fall during the present decade.

Table 4: Mongolia: selected indicators of fertility, 1969-1990

	1969-1974	1974-1979	1979-1984	1984-1989	1990
Crude birth rate	41.2	40.0	38.5	37.8	34.8
General fertility rate	209.0	195.1	179.3	168.3	149.6
Age-specific fertility rate					
15-19 years	0.094	0.062	0.045	0.035	0.040
20-24 years	0.222	0.265	0.274	0.267	0.246
25-29 years	0.355	0.380	0.356	0.333	0.249
30-34 years	0.355	0.315	0.255	0.219	0.184
35-39 years	0.298	0.243	0.185	0.134	0.117
40-44 years	0.138	0.140	0.118	0.071	0.044
45-49 years	0.044	0.043	0.035	0.021	0.011
Total fertility rate	7.53	7.24	6.34	5.40	4.45

Gross reproduction rate	3.72	3.57	3.11	2.64	2.18
Net reproduction rate	3.11	3.0	2.69	2.31	1.91
Mean age of childbearing	30.8	30.5	30.0	29.1	28.5

Table 4 also shows data on the age pattern of fertility decline. Age-specific fertility rates indicate that the fall occurred mainly as a result of fertility reduction among older women. For example, between the period 1969-1974 and 1990, the total fertility rate declined by 40.9 per cent. However, age-specific fertility declined by 60.7 and 68.1 per cent among those women aged 34-39 and 40-44 years, respectively. The fall among those 45-49 years old was 7.0 per cent. The mean age of childbearing also reveals this trend: it dropped from 31.3 years of age to 28.5 years. These data indicate that the decline was caused more by an earlier end to reproduction than by birth spacing.

Demographic theory suggests that there are two sets of variables that explain, from a demographic point of view, variations in fertility. One is population composition, particularly age structure and marriage patterns, both of which mediate the relationship between individual reproductive behaviour and birth rates observed in a population. The other is composed of the Davis and Blake (1956) "intermediate variables", such as breast-feeding, frequency of intercourse, fertility control and abortion, which directly affect reproductive outcome (see also Bongaarts, 1978).

The first suspects in declining birth rates are always changes in marriage patterns and age structure. The earlier that women marry and the higher the proportion of women who ever marry, the greater the exposure of a given population to the risk of childbearing, assuming that most births occur to married women (which is the case in Mongolia). It is also the case that the larger the proportion of women in reproductive ages with respect to the total female population, the greater the proportion of the population at risk of childbearing. Between 1979 and 1989, the percentage of women of reproductive age increased from 21.1 to 23.1 per cent of the total female population. While the total population grew at an annual rate of 2.8 per cent during this period, the growth exhibited by women in the reproductive age groups was 3.8 per cent. These results suggest that changes in the age structure did not contribute to the decline in fertility. On the contrary, age structure shifted in the direction of being more likely to increase the number of births. Regarding changes in marriage patterns, the percentages of women who were currently married were 63.4 in 1979 and 61.3 in 1989; the singulate mean age at marriage increased from 21.6 to 22.6 years of age between these two dates. These changes may have affected the decline in fertility but, considering that they do not represent a major shift in marriage patterns, their contribution has certainly not been of much significance.

Further insights into the nature of fertility decline in Mongolia can be gained by examining the role of the previously mentioned intermediate or proximate variables. Data on contraceptive availability and use are very limited and refer only to the most recent time. According to estimates of the Ministry of Health (1991), in 1990, only 11.0 per cent of the female population of reproductive age were using some modern contraceptive method (IUDs, oral contraceptives and condoms). This estimate was based only on contraception officially distributed. Data on non-official distribution are not available but private access does not seem to be very frequent in this country where private distribution of all kinds of medical and health products is still negligible. In summary, only a small proportion of women is currently benefiting from official family planning services. As previously mentioned, during the past administration this proportion was even lower in view of the barriers to the import and distribution of contraceptives.

The most important intermediate variable in Mongolia's fertility decline seems to have been abortion. According to data of the Ministry of Health (1991), 29,690 abortions were carried out in government health facilities in 1990 (abortion was legalized at the end of 1989). This number represents 57.8 abortions per thousand women and 386.2 per thousand births. The total abortion rate for pregnancies that are ended by abortion is 2.1. In spite of being illegal before 1990, it seems that abortion rates were also then quite high. In view of the figures presented above, the limited availability of contraception and the pace and magnitude of fertility decline, abortion does not seem to be a practice that just began in 1990. An indication of this is suggested by the evolution of the "spontaneous abortions and others" category in official statistics. Under this category, the statistics of the Ministry of Health register those women who present themselves to medical facilities reporting spontaneous abortions, or miscarriages. According to the same source, in 1985, the number of "spontaneous abortions and others" per thousand births was 168.6 and in 1989 it was 179.7. However, in 1990 the rate for this category fell dramatically to 95.3. The sharp decline in the year when abortion was legalized suggests that many of the previous "spontaneous abortions" were actually illegally induced ones.

Data on other proximate variables, such as breast-feeding, are not available. Breast-feeding lengthens a woman's period of natural infecundity after a birth and hence can increase the interval before the next

pregnancy and reduce fertility even if no contraception is used. Considering the experience of other third world countries that have also experienced a substantial and rapid process of modernization, it is very unlikely that this practice may have increased in Mongolia during the last two or three decades. Data regarding the use of traditional contraceptive practices or the calendar rhythm method are not available either. They may have played some role in the fall in fertility, but there is little doubt that abortion has been the major proximate determinant.

The pro-natalist policies implemented during the past decades, with drastic restrictions on access to family planning, seem to have forced families to rely on abortion to limit their fertility. The problem is that, in spite of the fact that now there are no restrictions regarding contraception, the economic crisis that the country is experiencing has prevented satisfaction of the demand for contraceptives. As mentioned previously, the availability of contraception is quite limited and the perspective for the future is not very optimistic. During 1991, even the limited supplies were stopped, with the exception of IUDs and condoms provided by the United Nations Population Fund (UNFPA). Therefore, unless this situation changes, Mongolian families will continue to rely on abortion to limit their fertility.

Until now only the factors which directly affect fertility have been examined. It is also important to mention those variables that have influenced changes in reproductive behaviour or, in other words, those economic and social factors that, through the proximate variables, contributed to the fertility reduction experienced by the Mongolian population.

There is little doubt that the transformations that Mongolia experienced during the second half of the present century, already mentioned in a previous section, have had a strong influence on the fertility decline. Increasing literacy and school attendance, declining infant mortality, urbanization and industrialization, female labour-force participation, emergence of an institutionalized social security system are factors that certainly affected fertility decline. As previously mentioned, analyzing the specific mechanisms of these relationships, or quantifying the impact of each variable on the decline, are beyond the objectives of this article, but it seems that most of them, in one way or another, influenced the fact that families began to perceive that it was advantageous to make reproductive choices.

This change appears to have occurred at the end of the 1970s or even earlier. Data on desired family size from 1989 show that women who have completed their reproductive careers wanted, on average, only 4.5 children (SSO, 1989). The completed fertility rate, according to the 1989 census, was 6.6 children per woman. Women who are starting their reproductive careers want, on average, 3.5 children. These data reveal a dramatic unmet demand for contraception. Fertility decline in Mongolia would have been more rapid and significant in the absence of a pro-natalist policy. The current level of fertility may have been reached probably in the late 1970s or early 1980s. In other words, the information on desired family size clearly shows that, probably since the 1970s, women really wanted to practise a more methodical and less overwhelming reproductive behaviour.

Impact of changing population dynamics and policy implications

The population of a country is normally considered its most important and valuable resource. In view of the size of the Mongolian population, the vastness of the country's territory and its geo-political position, the concern of the Government regarding the decline in fertility and its impact on population growth is understandable. However, a rapidly growing population also places new demands on health services, education, housing and jobs that must be fulfilled by the socio-economic system.

Table 5: Mongolia: increase in the potential labour force supply and in the potential demand for some selected social services

					Annual rate of increase			
					1969-1989		1989-2019	
Age interval		1969	1989	2019	%	Absolute	%	Absolute
Potential supply of labour force (working age population)								
Males	(16-60)	268,734	521,139	1,175,957	3.37	12,620	2.75	21,827
Females	(16-55)	244,442	492,407	1,091,368	3.56	12,398	2.69	19,965
Potential demand for social services, health services								

Maternal-child	Births+females (15-45)	273,155	561,486	1,122,113	3.67	14,417	2.33	18,688
Child (1-15 years)	Males and females(1-14)	498,287	828,652	1,104,252	2.58	16,518	0.96	9,187
Adult	Males and females(15-64)	588,972	1,125,246	2,521,203	3.29	26,814	2.73	46,532
Geriatric	Males and females(65+)	67,766	91,859	112,098	1.53	1,205	0.67	675
Housing	Couples (20-29)	75,110	193,466	330,056	4.84	5,918	1.80	4,553
Education								
Nursery	Males and females (0-3)	169,104	275,085	340,915	2.46	5,299	0.72	2,194
Pre-school	Males and females(4-7)	156,785	245,415	325,546	2.27	4,432	0.95	2,671
Primary	Males and females(8-12)	158,655	276,521	381,016	2.82	5,893	1.07	3,483
Secondary	Males and females(13-18)	128,266	292,132	417,967	4.20	8,193	1.20	4,195
Higher education	Males and females(19-24)	91,268	247,837	392,435	5.12	7,828	1.54	4,820
Social security								
Males	(60+)	47,967	56,152	97,349	0.79	409	1.85	1,373
Females	(55+)	77,284	100,834	200,934	1.34	1,178	2.32	3,337

Table 5 shows the size of several age groups as enumerated by the 1969 and 1989 censuses and as projected for 2019 (see the Demographers' Notebook section in this *Journal*). These age segments correspond to the portions of the population more likely to demand the respective services. Variations in size can be considered as indicators of change in the potential demand (or potential supply in the case of labour force). The table also shows the average annual rate of increase (both in terms of percentages and absolute figures) between 1969 and 1989 and between 1989 and 2019.

Although general, the data presented in table 5 show that the new population dynamics of Mongolia will be, to some extent, positive regarding the delivery of social services in the future. The pace of entrance to the different levels of the educational system will experience a slow but sustained decline. Less resources will be needed to expand health services and more effort can be dedicated to improve its quality. Housing deficits will probably be easier to solve. The main population problem that table 5 reveals is the substantial absolute growth of the working age population. Even if the economy experiences substantial rates of growth in the future, one may have reasonable doubts that it will be able to absorb such a large increase. Therefore, possible imbalances in the labour market are likely to occur in the future. Another problem revealed by the data is the rapid growth that the elderly population will experience. This growth will put substantial pressures on the social security system (according to the Mongolian labour law, the retirement age for males is 60 years and for females 55 years). Up to the end of the projection period, i.e. the year 2019, this increase is relatively modest in absolute terms. However, as the large cohort born in the past two decades continues to age, the absolute growth will be quite substantial.

It is important to mention that the prevalent idea among some government circles is that the population growth rate has become too slow as a result of fertility decline. Preserving the country's demographic vigour is seen as being closely related to safeguarding the country's fundamental identity. Actually, most of the incentives for large families have not been removed. It is true that there is also a great concern regarding the negative effects with respect to maternal and child health of high birth rates and also with respect to the substantial unmet demand for contraception. However, more concern seems to exist with regard to the slowdown of population growth rates, but without much interest in or awareness of the possible effects of more rapid population growth. Mongolia does not have, and certainly will not have in the near future, the problems of over-population exhibited by some least developed countries. For example, high population density in rural areas resulting in scarcity of agricultural land is unimaginable in Mongolia. Related problems of over-urbanization, with a substantial proportion of the urban population being marginal with regard to most basic services, are also unknown. In addition, until recently, in spite of more rapid population growth, the economic performance of Mongolia's economy created enough jobs so as to maintain low unemployment levels. The Government seems to have had the capacity to deliver basic social services to most of the population. However, the economic, social and political changes that Mongolia is currently experiencing call for reflection with regard to the future situation.

To begin with, Mongolia is currently experiencing a severe economic crisis. This crisis is not cyclical but structural, meaning that it is the result of a collapse of the socio-economic system, and it may take a long time for the economy to reach relatively satisfactory levels of performance again. It seems that the current population growth rate, although lower than in the past, has already exceeded the rate at which the Government can deliver basic services and the economy create new jobs. Current unemployment problems are being aggravated by the large cohorts born in the 1960s and 1970s having already entered or preparing to enter the labour force. It is quite certain that a higher rate of population growth, even if the country is able to overcome the current crisis soon, will strain the educational system, medical facilities, housing supply and social welfare services, and lead to chronic high unemployment (see, for example, Schultz, 1987).

The links between population growth and economic growth are highly complex and have been the subject of intense controversies (see, for example, Coale and Hoover, 1958; King and Kelly, 1985; Simon, 1981). Most studies of today's least developed countries found no connection between the growth rates of population and of per capita income up to about 1975. However, more recent data show a significant negative link: over the past decade and a half there has been a tendency for income growth to be slower in countries with faster population growth (UNFPA, 1992). According to Blanchet (1991), rapid population growth may have become much more difficult to cope with at a time of world recession and net resource outflows from least developed countries to developed countries. It seems that rapid population growth plays an "accomplice" role in many problems connected with development. Rather than being the root cause of the particular problem, it exacerbates or magnifies the effect of economic crisis or a recession, or the scarcity or misallocation of resources and poor planning (Merrick, 1986).

This evidence shows at least the need to reflect on the possible eventual consequences for Mongolia of higher population growth rates. Will the future performance of the economy in terms of job creation and provision of essential services be able to match more rapid population growth? It is not unreasonable to think that it is quite likely that a higher population growth rate resulting from an increase in fertility will endanger the efforts of the country aimed at attaining sustainable development in the future. Or to put the same thought in other words: the recent decline in the pace of population growth may be a favourable condition for development and for overcoming the current economic crisis.

The arguments presented above show the necessity for discussing and formulating a future population policy within the framework of economic and social objectives. We are not proposing here analyses on optimum population size and growth that have proved to be of little use for policy formulation. What we want to emphasize is the importance of integrating population variables within development planning and the need to base a new population policy on economic and social development objectives and not only on narrow ideological considerations.

In any case, the population growth that Mongolia will experience in the next three decades is not as low as some sectors seem to think. According to the results of the projections mentioned previously, the population will continue to grow at an annual rate of almost 2 per cent up to the year 2015. Even if fertility continues to decline at the same pace, by the end of the next decade the population of Mongolia will reach 3 million and by the 2020s probably 4 million. The large cohorts born during the post-war period, who already began their reproductive careers, will maintain a comparatively high rate of growth for the next three or four decades. When a population has a large and young population base, it takes a generation or more for declining growth rates to offset the numerical effect of high growth rates in the past. As mentioned previously, even the number of births will continue to increase in spite of the decline in fertility. Therefore, the Government's dilemma of maintaining relatively high population growth rates and, at the same time, reducing the birth rate for maternal and child health considerations is, to some extent, artificial.

In addition, it is also important to recognize the large unmet demand for family planning services among the population. Problems of availability of contraception, currently because of shortages caused by the country's economic crisis and previously because of government policies, have forced families to rely on abortion to limit their fertility. This fact alone would suggest that the possibility of implementing an official family planning programme should be taken more seriously. Access to information and the means of deciding on the size and spacing of one's family has been accepted globally as a human right for over 20 years. The denial of women's reproductive rights is not only incompatible with democratic values and human rights, but it is ineffective in the long run. The experience of Mongolia confirms this fact: in spite of the past restrictions on contraception and the current unavailability of contraceptives, couples will resort to any means to control their fertility. The main problem currently is that the most accessible means that people have is abortion, which by no means can be accepted as a family planning method.

Conclusion

Mongolia is characterized as having a vast territory but a small population. Increasing its population size has always been a matter of great concern for the Government. After the Second World War and a long period of political and economic instability, the population began to experience substantial and sustained rates of growth. Declining mortality rates, especially infant mortality rates, and high fertility levels, stimulated by a strong official pro-natalist policy, resulted in a demographic vigour never previously exhibited by the country. By the end of the 1980s, the much desired population size of 2 million was reached. However, by that time, fertility rates had already begun a significant and rapid decline.

By the end of 1989, Mongolia started a process of radical political and economic transformation, moving away from a centrally controlled system towards a market-oriented one. The new Government also favours high rates of population growth and continues perceiving a large population as a safeguard for the country's national identity. Although fertility decline is not seen as a favourable development, the Government has also shown concern for the negative impact of high birth rates on women's and children's health.

On the other hand, the population of Mongolia clearly wants to change its reproductive behaviour towards a smaller family size. The process of development and modernization that the country experienced during the present century, as in other third world countries, resulted in most couples beginning to perceive it as more advantageous to control their reproductive behaviour and limit their number of descendants. This trend went against the past government policy of maintaining as high as possible the fecundity potential of the population. However, in spite of this policy, fertility began a rapid and apparently irreversible decline.

Recently performed population projections that take into account the new demographic regime of the country show what can be considered optimistic perspectives. On the one hand, the population will exhibit more moderate rates of growth than in the past. This will have the beneficial effect of reducing the rate at which the Government will have to deliver a number of basic services such as education, housing and health, gaining more flexibility in the use of the resources available. Given the experience of other third world countries, these more moderate rates of population growth may contribute significantly to a more rapid solution of the economic crisis the country is currently experiencing. On the other hand, the concern of the Government that the current fertility trends may reverse population growth is groundless. Population will continue to increase and the expected rates of growth cannot be considered low, although they will be more moderate than in the past. In a little more than 30 years, the population will be double its current size. The impetus of natural population growth provided by the young age structure that resulted from past high fertility will not be neutralized in the next three or four decades by the magnitude and speed of fertility decline. An apparently negative trend, however, is the high growth rate that the working age population will continue to exhibit. Although slower than in the past, the pace of growth of this segment is high enough to be of concern to the Government with regard to possible imbalances that may affect the labour market in the near future. Nevertheless, the projections show that its pace of growth will gradually become more moderate.

The new population dynamics of Mongolia can be considered, in general, to be favourable. A moderate rate of population growth seems to be more positive for development than a high rate. On the other hand, negative or extremely low rates are quite improbable in Mongolia, at least in the foreseeable future. Therefore, the country's comparatively small population will continue to increase. However, there is a questionable aspect regarding this new population dynamic and it refers to the preponderant role that abortion has played in fertility decline. First, because of the past administration's rejection of family planning and now because of shortages in the supply of contraceptives, the Mongolian population has been relying on abortion to control and limit the number of births. The dramatic unmet demand for family planning should be of great concern to the administration. An adequate family planning programme will not endanger the capacity of the population to continue increasing. On the contrary, it will certainly have beneficial consequences in terms of health and, in general, for the well-being of the population.

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The Effect of Sex Preference on Subsequent Fertility in Two Provinces of China

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China's birth control programme did reduce couples' demand for children, but it did not change their attitudes about 'male superiority'

The effects of socio-economic characteristics on the general macro-level fertility in China are well documented (e.g. Tien, 1984; Poston and Gu, 1987; Wang, 1988). However, their role is not clear in the sequential fertility decisions of individual families regarding additional births. The diversity of social and economic characteristics among women with a different number and sex structure of living children also needs to be explored.

This article addresses the impact of sex preference on couples' family-building process at both the micro-level and macro-level. The micro-level analysis begins with the association between sex of the existing surviving children and sequential parity progression, without taking socio-economic conditions into account. The analysis is then extended to incorporate some selected socio-economic and demographic characteristics of women with special reference to those who had two or more living children before or during the period of the one-child policy. This is done in order to evaluate the roles of sex preference and socio-economic characteristics of individual women in determining further childbearing under population policies and programmes of different strengths. The macro-level analysis investigates to what extent, under China's intensified family planning programme and population policy pressure, sex preference still exerts an impact on recent fertility.

Data and methods

The analysis is based on data from the 1985 China In-depth Fertility Survey (IDFS), Phase I, which was organized by the State Statistical Bureau (SSB) of China in co-operation with the International Statistical Institute, Voorburg, the Netherlands. The survey was carried out in three provincial regions of China. The present study uses the data for Hebei and Shaanxi provinces; Shanghai municipality was also covered by the survey. Of the two peasant-dominated regions, Hebei, a north-eastern coastal province, is the more developed; Shaanxi is an inland province on the upper Yellow River. More detailed information on the survey procedures was published in the Principal Report (SSB, 1986).

The first section uses retrospective birth history data for all respondents with one or more living children at the time of the survey to identify the association between the sex of preceding children and subsequent childbearing, without taking socio-economic conditions into account.

In the second section, analysis of variance (ANOVA) and multiple classification analysis (MCA) were applied to ascertain the statistical significance and association between the decision to have another child and the set of social and economic factors when some demographic factors are controlled. Women who have had at least two children were selected rather than all respondents. The sex composition of the first two living children was treated as the independent variable, which was also classified by the variables of residence, education and occupation.[1/] The date of the first marriage and age when the second child was born were treated as covariates. The dependent variable is the proportion of respondents who have had a third child, since a majority of women in the two provinces want at least two children (SSB, 1986) and whether or not to have a third child seems to be a key decision in the family-building process. Women who had their second child were divided into two groups according to the time period of the second birth: before 1979 and 1979 or after. This made it possible to detect the impact of the intensified family planning programme, especially the one-child policy that officially started in early 1979.

The third section assesses the overall effect of sex preference on recent fertility. The proportion of women having at least one birth in the five-year period preceding the survey was chosen as the measure of recent fertility. The approximately longitudinal study design provides a dynamic picture and makes it possible to ascertain the effect of sex preference on recent fertility among the survey cohort women over a five-year period, which coincides with the most powerful period of birth control in China. The proportions of women

giving birth are cross-classified by number and sex of the living children at the start of the five-year period, i.e. 1980. This reconstruction of family size and composition was made possible by the survey's birth history data in the standard recode files, which contain detailed information for each birth on the sex, date of birth, birth order and, if applicable, the age at death. Note that the distribution of number of women among the parity and sex composition of children categories is quite different from their distribution of current family size and composition, since the distribution of proportion of women giving birth refers to a time-point five years before the survey.

Chowdhury and Bairagi (1990) suggest an index, the sex preference effect on fertility (SPEF), which is a modification of Arnold's measure (Arnold, 1985). The SPEF index is a method to assess the quantitative impact of sex preference on fertility and it estimates the expected reduction in the percentages of women who have had at least one birth, in the absence of the effect of sex preference. In this study, the SPEF index is used to test the effect of sex preference on recent fertility by both initial parity level and overall level.

Results

Sex composition and family building

Table 1: Proportional distribution of family size for women with two or more children according to sex composition of first two children in family, Hebei and Shaanxi provinces, China, 1985

(per cent)

Sex composition of first two children	Total number of living children 2	3	4	5+	Sum	N
Hebei Province						
DD	29.6	32.1	21.1	17.2	100.0	(795)
DS	48.3	27.0	17.2	7.5	100.0	(889)
SD	42.9	29.9	15.5	11.7	100.0	(921)
SS	48.6	28.0	13.5	9.9	100.0	(882)
Shaanxi Province						
DD	23.7	30.8	23.9	21.6	100.0	(620)
DS	39.1	26.7	21.0	13.2	100.0	(797)
SD	36.5	29.6	18.5	15.3	100.0	(756)
SS	37.3	29.7	20.2	12.9	100.0	(762)

*Source:*China 1985 IDFS survey data tape.

Note: D = Daughter, S = son

Table 2: Proportional distribution of family size for women with three or more children according to sex composition of first three children in family, Hebei and Shaanxi Provinces, China, 1985

(per cent)

Sex composition of first three children	Total number of living children 3	4	5	6+	Sum	N
Hebei Province						
DDD	34.8	33.2	19.0	13.0	100.0	(253)
DDS	54.4	27.4	13.0	5.2	100.0	(307)
DSD	45.5	37.4	12.2	5.0	100.0	(222)
DSS	58.4	29.4	8.0	4.2	100.0	(238)
SDD	46.5	29.9	16.2	7.4	100.0	(271)
SDS	58.4	24.3	9.8	7.5	100.0	(255)
SSD	60.2	21.9	11.4	6.5	100.0	(201)
SSS	50.0	29.8	14.7	5.6	100.0	(252)
Shaanxi Province						
DDD	29.1	34.5	22.2	14.3	100.0	(203)

DDS	48.9	28.9	12.6	9.6	100.0	(270)
DSD	42.7	35.1	13.8	8.4	100.0	(225)
DSS	45.0	33.8	12.7	8.5	100.0	(260)
SDD	38.1	35.3	15.1	11.5	100.0	(218)
SDS	53.8	24.0	14.5	7.6	100.0	(262)
SSD	43.3	33.3	17.9	5.4	100.0	(240)
SSS	51.3	31.1	11.8	5.9	100.0	(238)

Source: China 1985 IDFS survey data tape.

Note: D = daughter, S = son

Tables 1 and 2 illustrate the impact of the sex composition of the first two or three children on subsequent childbearing. An examination of the proportions for the first two children (table 1) indicates that women are much more likely to go on to have more children if their first two children are daughters, in contrast to those who have had at least one son or whose first two children are sons. First daughter-daughter (DD) combinations in the initial family formation are likely to lead to a larger family than other combinations. It is interesting to note that women with the sex combination of son-daughter (SD) seem more likely to continue childbearing than those with DS (daughter-son) combinations. (Hereafter, analogous abbreviations are used to describe these relationships).

Among the women who have had three or more children (table 2), the differences in family-building between DDD and SSS families are also marked. But the data seem to show that women's preference is not simply for sons. The highest proportions of women who had stopped childbearing are among mothers with combinations of SSD, SDS, DSS and DDS (and SSS in Shaanxi). It is also observed that women with two daughters and one son, especially in the order SDD or DSD, would try again. It appears that the sex of the third order child plays an important role in the decision about further family building if the first two children are a son and a daughter.

Table 3: Probability of having and (N + 1)th child for women with N or more children, for N=1,2,3 and 4, according to number of living children and sons of the women, Hebei and Shaanxi provinces, China, 1985

Number of first N living children & sons	Hebei Province		Shaanxi Province	
	Probability of having (N+1)th child	Number of women	Probability of having (N+1)th child	Number of women
(N=1)				
No son	77.0	2,186	80.1	1,770
One son	71.2	2,533	76.8	1,976
Total	73.9	4,719	78.4	3,746
(N=2)				
No son	70.4	795	76.3	620
One son	54.5	1,810	62.1	1,553
Two sons	51.4	882	62.7	762
Total	57.3	3,487	65.3	2,935
(N=3)				
No son	65.2	253	70.9	203
One son	50.8	800	56.4	713
Two sons	41.1	694	52.5	762
Three sons	50.0	252	48.7	238
Total	49.2	1,999	55.4	1,916
(N=4)				
No son	65.3	75	67.2	61
One son	44.1	290	47.9	282
Two sons	33.4	344	38.2	393
Three sons	37.1	210	38.8	278
Four sons	46.0	63	39.6	48
Total	40.6	982	42.7	1,062

Source: China 1985 IDFS survey data tape.

Table 3 is a summary from the survey data of the probabilities of families with different size and sex distribution having an additional child. As table 3 shows, of the women who have had at least one living child, about three quarters in the two provinces would probably proceed to the second or higher parity by the survey date, and considerably more than 50 per cent of women with at least two living children are likely to progress to third or higher-order births. Even of those with at least three living children, more than half in Shaanxi and about half in Hebei, are likely to continue bearing children.

In the two provinces, if couples did not have a son, impressively large proportions would continue bearing children until they got a son. This tendency is consistent over different stages of family-building (from family size one to four), although the proportions are slightly lower at later stages. Relatively small differences exist between first-daughter and first-son families, which may reflect the fact that most parents want to have more than one child. With further increases in family size, however, depending on the sexes of the preceding children, the probabilities are substantially different between no-son and at least one-son families. When the first three or four children are considered, the data also indicate some differences in the effect of an excess of sons compared with an excess of daughters. The results suggest that women would be more likely to have another child if they had an excess of daughters in the first three or four births. There is no indication that couples seek at least one daughter, although among families with three or more children, two sons plus one or two daughters appears to be a favourite choice.

Socio-economic differentials in family-building

Table 4: Analysis of variance of probability of having third child for women with two children, according to sex composition of living children, year of the second birth and selected characteristics of women, Hebei Province, China

	Second child born before 1979				Second child born 1979 or after			
Source of variation	Sum of squares	DF	Mean squares	F	Sum of squares	DF	Mean squares	F
Covariates	84.17	2	42.08	302.00 * * *	7.03	2	3.514	29.45 * * *
Date of first marriage	69.29	1	69.29	497.21 * * *	5.15	1	5.15	43.12 * * *
Age at second birth	14.88	1	14.88	106.79 * * *	1.88	1	1.88	15.78 * * *
.								
Main effects	28.7	7	4.1	29.43 * * *	7.49	7	1.07	8.97 * * *
Residence	6.39	1	6.39	45.84 * * *	0.62	1	0.62	5.16 *
Education	1.9	2	1.9	6.80 * * *	1.19	2	1.19	4.97 * * *
Occupation	4.5	1	4.5	32.28 * * *	0.37	1	0.37	3.11
Sex composition	15.92	3	5.31	38.09 * * *	5.32	3	1.77	14.87 * * *
.								
Explained	121.71	49	2.48	17.83 * * *	17.2	46	0.37	3.13 * * *
Residual	333.46	2,393	0.14		118.97	997	0.12	
Total	455.17	2,442	0.19		136.17	1,043	0.13	
.								
Covariates	Raw regression coefficient				Raw regression coefficient			
Date of first marriage			-0.002				-0.002	
Age at second birth			-0.026				-0.017	

Source: China 1985 IDFS survey data tape.

Notes: * p<0.05; * * p<0.01; * * * p<0.001; DF = degree of freedom; and F = Fisher (R.A. Fisher (1924). Proc. Int. Math. Conf. Toronto, 805).

Table 5: Analysis of variance of probability of having third child for women with two children, according to sex composition of living children, year of the second birth, and selected characteristics of women, Shaanxi Province, China

Source of variation	Second child born before 1979				Second child born 1979 or after			
	Sum of squares	DF	Mean squares	F	Sum of squares	DF	Mean squares	F
Covariates	54.49	2	29.75	245.81 * * *	7.55	2	3.78	28.52 * * *
Date of first marriage	45.5	1	45.5	376.02 * * *	2.97	1	2.97	22.41 * * *
Age at second birth	13.99	1	13.99	115.59 * * *	4.58	1	4.58	34.63 * * *
Main effects	9.26	7	1.32	10.94 * * *	9.59	7	1.37	10.35 * * *
Residence	1.36	1	1.36	11.21 * *	0	1	0	0.002
Education	1.43	2	0.72	5.91 * *	0.46	2	0.23	1.73
Occupation	1.76	1	1.76	14.57 * * *	0.44	1	0.44	3.31
Sex composition	4.71	3	1.57	12.98 * * *	8.69	3	2.9	21.90 * * *
Explained	75.87	49	1.55	12.80 * * *	21.77	43	0.51	3.82 * * *
Residual	258.48	2,136	121		93.31	705	0.132	
Total	334.35	2,185	0.15		115.08	748	0.15	
Covariates	Raw regression coefficient				Raw regression coefficient			
Date of first marriage			-0.002				-0.002	
Age at second birth			-0.028				-0.03	

Source: China 1985 IDFD survey data tape.
Note: See notes from table 4.

The analysis of variance in tables 4 and 5 shows that the raw regression coefficients of the two demographic covariates are both negative. The effect on bearing a third child of the date at first marriage and age at the birth of the second child are both negative and statistically significant. The two covariates account for about 70 per cent of the total explained variation in the period before 1979, while the figures drop to 40 per cent or less in 1979 or after. The date at first marriage, or the marriage cohort as mentioned previously, is the more important covariate because it captures more than 80 per cent of the variation explained by the covariates in both the regions before 1979, while the age at the birth of the second child accounts for less than 20 per cent.

It may be worth noting that the pattern changes to the opposite after 1979 in Shaanxi Province, that is, about 40 per cent of the covariance is accounted for by the date of first marriage, and 60 per cent by the age at the second birth, while the same pattern holds in Hebei but with a 10-percentage-point reduction in the explanatory power of date of first marriage. The levels of significance of these covariates for the period 1979 and after are higher than those in the earlier period.

Among the four demographic and socio-economic variables, sex composition accounts for 50 per cent or more of the main effects on continuing childbearing in the two provinces before 1979. It is more interesting to note that the percentages increase to 71 per cent for Hebei and even 91 per cent for Shaanxi in the period 1979 and after. This change is also reflected in the F (Fisher) ratios. Although all the four characteristics are substantially significant in the first period, in the later period the residence and occupation variables become rather weak or even no longer significant in Hebei, and all three other socio-economic variables are insignificant, except sex composition in Shaanxi. Only the sex of living children remains as the most significant variable throughout the two periods.

Table 6: Multiple classification analysis of probability of having third child for women with two children, according to sex composition of living children, year of second birth, and selected characteristics of women, Hebei Province, China

	Second child born before 1979					Second child born 1979 or after				
		Unadjusted		Adjusted			Unadjusted		Adjusted	
Variables	**N**	**Proba-bility**	**Eta**	**Probability**	**Beta**	**N**	**Probability**	**Eta**	**Proba-bility**	**Beta**
Residence										
Urban	(443)	66		68		(126)	8		10	
Rural	(2,000)	77	0.10	76	0.07	(918)	16	0.07	16	0.06
Education										
No schooling	(1,136)	79		74		(458)	19		18	
Primary	(1,017)	75		77		(384)	11		11	
Secondary & higher	(290)	59	0.14	71	0.05	(202)	13	0.11	16	0.08
Occupation										
Non-agriculture	(277)	58		62		(75)	5		8	
Agriculture	(2,166)	77	0.14	77	0.11	(969)	16	0.08	16	0.05
Sex of living children										
DD	(545)	90		90		(250)	27		27	
DS	(614)	70		71		(275)	10		11	
SD	(663)	73		73		(258)	15		14	
SS	(621)	69	0.19	68	0.19	(261)	9	0.20	9	0.20
Total women	(2,443)					(1,044)				
Grand mean		75					15			
Multiple R squared	0.25					0.11				

Source: China 1985 IDFS survey data tape.
Note: S = son; D = daughter

Table 7: Multiple classification analysis of probability of having third child for women with two children, according to sex composition of living children, year of second birth, and selected characteristics of women, Shaanxi Province, China

Variables	**N**	Second child born before 1979				**N**	Second child born 1979 or after			
		Unadjusted		Adjusted			Unadjusted		Adjusted	
		Proba-bility	**Eta**	**Probability**	**Beta**		**Probability**	**Eta**	**Proba-bility**	**Beta**
Residence										
Urban	(443)	76		81		(110)	15		22	
Rural	(1,743)	80	0.07	81	0.00	(639)	20	0.05	18	0.03
Education										
No schooling	(1,088)	84		80		(335)	25		21	

Primary	(821)	82		84		(199)	17		16	
Secondary & higher	(277)	68	0.13	77	0.05	(215)	12	0.14	18	0.06
Occupation										
Non-agriculture	(338)	71		73		(59)	7		10	
Agriculture	(1,848)	83	0.10	83	0.09	(690)	20	0.09	20	0.07
Sex of living children										
DD	(452)	90		90		(168)	39		39	
DS	(578)	79		79		(219)	13		14	
SD	(571)	79		79		(185)	14		13	
SS	(585)	78	0.12	78	0.12	(177)	12	0.28	13	0.28
Total women	(2,186)					(749)				
Grand mean	81					19				
Multiple R squared	0.21					0.15				

Source: China 1985 IDFS survey data tape.
Note: S = son; D = daughter

As also can be seen in the MCA tables (tables 6 and 7), the highest values of beta for the sex composition factor indicate that the sex of the first two living children, after adjustment is made for the demographic covariates and the other three socio-economic factors, has the most significant effect on bearing the third child. The beta value of sex of children in Hebei remained the same during the two periods, but in Shaanxi, the beta value more than doubled in the later period compared with the earlier period. These findings may suggest that among the four social and economic variables, sex preference is the strongest driving force for bearing the third child for women with two children. When the women are grouped by the year of the second birth, before or after the one-child policy was announced, the vigorous population control policies greatly reduced the probability of having a third child. An approximately 60-percentage-point decrease is found when comparing the grand means between two periods in the two provinces. It seems that the policy pressure has suppressed the effect of social and economic factors but not the sex composition of children, which continued to exert a great influence, even during the one-child campaign.

The overall effect of sex preference on fertility

Table 8: Percentage of women having at least one birth over 5 years, by number of living sons at start of study and values of index of sex preference effect on fertility (SPEF), Hebei and Shaanxi provinces, China, 1980-1985

Number of living children	Number of living sons	Hebei			Shaanxi		
		Number of women	Per cent giving birth	SPEF	Number of women	Per cent giving birth	SPEF
0		1,676	79.2	0.0	1,250	73.8	0.0
1		740	65.0	11.0	489	65.2	12.2
	0	332	73.8		222	74.8	
	1	408	57.8		267	57.3	
2		987	26.6	25.6	667	27.1	30.7
	0	155	54.8		129	55.0	
	1	544	22.2		352	21.3	
	2	288	19.8		186	18.8	
3		822	15.6	37.6	688	11.0	46.5
	0	65	44.6		46	34.8	
	1	315	17.1		232	12.9	
	2	330	9.7		304	5.9	
	3	112	11.6		106	11.3	
4		484	5.6	67.6	564	7.6	40.9
	0	26	34.6		18	11.1	
	1	127	5.5		130	13.8	

	2	192	3.6		222	4.5	
	3	111	1.8		167	6.0	
	4	28	7.1		27	11.1	
5+		371	3.0	96.6	426	8.0	43.6
	0	17	5.9		16	43.8	
	S<D	181	2.2		193	4.7	
	S=D	21	4.8		166	9.0	
	S>D	144	3.5		44	4.5	
	5 more S	8	0.1		7	14.3	
Total		5,080	44.0	8.8	4,084	38.6	10.3
				21.4 *			23.6 *

Source: China 1985 IDFS survey data tape.

Notes: S = son; D = daughter
* Assuming that childless women follow the preference pattern that other women followed.

Table 8 shows that, as expected, during the period of rapid fertility decline and the intense birth control campaign, the percentage of women giving birth substantially decreased in the five-year interval. The major aim of China's current population policy is to eliminate all births equal to three or more per couple, and to encourage most couples to have no more than one child. The policy impact is clearly visible in the pattern of the percentages according to parity. About 65 per cent of women in the two provinces with one living child have had at least one birth during the five-year period, while the proportion drops sharply to about one quarter among women with two living children, and then decreases as the family size becomes larger.

The result also confirms the previous findings by using different measures, which indicate a very strong desire in the two provinces to have at least one son. As can be seen in table 8, at each family size, the percentage giving birth is substantially higher among women with only daughters than among women with at least one son. Up to parity two, the more sons the women have, the smaller the proportion of them giving birth. In addition, women with no daughters among parity three and four are more likely to give birth than women who have had one daughter. This pattern is also found in Bangladesh (Chowdhury and Bairagi, 1990: 754), which may suggest that there is a general desire to have a daughter but probably not before two sons are born.

An inverse relationship is also found between the percentage giving birth and the level of the SPEF index. The SPEF values generally go up as the family size increases. The overall effect of sex preference on recent fertility, estimated from the SPEF index, is about 9 per cent for Hebei and 10 per cent for Shaanxi, both of which are substantial percentages in the case of China. Moreover, the SPEF index assumes that there is no sex preference among the childless women who account for 33 and 31 per cent of the total respondents for Hebei and Shaanxi, respectively. However, in the calculation of overall SPEF index these women are included in the denominator. This is why the overall index is substantially lower than the value in each parity level. Therefore, if it were assumed that the women who were childless at the start of the study would follow the preference pattern that other women followed, the effect might increase remarkably. As indicated in the bottom of table 8, the overall impact would increase to 21 for Hebei and 24 for Shaanxi.

Conclusion

The evidence in this study documents the strong, pervasive son preference which persisted during the powerful family planning programme period in the two provinces, while their fertility dramatically declined. This might imply that the great effort of China's birth control programme did, to some extent, reduce couples' demand for children, but did not change their attitudes towards "male superiority", which is deeply rooted in the traditional cultural and social structures of China. This attitude, however, 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.

In China, the critical family size, from the point of view of population policy, is two children for rural couples. Whether or not the third or higher order births can be eliminated is crucial to the success of any

further reduction in fertility. The present study found that, compared with some major socio-economic characteristics, son preference is the most significant factor which, even during the period of vigourous control of population growth, continued to exert a great influence on bearing the third child. It also found that the overall quantitative effect of sex preference on recent fertility is substantial.

There is also empirical evidence that sex preference affects other reproductive behaviour such as length of breast-feeding, birth intervals and abortion (Arnold and Liu, 1986; Tu, 1990, 1991), that is, both the level and the tempo of childbearing. When all the factors are considered, it may be argued that the efforts both to improve the level of socio-economic development and to change the sex preference will exert a substantial impact on future fertility.

Footnote

1. The occupation factor was regrouped into two broad categories: (a) non-agriculture, including professional, service and industry; and (b) agricultural, including agriculture and those who reported having never worked, since most women in rural areas reported them- selves as having never worked instead of having worked part-time in agriculture or in their household (Tu, 1991: 262). Child deaths were also included as one of the independent variables in the preliminary analysis. However, the results showed that child deaths were insignificant in the decision to bear the third child during the second time period for both the provinces. Although the variable was significant in the first period, it interacted with occupation and sex composition of children in Shaanxi Province. Therefore, child deaths were not fitted in the final model.

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Do Fertility Intentions and Behaviour Influence Sterilization in Sri Lanka?

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Promotion of temporary methods should not be neglected for spacing or limiting programmes

Since Sri Lanka has had a national policy of curbing high population growth since the late 1960s, facilities have been provided throughout the country to attract couples who want to terminate or delay their childbearing by using contraception.[1/] Among acceptors of family planning, sterilization has been the most popular contraceptive method for over a decade. In the 1975 Sri Lanka Fertility Survey (SLFS), only 10 per cent of currently married women aged 15-49 years were protected by sterilization, but by the time of the1982 Sri Lanka Contraceptive Prevalence Survey (SLCPS), the figure had risen to 21 per cent, and by the time of the 1987 Sri Lanka Demographic and Health Survey (SLDHS), to 30 per cent (Carrasco, 1981; Department of Census and Statistics 1983, 1988). The proportion of users relying on sterilization also increased from 30 per cent in 1975 to 38 per cent in 1982 and to 48 per cent in 1987. Among users, the proportion relying on temporary modern methods decreased, from 28 per cent in 1975 to 18 per cent in 1987, perhaps because of the programme emphasis on sterilization rather than birth-spacing methods.

Among the couples who chose sterilization, the female procedure has always been the more popular method. Among users of contraception in the 1975 SLFS, more than 29 per cent relied on female sterilization and only 2 per cent on male sterilization. After 1979, there was a considerable increase in the number of sterilizations, particularly vasectomies. Some argue that the introduction of a cash incentive of 100 rupees ($US 6.25) in 1980, with subsequent increases in the payment to acceptors,[2/] is the most plausible explanation for this rapid increase (Williams, 1982; Liskin, 1983; Thapa *et al*., 1987; Basnayake, 1988). However, sterilization had become one of the most popular contraceptive methods in Sri Lanka even before cash incentives were offered to acceptors. Hapugalle *et al*. (1989) believe that the most likely explanation for the dramatic increase in voluntary sterilization in the early 1980s in Sri Lanka is that pent-up demand for sterilization was being met by successful governmental and non-governmental programmes to improve access to contraceptive services. Moreover, permanent methods of contraception have become popular in Sri Lanka probably because temporary methods such as the pill and condom are relatively expensive. In a study conducted at the main sterilization clinic in Colombo and at various vasectomy camps in the rural areas and the estate sector during November 1980 and January 1981 (at which time the incentive payment was Rs. 500), only 10.9 per cent replied negatively to the question: "If the incentive was not paid, would you get a vasectomy done?" (Dias and Dias, 1988).[3/] Whatever the explanation for the rapid increase in sterilization acceptors after 1979, among all users in the 1982 SLCPS the proportion sterilized had risen to 31 per cent for females and 7 per cent for males.[4/] The figures are comparable with those for the developed world; for instance, in the United States of America, 41 per cent of couples practising contraception in 1982 were sterilized (Bumpass 1987), 26 per cent by tubectomy and 15 per cent by vasectomy (Miller *et al*., 1989).

Contraceptive choice is affected by various factors, among which motivation for childbearing is of the utmost importance (Westoff *et al*., 1980; McCarthy, 1982). Couples who decide that one partner should be sterilized indicate a strong motivation for limiting their family size, even though they may have exceeded their desired fertility. Since sterilization is a permanent method, it requires different motivation from the temporary methods. Cross-sectional data would not be useful to examine the influence of the fertility intentions and other determinants on sterilization behaviour since information on sterilization and preceding fertility intentions would have to be obtained retrospectively (Stephen *et al*., 1988). However, longitudinal data provide information on Sri Lankan women's fertility intentions in 1982 and their fertility and sterilization behaviour over three years and two months following the original interview, and will be useful specifically in answering two basic questions. First, among those who wanted no more children and those who wanted more in 1982, which women (or women's husbands) were sterilized during the period 1982-1985? Second, how did demographic and socio-economic factors, and intervening fertility, influence decisions on sterilization? The secular rise in sterilization, with the reliance on sterilization of about half the people practising contraception in contemporary Sri Lanka, provides another justification for investigating the determinants of sterilization. Identification of them with their earlier fertility intentions, compared with those who were not sterilized, will be useful for policy planners and programme managers in formulating more successful programmes for their clients.

The longitudinal data for the present study were drawn from the records of the 1982 Sri Lanka Contraceptive Prevalence Survey (SLCPS - referred to as Time 1) and its follow-up study, the 1985 Sri Lanka Contraceptive Survey (SLCS - referred to as Time 2). The 1982 survey enumerated 4,500 ever-married women 15-49 years

old, and covered the whole of Sri Lanka, while, owing to civil disorder, seven districts in the northern and eastern parts of the country (which constituted only 14 per cent of the total population) were excluded from the follow-up survey. As defined by the Department of Census and Statistics (1987), the sample for the 1985 follow-up consisted of all 1982 SLCPS respondents who lived in the sample districts, were married at the time of the 1982 SLCPS and also at the time of the 1985 SLCS, and were younger than 50 years of age at the time of the 1985 SLCS. Therefore, the 1985 follow-up study necessarily covers only women who had been married for at least three years and were 18 or more years old. Altogether the 1985 follow-up study covered 2,310 respondents or 76 per cent of those who were eligible. Computer and manual matching of these women with women interviewed in the 1982 survey yielded 2,219 matched respondents, and their response consistency on demographic variables was found to be high (De Silva, 1992). Since the study emphasizes fertility and sterilization events in the follow-up period, only those women who are exposed to such events are considered. Therefore, 493 women were excluded from the longitudinal sample because they or their husbands were reported as sterilized at the time of the original survey (1982). In addition, 172 women were excluded because they thought they were infecund.

Demographic correlates of sterilization behaviour between surveys

Table 1: Distribution of exposed women in 1982 by their inter-survey reproductive and sterilization behaviour

Desire for more children in 1982 and sterilization behaviour 1982-1985		Live births during 1982-85		Total	Percent of those non-sterilized at Time 1
		None	One or more		
Want no more					
Sterilized between surveys	N	77	105	182	22.2
	%	42.3	57.7	100.0	
Non-sterilized at Time 2	N	455	182	637 *	77.8
	%	71.5	28.5	100.0	
Want more					
Sterilized between surveys	N	19	82	101	13.7
	%	18.8	81.2	100.0	
Non-sterilized at Time 2	N	248	386	634	86.3
	%	39.1	60.9	100.0	

Source: Longitudinal data tape 1982-85.

Note: * = Among those who were reported non-sterilized by Time 2, 38 were found to be sterilized (respondent or respondent's husband) at Time 1; they were not included in this category.

Of women who wanted no more children and were not sterilized at Time 1 (1982), 22 per cent underwent sterilization by Time 2 (1985), while the rest relied on other methods of contraception or used no method at all (table 1). Although among the latter group over a quarter reported at least one undesired birth during the period 1982-1985, more than half of the former group reported such a birth. Of women who wanted more children at Time 1, only 14 per cent (101/735) had been sterilized by Time 2. The overwhelming majority (81 per cent) of these women also reported at least one live birth over this period. In other words, more women who had a birth between the two surveys than who had no birth were influenced to accept sterilization.

There were discrepancies in reporting sterilization. Of women who reported that they or their husbands were not sterilized at Time 2, among those who originally desired no more children, 38 (or their husbands) were found to be sterilized at Time 1.[5/] They are not included in this study. The discrepancy may be related to a number of factors, the first of which is surgical failure, or the reversal of male or female sterilization (Weisberg and Fraser, 1982; Silber, 1985; Thapa and Vaidya, 1990). Second, even though the longitudinal sample refers to women whose marriages were intact between 1982 and 1985, there may have been some unreported marriage dissolutions, and in such cases where the original sterilization was a vasectomy, inconsistency in reporting sterilization is not unexpected. In a separate study of a 35-day follow-up conducted on 300 rural women in southern Sri Lanka in 1988, Tsui *et al*. (1991) found that a large number of women protected by sterilization said they needed to rely on another method; the authors believe that either these women have an imperfect understanding of the protection against the risk of pregnancy they have acquired, or they have no confidence in the protection afforded by their husband's sterilization. From time to time, the Family Planning Association, which performs the majority of vasectomies in Sri Lanka, receives requests for reversals from men who have lost a child, remarried, or in later years had second thoughts about sterilization

(Basnayake, 1988). Moreover, since information on contraception relating to the husband, such as male sterilization, was reported by the wife, a few discrepancies are to be expected.

Throughout the world women have tended to be in their late twenties or early thirties when sterilized, although more recently sterilizations have been occurring among young men and women (Leoprapai, 1980; Temkin-Greener *et al*., 1981). A Sri Lankan study reported by Wickramasuriya (1974) found that mean female and male ages at sterilization were 31 and 36 years, respectively. The present study shows a declining trend in age at sterilization 10 years later; assuming that all inter-survey sterilizations took place in the middle of the inter-survey period, the mean age at sterilization was 29 years for females and 35 years for males.[6/] The important question is how life-cycle variables, reproductive desire at Time 1 and fertility outcome in the follow-up period were related to sterilization decisions: are certain groups in the population more likely than others to elect sterilization?

Table 2: Distribution of exposed women in 1982, by inter-survey fertility, sterilization behaviour and selected demographic characteristics

Desire for more children in 1982 and sterilization behaviour 1982-1985	**Age at Time 1**											
	No live birth (1982-85)						**One or more live births (1982-85)**					
	<25	**25-29**	**30-34**	**35-39**	**40+**	**Mean**	**<25**	**25-29**	**30-34**	**35-39**	**40+**	**Mean**
Want no more												
Sterilized between surveys	14.3	36.4	25.9	14.3	9.1	**30.1**	18.1	32.4	33.3	12.4	3.8	**29.4**
Non-sterilized at Time 2	4.4	12.1	19.3	31.8	32.4	**36.2**	21.5	29.3	30.4	14.4	4.4	**29.4**
Want more												
Sterilized between surveys	31.6	36.9	21.0	10.5	0.0	**26.9**	36.6	46.3	14.6	1.2	1.2	**25.8**
Non-sterilized at Time 2	27.4	25.8	25.8	11.3	9.7	**29.4**	48.2	27.8	18.6	5.2	0.2	**25.5**
Desire for more children in 1982 and sterilization behaviour 1982-1985	**Number of living children at Time 1**											
	No live birth (1982-85)						**One or more live births (1982-85) ***					
	0-1	**2**	**3**	**4**	**5+**	**Mean**	**0-1**	**2**	**3**	**4**	**5+**	**Mean**
Want no more												
Sterilized between surveys	3.9	20.8	27.3	24.7	23.4	**3.5**	3.8	26.7	24.8	24.8	20.0	**3.5**
Non-sterilized at Time 2	6.4	25.4	21.3	19.2	27.6	**3.7**	9.4	32.6	18.8	16.0	23.2	**3.3**
Want more												
Sterilized between surveys	26.3	42.1	15.8	10.5	5.3	**2.1**	37.8	41.5	12.2	7.3	1.2	**1.9**
Non-sterilized at Time 2	64.9	21.8	8.9	2.0	2.4	**1.4**	66.1	24.6	7.0	1.5	0.8	**1.3**
Desire for more children in 1982 and sterilization behaviour 1982-1985	**Marital duration at Time 1**											
	No live birth (1982-85)						**One or more live births (1982-85)**					
	<5	**5-9**	**10-14**	**15+**	**Mean**		**<5**	**5-9**	**10-14**	**15+**	**Mean**	
Want no more												
Sterilized between surveys	11.7	31.2	33.8	23.4	**11.3**		13.3	36.2	31.4	19.0	**9.9**	
Non-sterilized at Time 2	5.9	15.1	26.8	52.2	**15.6**		21.0	30.4	30.9	17.7	**9.8**	
Want more												
Sterilized between												

surveys	36.8	26.3	31.6	5.4	**7.5**	50.0	37.8	9.8	2.4	**5.6**
Non-sterilized at Time 2	43.1	27.8	14.9	14.1	**7.3**	66.3	24.6	7.3	1.8	**4.2**

Source: Longitudinal data tape 1982-85.

Note: * Since these women had at least one live birth in the interim, the actual mean at Time 2 should be one or more children higher than the estimated mean in the last column.

Among those who wanted no more children at Time 1 and behaved accordingly, women who were sterilized during the period 1982-1985 comprised a younger group than those with the same reproductive intention and outcome who were not sterilized (first panel of table 2). Those who were sterilized before Time 2 without having a single additional live birth among those who originally wanted more children were also younger, in general, than those who were not sterilized. Even after having one additional live birth among those who were not sterilized, presumably in many instances, a number wanted to have still more children; 48 per cent of these non-sterilized women were under 25 years of age at Time 1.

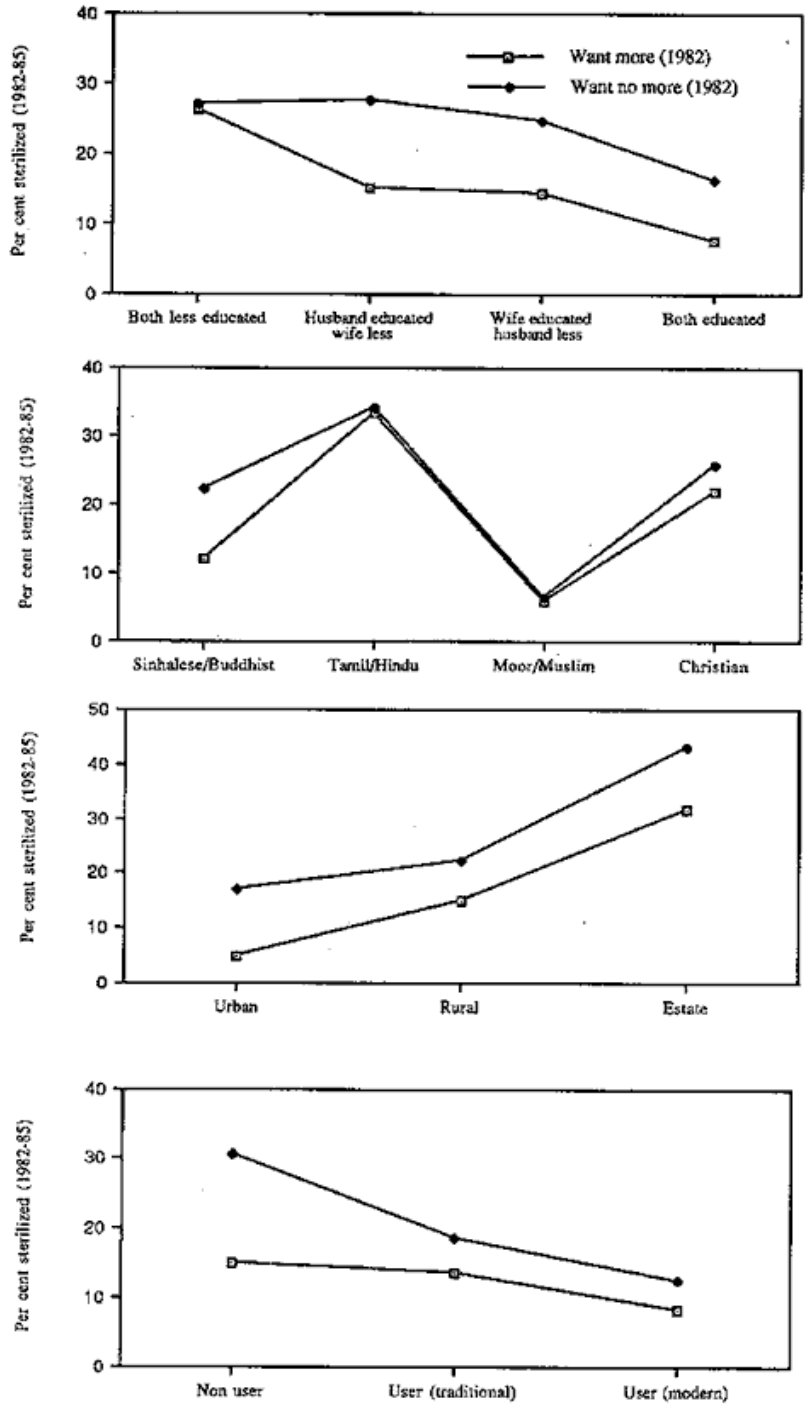
In the second panel of table 2, the number of living children at Time 1 is examined in relation to reproductive intention, subsequent fertility and sterilization behaviour. The sterilized group among those who wanted no more children and those who had none between surveys tended to have had fewer living children at Time 1 than those who were not sterilized. However, of those who had one or more inter-survey live births, irrespective of whether they wanted more children or not at Time 1, sterilized women had larger family sizes than non-sterilized women. The last children born to women who wanted to cease childbearing at Time 1 may have been considered unwanted and therefore may have sparked the desire for the sterilization; frequently these births could have resulted from non-use of contraception or from contraceptive failure. Among those who wanted to cease childbearing at Time 1 and behaved accordingly, sterilization was clearly more common among those married for shorter periods (last panel of table 2).

Socio-economic correlates of sterilization behaviour between surveys

Many researchers have argued that culture presents strong barriers to voluntary sterilization (Bertrand, 1982; McCarthy, 1982; Marcil-Gratton and Lapierre-Adamcyk, 1983). Those who choose not to be sterilized frequently cite religious opposition as an explanation. The 1979 Gallup survey in the United States found that Catholics were twice as likely as Protestants to object to sterilization on religious grounds (Gallup Organization, 1979). In India, Muslim workers often cited religious opposition as the reason for not having a sterilization (Ghosh, 1979). Individual behaviour is not necessarily affected by religion, but religious institutions' opposition to sterilization may affect its availability (Philliber and Philliber, 1985). For instance, in countries where Catholicism and Islam predominate, sterilizations are not always readily available and thereby knowledge of such methods is limited. Knowledge about contraceptives (including prompted knowledge) is high among Sri Lankan women: nearly 99 per cent know of at least one modern method. Female sterilization is known by 98 per cent and male sterilization by 91 per cent of women. Sterilization services are readily available all over Sri Lanka and the accessibility question is largely irrelevant.

Although among the 1,554 non-sterilized exposed women in 1982 about 18 per cent were sterilized by the time of the second survey, there were clear differences in the resort to this method across socio-economic groups and also according to reproductive preference at Time 1. Regardless of reproductive desire at Time 1, sterilization was accepted by a lower proportion of women who were members of better educated couples than of less educated couples[7/] (first panel of figure 1). Except among the less educated couples, where the proportion who were sterilized was almost the same for those who wanted no more children and those who wanted more, women who intended to have no more children adopted sterilization more widely than the rest. If only education of the woman is considered by dichotomizing the husband's and wife's education variable into "less educated" and "better educated", a negative association with inter-survey sterilization behaviour emerges; fewer of the better educated than of the less educated underwent sterilization. Interpretation of the proportions accepting sterilization in different educational categories could be complicated by selection factors. For instance, better educated women were probably younger (or had shorter duration of marriage) and therefore were at earlier stages of the family formation process and less likely to want to terminate childbearing. Such complications are avoidable with multivariate analysis, where the net effects of education on sterilization behaviour can be examined. Multivariate analysis is undertaken in the next section.

Figure 1: Proportion sterilized in the inter-survey period by reproductive desire at Time 1 by selected socio-economic factors



The proportions of Tamil/Hindus and Moor/Muslims who underwent sterilization are at two extremes. About a third of the Tamil/Hindu women in both the "wanted more" and "wanted no more" groups were sterilized during the period 1982-1985, while very few of the Moor/Muslim women were. Sinhalese/Buddhists and Christians were at the intermediate level, and in both cases a higher proportion of women who wanted no more children than of women who wanted more were sterilized (second panel of figure 1). Irrespective of their desire at Time 1, a higher proportion of estate women than of urban or rural women ensured that they ceased childbearing through sterilization between surveys (third panel of figure 1). A higher proportion of people not practising contraception among those who wanted no more children at Time 1 than of users of traditional and modern methods were sterilized at Time 2. The same pattern occurred among women who wanted more children, but the differences are marginal.

While inter-survey sterilization shows a relation to reproductive desire at Time 1, intervening fertility is also related to sterilization. Proportions sterilized within each category of each socio-economic variable after controlling for fertility in the longitudinal period in addition to original desire are presented in table 3. Of

women who had had an unplanned birth between surveys, 37 per cent were sterilized, while of those who succeeded in having no birth, 14 per cent were sterilized by Time 2.

Regardless of their original reproductive desires, a higher proportion of women in each category of each socio-economic variable who had an inter-survey live birth than of women who bore no child were sterilized. Although inter-survey fertility obviously influenced sterilization decisions, there were clear differences within each socio-economic variable.

Table 3: Percentage of exposed women at 1982 sterilized between surveys, by socio-economic factors, reproductive preferences and intervening fertility

Variable as of 1982	Want no more children at 1982		Want more children at 1982		Total
	No live birth 1982-1985	One or more live birth 1982-1985	No live birth 1982-1985	One or more live birth 1982-1985	
Couples' education					
Both less educated	17.1	43.2	13.6	30.7	26.8
Husband educated; wife less	20.0	44.1	11.4	16.9	22.3
Wife educated; husband less	23.0	25.9	4.3	20.0	20.6
Both educated	8.9	33.3	4.8	9.6	11.7
Ethnicity/Religion					
Sinhalese/Buddhist	14.5	37.2	5.3	15.9	17.4
Tamil/Hindu	28.6	41.2	26.7	35.7	33.7
Moor/Muslim	5.9	7.1	4.3	9.1	6.1
Christian	13.6	50.0	15.4	26.3	25.3
Place of residence					
Urban	11.6	31.8	6.9	14.5	10.7
Rural	14.0	36.8	8.2	18.7	18.9
Estate	40.0	45.4	25.0	34.1	36.4
Work status					
Non-working	13.8	36.3	6.5	15.5	11.4
Working at home	18.2	33.2	8.6	20.0	18.1
Working away	14.7	40.8	8.5	22.8	20.6
Husband's occupation					
Primary	16.7	34.0	5.2	22.9	20.3
Not in primary	13.3	38.2	7.9	14.2	17.1
Contraception					
Non-user	26.3	36.1	8.9	18.2	21.6
User (traditional)	9.8	38.3	3.9	18.1	16.5
User (modern)	5.4	34.3	5.9	10.5	11.1
Total	14.4	36.6	7.1	17.5	18.2

Source: Longitudinal data tape 1982-85.

Again, educated women in general, in the combinations of an educated husband and wife and an educated wife with a less educated husband, show the lowest proportions sterilized after having had unplanned births (table 3). However, except where both partners were educated, when couples had succeeded in having no child, almost the same proportions of all educational groups had been sterilized. Irrespective of whether they had borne a child or not and whether or not they initially wanted a birth, Moor/Muslim women were the least likely ethno-religious group to have been sterilized by Time 2. The opposite was true for Tamil/Hindu women, who were more often sterilized than the rest. Since there is a high concentration of Tamil/Hindu women in the estate sector, this, too, shows high levels of sterilization compared with the urban and rural sectors.

Although women working away from home in general resorted to sterilization more than non-workers and those working at home, there was not much difference when their original reproductive desires and

intervening fertility were controlled. Similarly the husband's occupation made little difference to sterilization behaviour. Among women who wanted, and had, no birth between surveys, a few had changed from using modern contraception to sterilization by Time 2. However, those not practising contraception at Time 1, even if they had no inter-survey birth, were more likely than the rest to have been sterilized.

Who chooses sterilization? Multivariate analysis

The sterilization behaviour by Time 2 of non-sterilized exposed women at Time 1 has been shown to be related to socio-economic and demographic factors, including reproductive intention and intervening fertility. To investigate the net association of these variables with sterilization behaviour (dependent variable) a multivariate logistic regression was undertaken using SAS (1985) computer software.[8/] The regression model uses a dichotomous dependent variable that takes the value of 1 if a respondent or her husband had been sterilized between surveys, and 0 if she or her husband were not.

Table 4: Logistic regression model of whether women had been sterilized between surveys on selected characteristics

Variable as of 1982	Coefficient (log odds)	Standard error	X^2
Constant	-1.421[a]	.168	79.3[a]
No. of living children			27.5[a]
0-1	-.852[a]	.171	
2-3	.214[c]	.107	
4+	.638[a]	.160	
Age			18.1[a]
<25	.288[d]	.158	
25-34	.350[a]	.107	
35+	-.638[a]	.163	
Duration of marriage (years)			5.5[d]
<5	.138[ns]	.148	
5-9	.177[ns]	.114	
10+	-.315[c]	.147	
Desire for more children (1982)			9.6[b]
Want more	-.267[b]	.092	
Want no more	.267[b]	.092	
Inter-survey births (1982-85)			24.3[a]
None	-.452[a]	.090	
One or more	.452[a]	.090	
Place of residence			4.7[d]
Urban	-.418[c]	.185	
Rural	.012[ns]	.169	
Estate	.406[c]	.198	
Ethnicity and religion			12.6[b]
Sinhalese/Buddhist	.157[ns]	.210	
Tamil/Hindu	.450[ns]	.353	

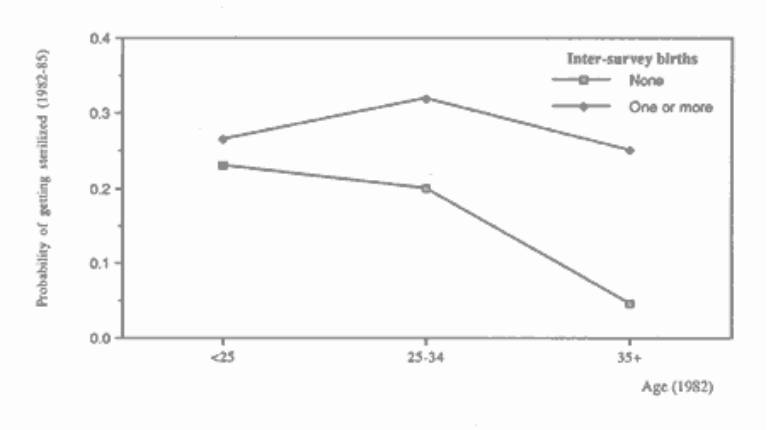
Moor/Muslim	-1.425[b]	.470		
Christian	.818[b]	.254		
Couples's education			13.1[b]	
Both less educated	.269[c]	.129		
Husband educated; wife less	.151[ns]	.138		
Wife educated; husband less	.021[ns]	.169		
Both educated	-.441[a]	.123		
Contraception (1982)			6.6[c]	
Non-user	.272[a]	.111		
User (traditional)	.104[ns]	.117		
User (modern)	-.376[c]	.164		
Age by inter-survey births			13.9[a]	
	None		One or more	
<25	.375[b]	(.129)	-.375[b]	(.129)
25-34	.130[ns]	(.102)	-.130[ns]	(.102)
35+	-.505[a]	(.131)	.505[a]	(.131)
Likelihood ratio X^2 with 675 d.f. (final model)			620.9	
Likelihood ratio X^2 with 820 d.f. (initial model)			743.5	

Source: Longitudinal data tape 1982-85.

Notes: a- P<0.001, b- P<0.01, c- P<0.05, d- P<0.10, ns- not significant. In the last panel, figures in parentheses are standard errors; others are coefficients.

Figure 2: Estimated probabilities of adopting sterilization 1982-1985 by inter-survey births and age

The final model selected is shown in table 4. A positive coefficient for any category of a predictor indicates that the likelihood of being sterilized between surveys was higher than for women in other categories of the same predictor. Parameter estimates with negative signs indicate the opposite. Within any variable, the sum of the coefficients is constrained to equal zero. After controlling all other socio-economic and demographic variables, women who wanted to have no more children at Time 1 were more than one and a half times ($e^{.267+.267}$=1.71) as likely to have been sterilized by Time 2 as women wanting more children. Among the demographic factors, the number of living children at Time 1 shows a strong positive relation with sterilization. Compared with women with fewer than two living children at Time 1, women with four or more living children were more than four times ($e^{.638+.852}$=4.44) as likely to have been sterilized.



With an increase in marriage duration or age of women, the likelihood of being sterilized shows a curvilinear relationship; women at age 25-34 or marriage duration 5-9 years were found to be at the peak stage of sterilization and thereafter the proportion sterilized decreased considerably. Moreover, age shows a strong interaction with intervening fertility. Women with one or more inter-survey live births were most likely to be sterilized, but there were clear differences between these groups as the ages of women increased. As shown in figure 2, at ages under 25 years intervening fertility shows no strong effect on sterilization, but as age increases there is a decrease in the proportion sterilized among women who bore no child. Among those who had had one or more live births, on the other hand, the likelihood of having been sterilized shows a curvilinear relationship with increasing age. About a third of women in the middle ages (25-34 years) had ceased childbearing and were sterilized. Among older women (35+ years) who had a birth during the period 1982-1985, a quarter adopted sterilization, but of those who had no birth in the same period, less than 5 per cent were sterilized. Among the socio-economic factors, education shows its strong influence on sterilization. Termination of childbearing by accepting sterilization is estimated to have been twice ($e^{.269+.441}=2.03$) as high among less educated couples as among better educated couples. Less educated couples even show about 34 per cent ($e^{.021+.269}=1.34$) higher acceptance of sterilization than the combination of an educated wife and a less educated husband. When all other factors are held constant, very few Moor/Muslim women adopted sterilization to limit their family sizes. Compared with Moor/Muslims, Christians were at the other extreme: many of them used sterilization to terminate childbearing. Among the residence categories, urban women were the least inclined to have undergone sterilization after controlling other factors, while estate women were the most inclined to have done so.

Although women included in the present analysis were not sterilized at Time 1, some of them were practising contraception at Time 1. Confirming the bivariate analysis, after controlling all other factors, higher proportions of those not practising contraception and traditional method users at Time 1 than of modern method users chose sterilization by Time 2. Although the analysis sheds some light on reproductive motives at Time 1 and subsequent fertility and sterilization behaviour, it is not possible to be sure about the observed pattern of sterilization behaviour within each socio-economic structure because of unknown patterns of induced abortion. For instance, induced abortions may have terminated a large proportion of unintended pregnancies in the urban sector, while in the estate sector fertility control relied largely on sterilization. Since induced abortion is legally prohibited, information about its incidence could not be obtained from any source in Sri Lanka. Although for religious reasons the majority of Sri Lankans are believed to disapprove of abortion as a fertility control method, a significant minority approve of it in certain circumstances, such as poverty, or when the mother is ill or has many children (Caldwell *et al*., 1987).

Summary and conclusions

From the above findings it seems that a large proportion of women who were motivated to accept sterilization in order to cease childbearing between 1982 and 1985 had wanted no more children at Time 1, but reported a birth between then and the sterilization. Many of them were aged 25-34 years at Time 1 and used no contraception before being sterilized. More women who had large families at Time 1 than who had smaller families underwent sterilization in the inter-survey period. Sterilization was favoured by Christian and Tamil/Hindu women more than by others and by less educated couples more than by the better educated ones. Of those who wanted to have more children at Time 1, only 14 per cent were sterilized in the inter-survey period, and of these women the overwhelming majority accepted sterilization only after they had had a birth which they were expecting.

A number of studies have found that a higher proportion of educated than of less educated women in Sri Lanka prefer traditional methods of contraception to modern methods (Caldwell *et al*., 1987; Kahn *et al*., 1989; Tsui *et al*., 1991). Moreover, since the cash incentive for sterilization was 500 rupees for most of the inter-survey period, this may have influenced more of the less educated couples to choose sterilization in this period. It is also possible that less educated couples turn to sterilization because they have more trouble using reversible methods. However, as found in this study, women using no contraception at Time 1 were the likeliest subjects for inter-survey sterilization while those using modern methods were the least likely.

In comparison to other ethno-religious groups in Sri Lanka, Muslim women commonly resist contraception, especially sterilization. This may be related to religious reasons or to their traditional outlook. Even though Tamil/Hindu women favoured sterilization marginally more than Sinhalese/Buddhists, both groups showed little difference from the average inter-survey level of acceptance of sterilization. The contraceptive appliances for modern temporary methods may have been more available and accessible in urban Sri Lanka than in the rest of the country; therefore, more urban than other women may have continued their dependence on such methods instead of changing to sterilization.

There are a number of reasons for the high acceptance of sterilization in the estate sector. First, greater failure

to control their fertility by other means could be the prime reason; not only did the estate women record the highest total fertility rate (TFR), i.e. 3.4, for the period 1982-87 (SLDHS), after having the lowest in 1975 (SLFS), compared with the levels of urban and rural women, they also reported the highest level of undesired births (Westoff *et al.*, 1989; De Silva, 1990b, 1991). Second, the cash incentive of 500 rupees and leave benefits of the sterilization package offered by the Government since 1979 may have attracted a higher proportion of estate women (Hapugalle *et al*., 1989). Third, maternity leave for estate women is granted only for the first two children, so that fertility after two children may have been considered undesirable because it could cause serious problems related to subsistence.

In the last two or three decades, the demand for large families in Sri Lanka has weakened; the TFR dropped from 5.0 in 1963 to 2.8 for the years 1982-1987. To achieve the replacement fertility target (TFR of 2.1 per woman) in Sri Lanka by the year 2001, the prevalence of contraceptive methods is required to rise from 55 per cent in 1981 to 71 per cent in year 2001. The most recent estimate of contraceptive prevalence, which is provided by the 1987 DHS, is 62 per cent, which is near the required level, but falls short of the estimated target of 64 per cent by a narrow margin (De Silva, 1990a). However, to achieve the target of replacement fertility by 2001, female sterilization will need to increase to 30 per cent and male sterilization to 7.1 per cent from the 1981 levels of 17 per cent and 3.6 per cent, respectively; thus, female sterilization must increase annually by 30,000 and male sterilization annually by 7,000 throughout the period.

Demand for family planning services in Sri Lanka is well accommodated through public and private organizations. However, programmes had less effect in promoting contraception for birth-spacing methods. If at any time in the future the compensatory payment is reduced or removed, there will be a challenge for the providers to meet the high demand for temporary contraceptives for the large segment of the population who want to limit family size. The study shows that among those women who became sterilized in the interim, a large proportion had used no contraception at the time of the first survey; therefore, promotion of temporary methods for spacing or limiting purposes should not be neglected in the public and private sector programmes. The strategy may well be useful to prevent any undesirable outcomes on the side of those practising contraception, which may arise if there is a policy change with regard to compensatory payment for sterilization. Moreover, if contraception is well linked to reproduction in Sri Lanka, such a strategy could not be a failure.

Even though there is no direct evidence, the study shows the possibility of some of the sterilized couples obtaining reversal operations. Therefore, an important policy implication is that family planning providers need to do more careful screening and pre-operative counselling. From the present data, it is not possible to judge what proportion of the sterilized women have later regretted their action, but it may not be a significant proportion.9/ Most would have been sterilized after having all the children they wanted in order to make sure that the remainder of their reproductive period would not be interrupted by unwanted births.

Footnotes

1. The first family planning services were made available by the Family Planning Association as a non-governmental activity as early as 1953, but a national programme was inaugurated only in 1965 and became active only in 1968 when the Family Planning Bureau was established within the Ministry of Health.

2. In May 1979, the Government of Sri Lanka introduced a system of payment of financial benefits to medical personnel and supporting staff who carried out sterilizations; a fee of 65 rupees was paid for female sterilizations and 35 rupees for male sterilizations. In January 1980, the Government introduced a cash benefit of 100 rupees for all people accepting sterilization voluntarily. In October 1980, this was increased to 500 rupees, but from February 1981 to the end of that year only 200 rupees were offered. From January 1982, the payment was increased to 300 rupees and it remained at that level until May 1983. From June 1983, it was again raised to 500 rupees (Thapa *et al*., 1987). Cash payments to sterilization acceptors are common in the programmes of Bangladesh, India, Nepal, Pakistan and the Republic of Korea; however, the client's decision to accept sterilization is well thought out, and the principal reason for choosing sterilization has been found to be the desire to limit family size (Covington *et al*., 1985; Philliber and Philliber, 1985; Ross *et al.*, 1985; Cleland and Mauldin, 1987).

3. A somewhat higher negative response might have been recorded had acceptors been questioned in a place away from the clinic or camps by someone independent of the sterilization procedure, or had they been questioned a few months after the operation, because the most common reasons for sterilization regret are related to the remarriage of the person, or the death of his or her child, and not enough time had passed from the time of the operation (Landy, 1990).

4. Although there are no legal prescriptions concerning eligibility for either male or female sterilization in Sri

Lanka, the Government has established three eligibility criteria. The potential acceptor should (a) be younger than 49 years old if male and younger than 44 if female, (b) be legally or customarily married and have the informed consent of his or her spouse, and (c) have at least two living children (Ministry of Plan Implementation, 1985).

5. The inconsistency level observed in Sri Lanka is low (38/493 = 8 per cent) compared with corresponding estimates from some other countries. For instance, in the Costa Rican World Fertility Survey follow-up study (only one and half years), of 256 women who reported contraceptive sterilization at the first interview, 11 per cent failed to do so at the second interview (Stycos, 1984).

6. A study conducted in 1985 found that at the time of the sterilization, the mean age among all women was 29, and their mean number of living children was 3.5 (Hapugalle *et al*., 1989). However, at sterilization, women from the tea estates were younger and had fewer living children than women from the Colombo clinics or from rural clinics. Almost half (47 per cent) of the sterilizations among women in the rural areas occurred within one month of delivery, compared with 13 per cent among women in Colombo and 12 per cent among women on the tea estates.

7. The cut-off between "educated" and "less educated" was made at six years of schooling. Categorization was limited to four classes: both less than or equal to six years; husband more than six years, wife less than or equal to six years; wife more than six years, husband less than or equal to six years; both more than six years.

8. Since there are relatively few variables, a backwards elimination procedure is employed; in the first run, all variables and possible first-order interaction terms are considered. Based on the level of significance in the first run, the least important interaction term was dropped in the second run and its impact on the model was tested by the change in likelihood ratio statistic. The procedure continued until significant change in likelihood ratio statistic was observed to decide on the final model. The overall summary statistics for the final and initial models are shown at the bottom of table 4. Since the reduction in LRX^2 = 122.6 with d.f. = 145, it is evident that nothing significant has been eliminated.

9. A study which examined "regret" among sterilization acceptors between 1980 and 1983 in Sri Lanka indicates that 14 per cent subsequently regretted their sterilizations: that is, they said they wanted to have another child or they wished they had been sterilized later or not at all (Hapugalle *et al*., 1989). The estimate is identical with the 1987 SLDHS figure for the question: "Do you regret that you (your husband) had the operation not to have any more children?" Thapa *et al.* (1987) and Hapugalle *et al*. (1989) found that women who had received higher payments were no more likely than those who had received lower amounts to regret having been sterilized.

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Population Projections for Mongolia: 1989-2019

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This note provides updates of the population projections prepared by the State Statistical Office of Mongolia in 1989. The exercise is justified for two reasons. First, as has been the case with other former socialist countries, Mongolia has recently been experiencing substantial economic, social and political transformations that will certainly have a major impact on its future population dynamics. Second, during the last four years, there have been substantial deviations in fertility and mortality trends from those that were foreseen some time ago. In part, these changes have occurred as a result of the transformations that are going on in the country, but mainly because of major changes in population policies. Past and recent population trends in Mongolia, as well as shifts in population policies, are described and examined in the lead article of this *Journal* starting on page 3.

The current national leaders have come to recognize the importance of factors that affect, and are affected by, socio-economic development. One such factor that is recognized as crucial is population. The emphasis that the present administration places on population is unparalleled in the country's history.

This interest emerges during a period of great perplexity for the country with regard to its economic and social future. Currently, Mongolia is suffering from the worst economic crisis of its recent history. It is very difficult to predict when the economy will begin to emerge from the collapse which it is currently experiencing, and whether or not it will be able to generate enough employment and higher salary levels, and when the transition towards a market economy will be completed. The lack of knowledge with respect to what will occur vis-a-vis the country's population dynamics in the next two or three decades is an uncertainty that must be added to the rest.

Aware of this growing need for information, the State Statistical Office (SSO), with the support of UNDESD and UNFPA, prepared the new projections contained in this note. In most countries, population projections have become essential items of information for both the Government and the private sector. Any development plan should consider in advance, for example, what is going to be the size of the labour force, what will be the housing needs and the demand for schools and for health services. The information on these needs comes from data on the future population size, its age distribution, its rate of growth etc.

In Mongolia, because of the economic and social transformations currently under way, and because of the recent changes in the country's population dynamics, population projections are particularly important. It is expected that the results of these projections could become a useful contribution for the design and formulation of public policies oriented towards accelerating social and economic development in the country.

Methodology

A standard cohort component method was used in preparing these projections. Using this approach, each five-year cohort was advanced through time in five-year increments (Shryock and Siegel, 1976). In other words, this method yields the projected population by sex and five-year age groups for the end of each quinquennium of the projection period, in this case, for each quinquennium between 1989 and 2019. The base population used in these projections is the adjusted 1989 census population. As mentioned in another section of this issue of the *Journal*, the method used for the adjustment was consistent correction. A brief description of this technique is presented in the section entitled "Sources of data" in the article beginning on page 3. The computer program DEMPROJ was utilized to perform the projections (United Nations, 1991).

Because of the evident uncertainties regarding future population changes, it is desirable to present more than one projection. These different projections represent combinations of assumptions concerning one or more of the components of population change. The most common practice is to prepare three projections which are called high, medium and low variants according to the assumptions made concerning the impact on population growth of the assumed changes in the components.

The projection of mortality

The level of mortality (expectation of life at birth) was projected by assuming that, during the projection period, it will continue to decline at the same pace as in the past two decades. The four values of expectation of life at birth corresponding to the four quinquennia were incorporated within a linear equation and, using this equation, expectations of life at birth were extrapolated up to the period 2014-2019. The procedure was applied separately to males and females. Table 1 and figure 1 show the respective data.

Table 1: Mongolia: projection of expectation of life at birth

(years)

	Quinquenium	Male	Female
Estimated	1969-1974	56.3	59.4
	1974-1979	58.3	62.1
	1979-1984	58.0	61.6
	1984-1989	58.5	62.4
Projected	1989-1994	59.4	63.5
	1994-1999	60.0	64.4
	1999-2004	60.6	65.2
	2004-2009	61.2	66.1
	2009-2014	61.9	66.9
	2014-2019	62.5	67.8

Figure 1: Projection of expectation of life at birth

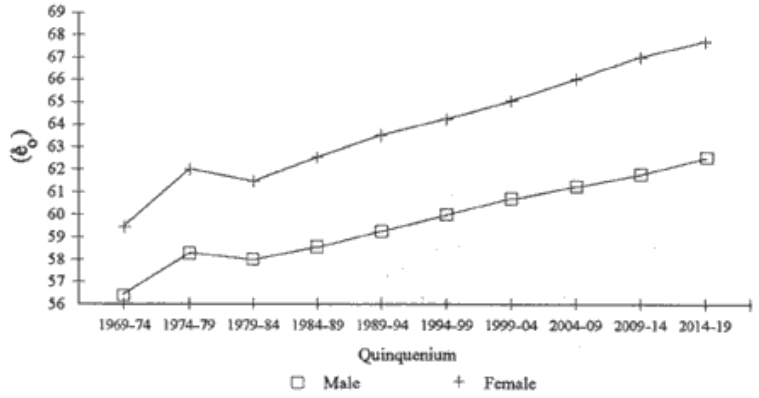
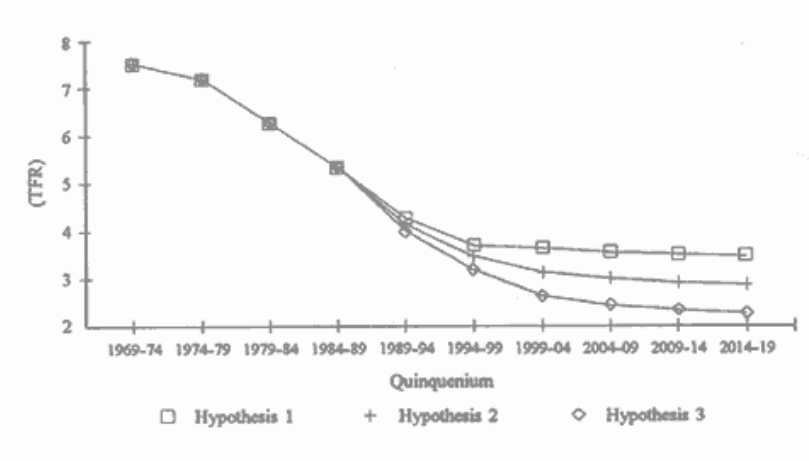


Table 2: Mongolia: projections of total fertility rate

	Estimated	**Projected**		
Quinquenium		Hypothesis 1	Hypothesis 2	Hypothesis 3
1969-1974	7.5342			
1974-1979	7.2441			
1979-1984	6.3408			
1984-1989	5.3964			
1989-1994		4.2883	4.2250	4.1618
1994-1999		3.7515	3.4680	3.1845
1999-2004		3.5721	3.1019	2.6317
2004-2009		3.5200	2.9483	2.3767
2009-2014		3.5055	2.8878	2.2702

2014-2019	3.5015	2.8645	2.2275

Figure 2: Projections of total fertility rates



It is important to note that the differences in male and female expectations of life at birth are assumed to increase through time. This trend has been observed in most countries: as mortality declines, the differences between male and female mortality increase. In addition, the observed expectation of life during the four past quinquennia already shows this trend.

The age structure of mortality is assumed to remain constant during the complete projection period. During the past two decades, it has not experienced any major changes and there is nothing to suggest that it may change in the future. Therefore, the mortality structure observed in the period 1984-1989 was assumed for the complete projection period. The sub-routine MATCH, from the United Nations (1988) computer program for mortality analysis, MORTPAK, was used to compute the life tables which correspond to the projected expectations of life at birth.

The projection of fertility

The procedure used here to project fertility is based on the demographic transition theory which assumes that this variable, when at an historical high and relatively stable level, will decline to a much lower level which is also comparatively stable. This decline can be described through a logistic curve where fertility is expressed in terms of total fertility rates (TFR) or gross reproduction rates (GRR). This curve usually plots as an inverted S-shape when used to represent these rates (see CELADE, 1984; United Nations, 1956).

Using the logistic function as a tool to project fertility, three hypotheses were proposed: in Hypothesis 1, fertility was assumed to follow a logistic pattern in the future that will stabilize at a level corresponding to a TFR of 3.5 children per woman. This figure was chosen mainly because a recent survey, previously cited, reveals that the desired family size among young Mongolian women is approximately 3.5 children (SSO, 1989).

In another hypothesis (Hypothesis 3), fertility was also assumed to follow a logistic trend but, in this case, the decline will be almost linear up to the period 1990-2004. After that, it will continue to decline but at a slower pace and up to the replacement level. This level corresponds to the fertility necessary for a population to replace itself (approximately 2.23 children per woman in the case of Mongolia during that period). The replacement level would be reached during the last quinquennium of the projection period. In a number of countries that have already completed their fertility transition, their fertility has stabilized at a level corresponding to replacement. Hypotheses 1 and 3 can be considered as representing the lower and upper limits of fertility decline. It is very unlikely that, at the end of the projection period, fertility will reach values below the replacement level or higher than 3.5 children per woman. However, these two values should be considered more as extreme limits than the most plausible levels for the future. A fertility level of 3.5 children per woman seems too high for the end of the projection period, especially considering the rapid decline in fertility experienced by the Mongolian population during the 1980s. On the other hand, stabilization at the replacement level would seem to reflect a fertility level too low, especially considering that in some rural areas fertility is still quite high and that the traditional preference for large families still prevails in some areas and segments of Mongolian society.

For this reason, a third hypothesis was proposed (Hypothesis 2). It represents an intermediate situation between Hypothesis 1 and 3. The TFRs projected by means of this hypothesis are considered as the most plausible future trend of fertility. The fertility trends proposed by these three hypotheses are presented in table 2 and figure 2.

As mentioned in a previous section, the age structure of fertility has experienced major changes during the past decade. In other words, the decline in fertility level is being accompanied by a change in the pattern of age-specific fertility rates. Therefore, it was considered necessary to project not only the level of fertility but also its age composition.

The age structure of fertility was assumed to follow in the future the trend observed in the past two decades, that is, as fertility continues to decline, the age structure will become more concentrated in the younger age groups. In other words, the mean age of fertility will become lower and the variability of the distribution smaller.

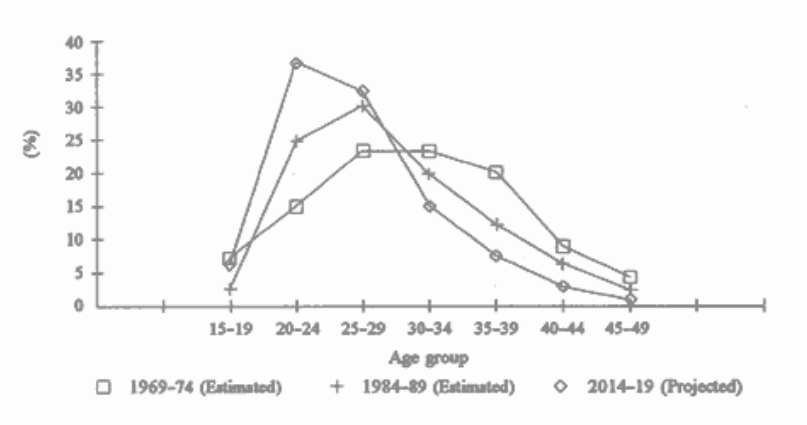
A method based on the linearized Gompertz function was used to project the age structure of fertility. The technique involves essentially representing accumulated age-specific fertility rates by the Gompertz function previously linearized by a logarithmic function in such a way that a linear equation is obtained (see, for example, CELADE, 1984; Martin, 1967; Romaniuk and Tammy, 1969; Wunsh, 1966).

Table 3: Mongolia: projections of the age structure of fertility

(per cent)

Age group	1989-1994	1994-1999	1999-2004	2004-2009	2009-2014	2014-2019
15-19	3.4	3.7	4.0	4.4	5.0	5.7
20-24	26.6	28.8	31.0	33.2	35.2	37.1
25-29	31.6	32.2	32.6	32.8	32.5	32.0
30-34	19.7	18.8	18.0	17.0	16.0	15.1
35-39	11.4	10.3	9.3	8.4	7.6	6.9
40-44	5.7	4.9	4.1	3.5	3.1	2.7
45-49	1.6	1.2	1.0	0.8	0.6	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Figure 3: Age structure of fertility



In these projections, it was assumed that the age structure of fertility would be the same for the three fertility-level hypotheses already formulated. Table 3 shows the respective information and figure 3 shows the distributions for the periods 1969-1974, 1984-1989 and 2014-2019.

The article beginning on page 3 of this issue of the *Journal* suggests that official population policies regarding fertility had a significant impact on fertility trends in the recent past. Therefore, it is important to make some reference here to the current situation and possible future developments.

Although a formal population policy has not been formulated, some sectors in the Government are alarmed by the recent sharp decline in birth rates mainly because they consider that the size of the population is too

small and the rate of growth is too slow. It is important to mention that Mongolia is experiencing a revival of its traditions and culture, and the idea of a sustained population increase is considered as a positive contribution to maintain the national identity and to strengthen the country as a nation. However, this idea is not part of any development plan or economic growth strategy. Actually, there is not much understanding of the future economic and social consequences of more rapid population growth.

On the other hand, the Government is also quite concerned about the high levels of infant and maternal mortality, and also with the fact that couples really want to regulate their fertility. Thus, it is quite difficult for the Government to revive the past policy of limiting the use of contraception, or to change the abortion law. It is even possible that an official family planning programme will be implemented in the near future as part of a broader maternal and child health care programme. Therefore, it is relatively safe to predict that fertility will continue to decline in Mongolia.

Net international migration

As mentioned previously, international migration in the past has been negligible in Mongolia. Nevertheless, it seems that this situation may change in the future. The new administration has not yet issued a formal migration policy, but some changes can be observed. To begin with, the severe restrictions placed on travel abroad for Mongolian citizens have been relaxed and, because of the effects on employment of the economic crisis, there is not as much concern as previously with respect to eventual labour shortages as a result of emigration. This change of attitude is reflected in the migration of a large number of Mongolian citizens of Kazakh descent to the Republic of Kazakhstan. It is estimated that during 1990, some 12,000 Kazakhs left Mongolia. Unfortunately, exact figures are not available.

A decision with regard to immigration has not been taken either, but, considering the geo-political situation of the country and the economic problems that it faces, it is not likely that it will adopt a policy of facilitating or stimulating immigration. However, if a policy favourable to immigration is adopted, a significant migration from China could be expected, in particular from Inner Mongolia.

There is little doubt that international migration will have an impact on Mongolia's population -- probably not in the next few years, but certainly during the next quinquennium. However, the situation is too uncertain for one to consider the migration component in these projections. Since it is not possible to risk a future estimate, it is assumed that international migration will continue to be negligible in the next 30 years in spite of the fact that this possibly will not be the case.

Population projections

Based on the projections of mortality and fertility, three population projections were performed:

Projection 1: In this projection, it is assumed that mortality will follow the proposed linear trend. Fertility is assumed to follow the trend proposed in Hypothesis 1. This projection can be considered as the high variant or the projection that will result in the largest population.

Projection 2: Mortality is assumed to follow the same declining linear trend of fertility proposed in Hypothesis 2. This projection represents the medium variant. This variant can be considered as the "recommended projection", that is, the projection that describes the most likely population size and structure for the future.

Projection 3: The assumptions regarding mortality are the same as in the other two projections. Fertility is assumed to follow the trend proposed in Hypothesis 3. This projection can be considered as the low variant, that is, the projection that will produce the smallest population size.

It is important to mention that the component that will determine the future population size and structure in Mongolia is fertility. Mortality has a secondary role and even if its decline is more rapid than is assumed here, it will not affect substantially the future population.

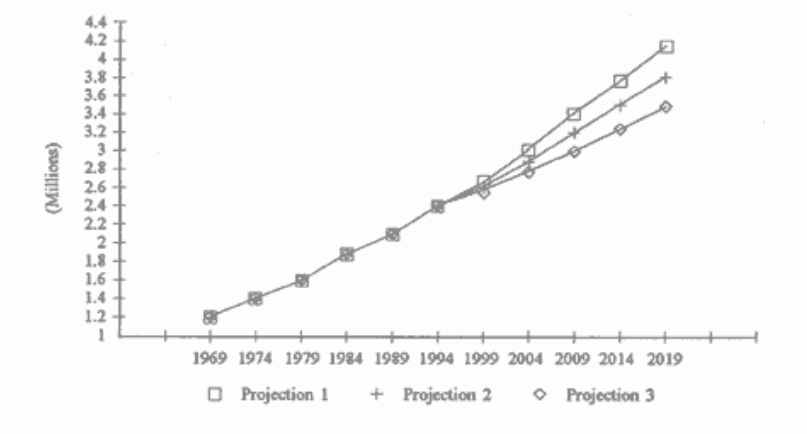
Table 4 shows the total populations obtained with the three projections (see also figure 4).

Table 4: Mongolia: projections of the total population

Year	Projection 1	Projection 2	Projection 3
1969	1,196,307	1,196,307	1,196,307

1974	1,405,820	1,405,820	1,405,820
1979	1,602,346	1,602,346	1,602,346
1984	1,873,228	1,873,228	1,873,228
1989	2,119,965	2,119,965	2,119,965
1994	2,388,345	2,383,047	2,377,803
1999	2,661,186	2,628,777	2,595,787
2004	2,982,962	2,898,747	2,813,538
2009	3,347,028	3,190,883	3,034,249
2014	3,750,216	3,505,158	3,261,177
2019	4,180,091	3,827,981	3,482,194

Figure 4: Projections of the total population



According to Projection 2 (the most probable), the population of Mongolia will be almost 3.8 million in the year 2019. Projections 1 and 3 give total populations of 4.2 and 3.5 million, respectively. Since only the level of fertility differentiates the results of these projections, its impact on the size of the population is quite clear. The difference between a TFR of 2.2 and 3.5 for the last quinquennium of the projection period resulted in a difference of around 700,000 people. The difference between Projections 1 and 2 is not that large: about 400,000 people. It is also important to mention that the three projections give relatively similar population sizes for the rest of the present century. For 1999, for example, the difference between Projections 1 and 3 is approximately 70,000 persons. Considering the fertility assumptions adopted for these projections, it is not very likely that the size of the population at the turn of the century will be much smaller than 2.6 million or larger than 3 million. What is more uncertain is the scenario for the second decade of next century.

Table 5: Mongolia: population projections - indicators of age and sex structure

Projection 1	**1989**	**1994**	**1999**	**2004**	**2009**	**2014**	**2019**
Total	2,119,965	2,388,344	2,661,186	2,982,962	334,7028	375,0215	4,180,091
Males	1,057,661	1,194,025	1,333,524	1,494,346	167,5900	187,6897	2,090,128
Females	1,062,304	1,194,319	1,327,662	1,488,616	167,1128	187,3318	2,089,963
0-4	343,856	347,867	362,556	399,834	449,126	497,946	535,179
5-14	559,004	628,160	673,265	692,900	745,090	831,312	929,063
15-64	1,125,246	1,329,353	1,550,669	1,809,063	2,060,130	2,323,529	2,603,751
65+	91,859	82,965	74,696	81,166	92,682	97,429	112,098
% male	49.9	50.0	50.1	50.1	50.1	50.0	50.0
% female	50.1	50.0	49.9	49.9	49.9	50.0	50.0
% 0-4	16.2	14.6	13.6	13.4	13.4	13.3	12.8
% 5-14	26.4	26.3	25.3	23.2	22.3	22.2	22.2
% 15-64	53.1	55.7	58.3	60.6	61.6	62.0	62.3
% 65+	4.3	3.5	2.8	2.7	2.8	2.6	2.7
Females 15-49	487,278	579,792	686,019	802,893	900,092	981,536	1,072,542

% females 15-49	23.0	24.3	25.8	26.9	26.9	26.2	25.7
Sex ratio	99.6	100.0	100.4	100.4	100.3	100.0	100.0
Dependency ratio	0.802	0.734	0.668	0.604	0.580	0.572	0.562
Median age	18.4	19.1	20.0	21.1	22.1	22.9	23.4
Projection 2	**1989**	**1994**	**1999**	**2004**	**2009**	**2014**	**2019**
Total	2,119,965	2,383,074	2,628,777	2,898,747	3,190,883	3,505,158	3,827,981
Males	1,057,661	1,191,350	1,317,087	1,451,662	1,596,823	1,752,858	1,912,021
Females	1,062,304	1,191,724	1,311,690	1,447,085	1,594,060	1,752,300	1,915,960
0-4	343,856	342,596	335,292	347,407	376,028	407,426	426,144
5-14	559,004	628,160	668,120	661,111	667,153	708,365	768,536
15-64	1,125,246	1,329,353	1,550,669	1,809,063	2,055,019	2,291,938	2,521,202
65+	91,859	82,965	74,696	81,166	92,682	97,429	112,098
% male	49.9	50.0	50.1	50.1	50.0	50.0	49.9
% female	50.1	50.0	49.9	49.9	50.0	50.0	50.1
% 0-4	16.2	14.4	12.8	12.0	11.8	11.6	11.1
% 5-14	26.4	26.4	25.4	22.8	20.9	20.2	20.1
% 15-64	53.1	55.8	59.0	62.4	64.4	65.4	65.9
65+	4.3	3.5	2.8	2.8	2.9	2.8	2.9
Females 15-49	487,278	579,792	686,019	802,893	897,567	965,912	1,031,685
% females 15-49	23.0	24.3	26.1	27.7	28.1	27.6	27.0
Sex ratio	99.6	100.0	100.4	100.3	100.0	100.0	99.8
Dependency ratio	0.802	.730	0.647	0.557	0.508	0.487	0.474
Median age	18.4	19.2	20.7	21.9	23.3	24.7	25.9
Projection 3	**1989**	**1994**	**1999**	**2004**	**2009**	**2014**	**2019**
Total	2,119,965	2,377,803	2,595,787	2,813,538	3,034,249	3,261,177	3,482,193
Males	1,057,661	1,188,675	1,300,355	1,408,474	1,517,498	1,629,365	1,737,117
Females	1,062,304	1,189,128	1,295,432	1,405,064	1,516,751	1,631,812	1,745,076
0-4	343,856	337,325	307,448	294,555	303,424	318,479	322,379
5-14	559,004	628,160	662,975	628,754	588,235	585,487	610,039
15-64	1,125,246	1,329,353	1,550,669	1,809,063	2,049,908	2,259,782	2,437,677
65+	91,859	82,965	74,696	81,166	92,682	97,429	112,098
% male	49.9	50.0	50.1	50.1	50.0	50.0	49.9
% female	50.1	50.0	49.9	49.9	50.0	50.0	50.1
% 0-4	16.2	14.2	11.8	10.5	10.0	9.8	9.3
%5-14	26.4	26.4	25.5	22.3	19.4	18.0	17.5
%15-64	53.1	55.9	59.7	64.3	67.6	69.3	70.0
%65+	4.3	3.5	2.9	2.9	3.1	3.0	3.2
Females 15-49	487,278	579,792	686,019	802,893	895,041	950,009	990,345
% females 15-49	23.0	24.4	26.4	28.5	29.5	29.1	28.4
Sex ratio	99.6	100.0	100.4	100.2	100.0	99.9	99.5
Dependency ratio	0.802	0.726	0.626	0.510	0.435	0.400	0.383
Median age	18.4	19.2	20.7	22.6	24.5	26.5	28.5

Table 6: Mongolia: population projections - rate of growth

(per cent)

	Projection 1	**Projection 2**	**Projection 3**
1984-1989			
Total	2.51	2.51	2.51
0-4	2.41	2.41	2.41
5-14	2.11	2.11	2.11
15-64	2.88	2.88	2.88
65+	0.38	0.38	0.38
Females 15-49	3.33	3.33	3.33
1989-1994			

Total	2.41	2.37	2.32
0-4	0.23	-0.07	-0.38
5-14	2.36	2.36	2.36
15-64	3.39	3.39	3.39
65+	-2.02	-2.02	-2.02
Females 15-49	3.54	3.54	3.54
1994-1999			
Total	2.19	1.98	1.77
0-4	0.83	-0.43	-1.84
5-14	1.40	1.24	1.08
15-64	3.13	3.13	3.13
65+	-2.08	-2.08	-2.08
Females 15-49	3.42	3.42	3.42
1999-2004			
Total	2.31	1.97	1.62
0-4	1.98	0.71	-0.85
5-14	0.58	-0.21	-1.05
15-64	3.13	3.13	3.13
65+	1.68	1.68	1.68
Females 15-49	3.20	3.20	3.20
2004-2009			
Total	2.33	1.94	1.52
0-4	2.35	1.60	0.60
5-14	1.46	0.18	-1.32
15-64	2.63	2.58	2.53
65+	2.69	2.69	2.69
Females 15-49	2.31	2.25	2.20
2009-2014			
Total	2.30	1.90	1.45
0-4	2.09	1.62	0.97
5-14	2.21	1.21	-0.09
15-64	2.44	2.21	1.97
65+	1.00	1.00	1.00
Females 15-49	1.75	1.48	1.20
2014-2019			
Total	2.25	1.78	1.32
0-4	1.45	0.90	0.24
5-14	2.25	1.64	0.82
15-64	2.30	1.93	1.53
65+	2.84	2.84	2.84
Females 15-49	1.79	1.33	0.84

Table 5 shows a number of indicators of the projected age and sex structure. The most significant feature of this table is that the age structure of the population will experience substantial changes in the future no matter what the assumptions are with regard to the population components. The main changes will be an increase in the proportion of the population between 15 and 64 years of age, which corresponds to the working age population, and a decline in the proportion of the young population. These changes obviously result in a substantial decrease of the dependency ratio and an increase in the median age of the population. However, it is important to understand that these facts do not mean that the young population will decline in size. Actually, according to the three hypotheses, the young population will continue growing; it is only its pace of increase that will be slower than previously. Table 6 shows the respective rates of growth. Only during some quinquennia will the young population experience negative rates.

It is interesting to note that the rates of growth corresponding to the young population exhibit a somewhat erratic or inconsistent trend: in one quinquennium the value is negative, or very low, and in the next, it is

positive, or much larger. This is mainly the result of the progressive impact of fluctuating fertility and mortality rates on the age structure. They act in cumulative waves, from the younger age groups to the older ones, producing destabilization.

Figure 5a

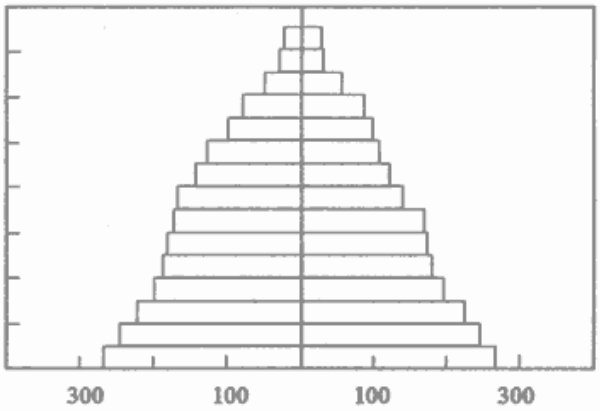


Figure 5b

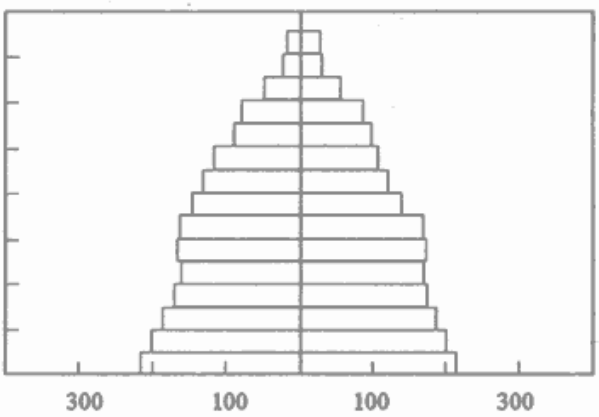
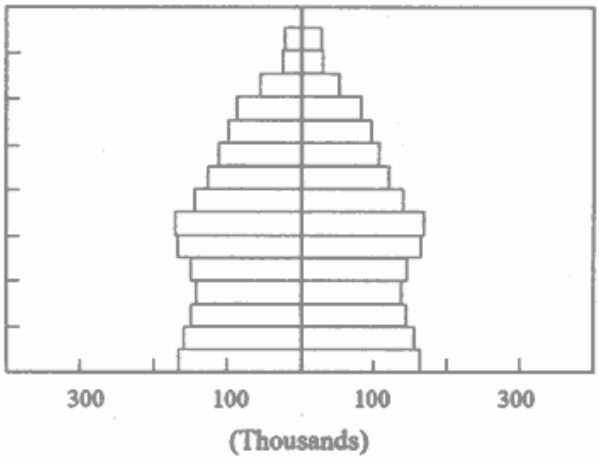


Figure 5c



Figures 5a to 5c show the pyramids of the expected population for the year 2019 according to each projection. Notice that they are presented in absolute figures and not in percentages. They all have different

shapes and sizes, reflecting mainly the different fertility assumptions. Obviously, the one that corresponds to Projection 1 is the largest (figure 5a), followed by that of Projection 2 (figure 5b). The smallest is that corresponding to Projection 3, where the decline in fertility was assumed to be more rapid and substantial (figure 5c). The shape of the three projected pyramids is different. The first one, corresponding to Projection 1, reflects the typical age structure of a population with a high, or slowly declining, fertility: a mountain-shape with a relatively gentle descending slope. This slope, however, is not very regular. The middle-age groups show a constriction, which is the result of the rapid fertility decline of the 1980s. The slope of the base, corresponding to the youngest age groups is, however, quite regular.

The pyramid corresponding to Projection 2 has an intermediate form between a mountain-shape and a bell-shape. The constriction in the middle-age groups is clearer than in Projection 1 and the slope of the base is also regular. In both cases, this trend is caused by the fact that the impetus of natural population growth provided by the age structure has not been neutralized by the magnitude and speed of fertility decline. The pyramid corresponding to Projection 3 has a clear bell-shape form. The base shows the typical constriction that results from a very rapid and substantial fertility decline when it begins to cancel the aforementioned impetus of population growth resulting from a young age structure. It is important to notice, however, that the upper portion of the three projected pyramids is equal. This reflects the fact that the same mortality assumptions were applied to the common base population.

Table 7: Mongolia: population projections - indicators of fertility

	1984-1989	**1989-1994**	**1994-1999**	**1999-2004**	**2004-2009**	**2009-2014**	**2014-2019**
Projection 1							
Births	74,918	75,349	78,191	85,888	96,076	106,083	113,565
Crude birth rate	37.8	33.4	31.0	30.4	30.4	29.9	28.6
Child-woman ratio	0.73	0.71	0.60	0.53	0.50	0.50	0.51
Total fertility rate	5.4	4.3	3.8	3.6	3.5	3.5	3.5
Gross reproduction rate	2.6	2.1	1.8	1.8	1.7	1.7	1.7
Net reproduction rate	2.3	1.9	1.7	1.6	1.6	1.6	1.6
Projection 2							
Births	74,918	74,208	72,311	74,626	80,439	86,798	90,428
Crude birth rate	37.8	33.0	28.9	27.0	26.4	25.9	24.7
Child-woman ratio	0.73	0.71	0.59	0.49	0.43	0.42	0.42
Total fertility rate	5.4	4.2	3.5	3.1	3.0	2.9	2.9
Gross reproduction rate	2.6	2.1	1.7	1.5	1.5	1.4	1.4
Net reproduction rate	2.3	1.8	1.5	1.4	1.3	1.3	1.3
Projection 3							
Births	74,918	73,066	66,306	63,273	64,908	67,849	68,409
Crude birth rate	37.8	32.5	26.7	23.4	22.2	21.6	20.3
Child-woman ratio	0.73	0.71	0.58	0.45	0.37	0.34	0.34
Total fertility rate	5.4	4.2	3.2	2.6	2.4	2.3	2.2
Gross reproduction rate	2.6	2.0	1.6	1.3	1.2	1.1	1.1
Net reproduction rate	2.3	1.8	1.4	1.2	1.1	1.0	1.0

Table 7 shows the future evolution of mortality according to the three projections; table 7, the evolution of fertility. These tables are self-explanatory. However, it is important to make a brief reference to the evolution of the absolute number of births. The figures presented in table 7 correspond to the average number of births per year. Only in Projection 3 do these figures show a decline, but in Projections 1 and 2 they continue to increase during the complete period. Therefore, in spite of the fact that fertility will decline to as few as 2.9 children per woman (Projection 2), the number of births will continue to increase. Even in Projection 3, after an initial decline, there is a new increase. It is very important for policy and planning

purposes to differentiate a decline in fertility from a decline in the number of births. Unless fertility decline is quite rapid and substantial, it cannot compensate for the large cohorts of women born when fertility was high and that each year enter the reproductive ages.

Summary

The most important consequences and policy implications of the future population trends proposed in these projections are examined in the article beginning on page 3 of this issue of the *Journal*. Thus, as a final section of this note, only a summary of the main results of the projections is presented.

It is very likely that the population of Mongolia at the end of the century will not be less than 2.6 million or more than 2.7 million. More uncertain, however, is the situation for the first two decades of the next century. Depending on the future pace of fertility decline, the total population size may vary between 4.2 million and 3.5 million by the year 2019.

In spite of the rapid and significant fertility decline that the country has experienced during the last decade, the number of births will continue to grow, although at a more moderate pace than in the past.

As a result of the trend mentioned above, the population will continue to grow at a comparatively rapid pace during the current decade. During the next two decades, the growth will become gradually more moderate.

The age structure will experience substantial changes in the future. There will be a decline in the proportion of young to old people and an increase in the proportion of the population in the working age groups. Nevertheless, all age groups will continue to experience absolute increases.

The population profile of the Mongolian population in future decades will not be much different from that exhibited by most of the countries that have recently experienced fertility reductions. It seems unlikely that fertility and mortality may deviate substantially from the trends proposed in these projections. International migration may produce some deviations in this expected profile. However, it does not appear that its volume will be significant enough to result in major changes in population growth or composition.

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