A Speculative Analysis of Socio-economic Influences on the Fertility Transition in China

*Attempts to assess the achievements
in fertility decline must take into
account not only the effects of programmes
but also the direct and indirect eflects of
various socio-economic changes*

By Chaoze Cheng*

The dramatic changes in fertility that occurred in China during the past few decades are well known. The 1982 One-per-Thousand Fertility Sampling Survey of China reveals that the total fertility rate fell from 5.81 at the beginning of 1950 to 2.63 in 1981. 1/

* The author of this article is a Ph.D. candidate, Department of Sociology, University of Western Ontario, Canada. He formerly was a lecturer in the Department of Economics at the Shanghai Finance and Economics University, Shanghai, China.

The factors fostering the fertility transition in China are a matter of debate among demographers. Quite a few demographers have attributed this demographic phenomenon to the family planning programme implemented by the Chinese Government.[2/] It is, however, very interesting to ask whether fertility in China would have declined without government support of family planning services. One may also ask why China's fertility patterns and trends differ in urban and rural areas in spite of a uniform intensification of population policies throughout the country, and whether these differences could have resulted from differences in socio-economic conditions. We argue that before and since the intensification of population planning activities, policies that have explicitly attempted to influence fertility change in accordance with official objectives have been affected by implicit or unintentional socio-economic forces.

The 1982 population census seems to support the hypothesis. The fertility transition in China started as early as the mid-1950s. After a "baby boom" between 1949 and 1954, fertility began to decline after 1955, but its progress was interrupted by both the three-year famine that followed the "Great Leap Forward" between 1959 and 1961 and the "Cultural Revolution" that started in 1966. In 1968, fertility once again began to decline and, since the 1970s, it has declined precipitously from year to year.[3/]

This article attempts to examine a broad spectrum of causes related to institutional and socio-economic developments beyond the Government's population policies and family planning programmes. It seems likely that most of those factors, though implicit or unintentional, are either highly conducive to the spread of birth control or tend to facilitate the Government's efforts to make information, supplies and services accessible to the population.

The study engages in a "speculative discussion" of the likely impacts of these recent great changes on fertility trends. It focuses on the following changes: (a) the emancipation of women, (b) the socialization of agriculture and industry, (c) social security and other welfare benefits, (d) public health care, (e) the expansion of education, (f) changes in female labour force participation, (g) the rise in urban residence and (h) the so-called "sending-down" campaigns.

It is hoped that the article will contribute to the study of the effect of different development paths on the transition. If China's fertility transition reflects its past population policy decisions, then considerations of demographic development must be broadened to include the issues of societal development strategy so important in China's experience.

The 1950 Marriage Law and emancipation of women

As a revolutionary regime, uprooting many age-old cultural values, the Chinese Communist Party realized from the very beginning that if it was to succeed in a socialist setting it would have to storm the very bulwark of the oldest institution -- the traditional family. Since a family is formed upon marriage, any transformation of this institution must begin with a reform of the marriage law. Thus, one of the first significant laws promulgated by the regime after its rise to power was the 1950 Marriage Law.

The 1950 Marriage Law called for sweeping changes in many areas of family life. It forbade any "arbitrary and compulsory" form of marriage that would be based on the superiority of men and would ignore women's interests. The new democratic marriage system was based on the free choice of couples, monogamy, equal rights for both sexes, and the protection of the lawful interests of women. It abolished the begetting of male offspring as the principal purpose of marriage and weakened kinship ties which reduced the pressure on women to bear many children, especially sons. With arranged marriages prohibited, young women could choose their own marriage partners, share the financial cost of setting up a new household, and have equal status in household and family decision-making. The Government then initiated an extensive campaign of marriage-law education, working jointly with the Communist Party, women's federations, trade unions, the armed forces, schools and other organizations.

Although the 1950 Marriage Law was instituted for reasons that had nothing to do with demography, the campaign turned out to have unintended demographic consequences.[4/] Once the role of marital postponement in fertility limitation was recognized in the 1950s, a diversity of opinion emerged concerning the advisability of raising still further the age requirements for marriage. Later, during the third phase of population control, Chinese couples were strongly encouraged to delay marriage until age 25 in urban areas and 23 in rural areas.

One important political campaign was the drive to criticize Confucius, which has been prominent since early in the 1950s and which reached a fever pitch during the Cultural Revolution. The movement attacked superstitious restrictions on the activities of women and emphasized the equality of the sexes. The downfall of Confucian teachings was linked directly to the promotion of birth and population control. The campaign reported that young women were successfully resisting such abuses as arranged marriages. The pressure on women to produce a son at all costs was another ancient convention scorned both as part of the Confucian heritage and as a

hindrance to effective birth control. For the sake of orderly economic development, the argument went, population planning must replace "complete anarchy in mankind's reproduction". The anti-Confucius campaign lashed out at early marriage, failure to plan pregnancies and defiance of the Communist Party's policy on marriage and its function.

It is impossible to calculate the impact that attacks on Confucius have had on individual women. However, one thing is certain: since the Chinese Communist Party came to power in 1949, no other drive would seem to carry such potentially immediate and drastic implications for population growth.

Socialization of the economy

In agricultural countries, virtually all children of a household except infants contribute some labour both to productive activities and to household chores. Under such conditions, where the cost of raising children is marginal and the children's contribution to the family's welfare increases proportionally as they grow up, there is every incentive to bear many children, especially when the survival ratio is low. Therefore, private ownership of the means of production (including land) may be viewed at fostering high fertility. As long as the internal relations of the familial mode of production remain intact, marital fertility will not be restricted for the purposes of limiting family size".[5]

However, the factors that tend to sustain high fertility when the means of production are in private hands are greatly weakened by the socialization of production, which happened in China with the collectivization of agriculture in 1955, the socialist transformation of industry and commerce in 1955/56, and the formation of people's communes in 1958. The socialization of state enterprises took modern organizational forms in which the means of production are owned and controlled by individuals in exchange for monetary compensation. First, these forms entail a fundamental separation between family and economy that decreases opportunities for the productive employment of children: the family is no longer a production unit, and labour contracts are with state-run firms or collectivized production teams rather than families.

Second, the place of work is no longer the place of residence, so that there is a differentiation between child care and the supervision of child labour. This is at least partly true even in rural China, where the structure of collective production introduces both traditional and modern elements.

Where both parents are engaged in field work for the production team, they cannot also supervise the domestic work of children.

Third, when agriculture is collectivized, the earnings of extra sons can no longer be used to buy larger land-holdings. Without the control of land, parents and grandparents lose some of their economic authority and their ability to pressure their grown children to have more offspring. Furthermore, an adult son or daughter no longer remains economically active in the parents' household. In the pre-1949 scheme, a son laboured on the family farm after marrying until it became his own farm through inheritance or the father's retirement. Land reform and collectivization in the 1950s have curtailed the economic authority of the father and his power and desire to keep sons together under his rule.

Fourth, the institutional effects of the new forms on child labour have been complemented by the effects of the shifts in technology, mechanization, specialization, and required skill levels. One may speculate that specialization and increased skill levels not only made possible the impressive increases in rice yields, but also reduced opportunities for the productive employment of children, at least on collective land.[6]

Fifth, one of the economic functions of the traditional family, the support of an aged parent by grown-up children as a relieving agency in case of distress, has been taken over by the collective welfare fund, which funds, among other things, aid to members who are ill, retired, or unable to work. The family is no longer the only source of help. The collective also subsidizes the rural cooperative medical system and provides relief to members who are in financial difficulty.

Social security and other welfare benefits

In traditional Chinese society, there were very substantial benefits from a large family, since the flow of services tended to be from the younger to the older generation.[7] At the same time, there were few alternative means by which the household could cushion itself against the insecurities of life. The value of children to their parents as a source of economic support in old age thus constituted a powerful motivational force in favour of high fertility.

The post-liberation years have witnessed dramatic changes in these conditions. There have emerged many more substantial opportunities for households to provide for themselves in other ways. Savings, the accumulation of secure assets, and participation in institutionalized pension and in-

surance schemes have brought more security to the large majority of Chinese families.[8/]

Other forms of social insurance are widely available, especially in the non-agricultural sector: civil service pensions, military pensions, industrial pensions and "family planning insurance" that makes payments to one-child parents whose children have died or may die.

Social security and welfare benefits are admittedly more favourable in urban than in rural areas. After the campaign to socialize the urban economy in 1955/56, there were two kinds of enterprises: state and collective. Workers in state enterprises are paid according to fixed wage-scales that are centrally determined and enjoy a wide range of fringe benefits (health insurance, disability pay, paid maternity leave, subsidized pre-school care, retirement pension etc.). In collective enterprises, some people are paid by the day, and others by the piece or according to some other incentive device. Some workers in collective enterprises enjoy partial medical benefits, disabiity insurance, maternity leave, or pensions. Some collective enterprises provide no benefits at all, but are very profitable and can therefore pay their employees wages higher than those offered by similar state enterprises.[9/]

Both state and collective enterprises have shared to a considerable degree in a distinctive Chinese version of permanent employment. Once one is employed, it becomes almost impossible to be laid off. As a result, employed persons have a reasonable degree of job security.

Normally, in state work units, men retire at age 60 and women at 50 or 55; they work 15 to 20 years for a full pension, three years for full disability benefits, and so on. Those with fewer than 20 years' employment are entitled to a smaller percentage of the last wage, but in no case does the pension fall below 20 yuan per month ($US1.00 = about ¥5). In addition, all retired people continue to receive free medical care and benefits from the general food subsidies.

In the rural sector, a rudimentary social security system has also been introduced.[10/]   Since the introduction of collective farming in the mid-1950s, the means of production have been progressively socialized, turning virtually every peasant into a *de facto* wage earner. The peasant still retains nominal title to the land allocated to him by the land reform. Everyone is assured of a basic grain and cloth allocation and some degree of social security, cash income varies with total work-points and hence with the amount of labour in a household.

For the childless elderly, the collective provides "five guarantees": food, clothing, shelter, medical care and burial. Recipients of five-guarantee support are given a set amount of grain, oil, cotton, fish and whatever other goods are distributed by their team. The grain allocations they receive are equal to those distributed to other non-working elderly people in the team. In addition to these goods, they are given two or three *yuan* a month in cash, depending on the wealth of the production team.

Apart from the five-guarantees system, the collective has other support mechanisms, operating most commonly through indirect channels or loans. An old man in a poor family or without any children is requested to oversee water levels in paddy fields or raise buffaloes for a few points a day. If all else fails, poor families can always go into debt, overdrawing their collective accounts while still eating -- at least in the majority of teams that distribute part of the peasants' earnings in the form of "basic grain".

In a commune (or production brigade, depending upon the period and area), before the total income is distributed among the members, a specific percentage is set aside as the public welfare fund, earmarked for taking care of childless elderly people.

It is worth noting that some of the most prosperous communes have introduced pensions for their members. Such locally funded retirement schemes provide either cash or in-kind payments worth up to 50 per cent of average income. In 1981, 426,000 elderly peasants were regularly collecting monthly pensions from their brigade welfare funds.[11]

Homes for the elderly, another alternative to the traditional reliance on adult children, have increased in number since 1949, although they remain statistically insignificant. By December 1982, there were over 8,800 rural homes for the elderly, housing a total of 138,000 people, with plans to expand these to house 20 per cent of the elderly population by 1985.[12] According to the 1987 One-per-Hundred Sample Survey of China, there were over 28,014 rural homes for the old, housing a total 281,058 people.[13]

In general, the economic growth of the period after 1949 has brought with it a decline in the value of children as sources of economic security. These developments have weakened the motivation for larger families.

Public health care

As in social security and welfare benefits, China has made a major commitment to improve health care and has made efforts to make medical

care facilities more widely available in the country as a whole, but especially in rural areas. Advances in health care and gains in life expectancy have somewhat altered traditional strategies for ensuring physical well-being in old age, and with them the traditional motivation for larger families.

Up to 1949, China had only a few trained medical personnel, no adequate hospital facilities, and no nationwide public health network. In the three decades since, medical education hospitals and public health efforts have all expanded rapidly. By the 1970s, the various kinds of doctors and medical facilities were typically organized in a three-tier system in the country as a whole. Since then, in urban China, at the lowest level, small clinics have been set up and maintained in urban neighbourhoods. They tend to be staffed by secondary-school trained Western-style and Chinese doctors, and sometimes only by minimally trained paramedics or by nurses. At the middle level, hospitals are spread throughout the city, accepting patients from neighbourhoods and work units within their assigned areas. At the highest level are city or provincial general and specialized (e.g., maternity, mental) hospitals, staffed by the highly trained doctors. In a large city, there may be several of these, some general hospitals, and some facilities designated to handle referrals from surrounding rural areas or from smaller towns that have only middle-level hospitals.[16/]

In the countryside, at the highest level of the rural health care system is the country people's hospital, staffed mostly by graduate physicians trained in either Western or traditional herbal medicine. Most are equipped with an operating room, x-ray and laboratory facilities, and some in-patient beds. Such hospitals also operate continuing in-service training for the commune health staff. The commune health centre is financed by county and provincial subsidies, user fees and contributions. Medical workers employed by the commune health centre include graduates of middle-level medical schools and practitioners of traditional herbal medicine. They supervise the "barefoot doctors", organize continuing in-service training for the treatment of complex cases, and perform sterilizations and abortions. At the lowest level of this three-tier primary health care system is the production brigade health station, which is staffed by two to three barefoot doctors whose responsibilities include sanitation, immunization and vaccination, maternal and child health, and family planning.

Early in the 1960s, however, medical care was largely unavailable to the majority of the rural population, which made up about 80 per cent of the total population. Against this background it becomes easy to understand why Chairman Mao Zedong issued his now famous 26 June 1965 directive calling for a mass migration of medical personnel to the rural villages:

In medicine and public health, put the stress on the rural areas -- Urban hospitals should retain some doctors who graduated only one or two years ago and who are not very experienced. All the others should go to the countryside.[15/]

Following that directive, urban medical hospitals dispatched one-third of their personnel to villages as mobile medical teams on a rotating basis, the usual period of service lasting one year or so. With the advent of the Cultural Revolution, this programme was intensified and resulted in a mass migration of doctors from urban and county hospitals to the countryside: some even took up more or less permanent residence there, and a new network of paramedics -- barefoot doctors -- was created.

The mobile medical teams were directed to train four or five doctors for each health clinic in a commune, one or two barefoot doctors for each production brigade, and one or two midwives and one or two volunteer health workers to handle emergencies within each production team. Under this new system, each production brigade was to have a health station with at least a barefoot doctor and a trained midwife (and sometimes other personnel, such as a traditional herbalist). Below the brigade level there might also be team-level health workers to look after emergency first-aid and health education.

By the early 1980s, every county had a hospital and the majority of them had a county station set up to prevent the outbreak of epidemics as well as a specialized maternal and child health care hospital. Over 50,000 communes had their own commune health centres, while over 90 per cent of the country's production brigades had their own cooperative health stations or similar health facilities, staffed by a total of 1.48 million barefoot doctors.[16/]

Decentralized health care options have served China's purposes fairly effectively. Thanks to the development of low-cost, effective public health techniques and the expansion of public health networks, mortality, especially infant mortality, has declined significantly. For instance, the death rate, especially the infant mortality rate, in China in 1982 was substantially lower (7 and 67 per thousand, respectively) than the corresponding rates in India (13 and 94 per thousand), Bangladesh (17 and 133 per thousand) and Indonesia (13 and 102 per thousand).[17/]

In China, old age has the same connotations of illness as it has in all countries, and people have the same worries about how they will cope with their reduced abilities and increased need for physical care. In the decades

immediately before 1949, Chinese parents traditionally relied on close ties with male children. Aphorisms such as "the more children the better" and 'bearing sons to guard against old age" convey the importance attached to child-bearing. A relatively high infant mortality rate reinforced parents' motivation to bear many children on the assumption that some would not survive.[18] Recent advances in public health and social welfare, together with gains in life expectancy, have somewhat altered traditional strategies for coping with dependency in old age. The change in infant mortality has also motivated parents to bear fewer children because they can feel assured that the children they do bear will survive into adulthood.

Educational development

Since 1949, educational opportunities in China have expanded very rapidly. The literacy rate in China in 1981 was 69 per cent, compared with 36 per cent in India, 24 per cent in Pakistan, 26 per cent in Bangladesh and 40 per cent in the "average" middle-income country.[19]

China's progress in women's education has also been remarkable. In pre-revolutionary China, more than 90 per cent of women were illiterate. Before 1949, women accounted for only one quarter of primary school pupils, 20 per cent of middle-school students, and just 18 per cent of college students. Educational levels among married women have been rising since that time. Illiteracy and semi-illiteracy decrease rapidly with age cohort, i.e. from 76 per cent among women aged 45-49 years to 14 per cent among women aged 15-19. The proportion of women who have attended secondary school varies inversely with age, from 3.4 percent among women aged 45-49 to 41 per cent among women aged 15-19.[20]

Although China's intentions in educating its population have been economic rather than explicitly demographic, education is an actual or potential determinant of fertility reduction. First, educational development has had a substantial effect on the ages at which women marry, both because they stay in school longer and because education widens their employment opportunities outside the agricultural sector. Second, from the standpoint of the parental household, higher school enrolment rates have substantially raised the investment costs of children, especially for parents who wish to ensure good career prospects for their children. Third, education promotes a rational view of family formation and the acceptance of contraception for either the spacing or limitation of children.

Fertility within marriage is significantly lower at higher educational levels. The 1982 One-per-Thousand Fertility Sampling Survey shows that,

with one exception, the total fertility rate declined sequentially for five groups of married women classified by education, even when age was held constant. The potency of higher level school exposure for this purpose is apparent in almost all age groups.[21/]

If education operates indirectly to control fertility, we might expect that would have a measurable influence on the direct variables of greatest interest to programme planners: contraception and one-child certificate holding. In Beijing, for example, among women with higher education, 89 per cent are practising contraception. By comparison, 82 per cent of middle-school educated women and 57 per cent of those with primary education are using contraception. The impact of education on one-child certificate holding shows similar trends.[22/]

Changes in women's workforce participation

In China, working people are defined as those who derive an income from their labour, including persons engaged in household production as a sideline, those working at temporary jobs, retired persons who continue to work for additional income, and self-employed persons, as well as those holding regular jobs. The 1982 population census counted 521.4 million employed workers, of whom 227.8 million were women aged 15-54.[23/]

During the 1950s, the general trend was towards a much greater involvement of women in the labour force, and real efforts were made to encourage women to stand up and take part in decision making, both within the family and in the wider context of society. There was an upsurge in the number of working women during the Cultural Revolution. The change in attitudes to women's roles was intensified, and the slogan widely associated with the questioning of Confucian attitudes, "women hold up half the sky" was taken increasingly seriously.

As previously mentioned, during the late 1940s there was a massive attempt to widen the basis of medical care by creating vast numbers of barefoot doctors, low-level medical stations and other facilities. This in turn led to a considerable increase in the number of women employed in, or working part-time with, the health services. On the rural communes, all women, except old women, were working outside the home. In 1971, 90 per cent of all Chinese women, including those in the countryside, worked outside the home.[24/]

Demographers have noted that separation of place of work from place of residence appears to be a key consideration in identifying the impact of

employment upon fertility. The work status of women in China has affected perceptions of the value of children, husband-wife communication and decision making, and desired and actual fertility: (a) women working in the formal sector begin practising contraception earlier in their marriage than women working in the informal sector; (b) women in the formal sector are less likely to want children for traditional reasons, such as continuing the family name or enhancing their own status through the motherhood role, and they are also less concerned than those in the informal sector about the sex composition of their family; (c) women in the formal sector are usually better educated and tend not only to differ from other women in their opinions concerning the ideal age at marriage but also to delay their marriage in practice; (d) female employment is associated with postponement of chid-bearing and wider spacing of births.[25/] Therefore, married women who have been economically active tend to have fewer births than economically inactive women with the same duration of marriage.

The impact of occupational factors upon the fertility level is fairly stable, in the countryside as well as in the cities. The numbers of children ever born are substantially higher in the informal sector at all ages.[26/] The percentage of one-child-certificate-holding is still higher in the formal sector among cadres and workers, and lower in the informal sector among agricultural workers.[27/]

Urban residence

It has long been recognized that residence is an important determinant of fertility, and urban areas are characterized by factors thought to be conducive to lower fertility.[28/]

After the Great Leap Forward in the 1950s, the opportunities facing school-leavers became dark. Urban jobs became increasingly scarce, and many youths faced the prospect of being sent to the countryside to receive low starting pay, with little prospect for raises that would enable them to plan for a wedding and to support a family early. This situation lasted nearly two decades until the beginning of the 1980s.

Problems with mate choice trigger the postponement of marriage.[29/] There has been an official policy at least since the late 1950s that young people still in school should not pair off, and marriage is strictly forbidden. This ban makes it difficult for youths attracted to each other to communicate their feelings and develop a romantic relationship.

Once one is promoted to a secure job as a regular employee it still may not be an easy matter to find a partner. There is, for example, a considerable amount of occupational segregation by sex (for instance, women tend to work as textile works or nursery-school teachers, while men work as coal miners and the like). Also, men and women are often assigned to different kinds of jobs even within the same enterprise. There are undoubtedly few prospects close at hand for those who are thus segregated, while the absence of the facilities of a dating culture, such as dance halls (these have developed only after the Mao era), drive-in movies and all the rest, means that individuals lack opportunities to meet eligible partners outside on their own.

Housing became a serious problem as urban living space became increasingly tight and as a dominant share of housing came under the control of the authorities. In 1949, the average per capita living space in urban China stood at 6.25 square metres. As the urban population more than doubled during the 1950s, this figure had shrunk to around three sq. metres by 1962.[30] This housing crunch meant that, if neither set of parents had extra room, the new couple would have to apply to their work units or to city housing offices for an apartment. They might have to wait for several years before an apartment would be assigned to them.

Falls in mortality levels and concomitant increases in life expectancy have contributed to the problem of crowding so that several generations may have to live together under the same roof. Lack of housing investment from the Government has gone hand in hand with the well-known population growth, and has been complicated by the cohorts from earlier baby booms coming to marriage age. In these circumstances, grandparents' traditional yearning for grandchildren around their feet may well be muted.[31]

The costs of marriage and of establishing a household are now generally the responsibility of young couples, rather than of the parents, as had previously been the case. Higher disposable incomes and the general availability of consumer goods brought about by the economic reforms of recent years have generated increasing requests for the "big four items" or the "three rounds and one sound" (bicycle, sewing machine, wrist watch and radio), as well as for the "thirty legs" (of the bed, table, chairs and other furniture). Many young couples prefer to postpone marriage and even childbearing in order to enjoy the luxury of being able to spend more of their combined salaries.[32] The groom may be expected to pay out approximately 2,000 yuan on furniture, even if his salary is only 50 or 60 yuan a month.

Since 1970, the feast or banquet customary at weddings has again begun to flourish, especially in recent years in urban areas.[33] Holding a feast of 8-10 tables nowadays costs 2,000 yuan or even more -- certainly an expense that couples would have to plan for over a long period of time. But in order to maintain reputation and "prevent others from laughing", many urban brides and grooms postpone their marriage in order to build up savings to finance such expensive feasts. Some families go into debt by borrowing from kin and friends in order to meet these expenses. As a result, they are left in financial difficulties that delay child-bearing.

Life is arduous both inside and outside the home. In cities, both husband and wife work six days a week, eight hours a day, plus one or two hours of travelling back and forth for those who live far from their work units. On their day off, they must wash, clean, queue for shopping, cook etc. Life for the couple is tiring, and will be more so if they have more children. Waking up at night to feed the baby, more washing, education and many other activities all consume time and energy.

A 1983 survey of the off-duty activities of Shanghai workers found that commuting and household chores such as cooking and washing took an average of six hours and forty-five minutes a day.[34] Croll's survey[32], on the other hand, found that in urban Shanghai and Beijing, average daily shopping took over three-quarters of an hour and half an hour, respectively. Cooking took an hour and three-quarters in Shanghai, and an hour and twelve minutes in Beijing. Where the household does not have a resident grandmother, shopping and cooking add appreciably to the length of the working day (35-45 per cent of the working women had to undertake these tasks).[35]

The value of children has declined drastically in urban China.[36] The evidence of this is plentiful. Family firms were eliminated by 1956, for example, and there are few jobs to which child labour can be applied. Education is compulsory but not free, so that parents' financial burden increases with the number of their children. In the cities, the relatively clear delineation of career paths affects the desire for children. These prospects were greatly dimmed by a sudden scaling down of both white-collar and blue-collar opportunities after the early 1960s. The Government's response to this politically explosive situation has been to send school-leavers to rural jobs. Since the value placed on children appears to be directly proportional to their chances of horizontal mobility, it seems doubtful whether, under these circumstances, family members will continue to find value in numerous children.

The decline in the value of children has been reinforced by the cost of rearing them in urban China. The 1979 estimates indicate that rearing a child to age 16 costs much more in large cities and towns than in rural villages. The total average family expenditure on a child to age 16 in large cities 4,689 yuan) is nearly four times the average in rural areas (1,196 yuan).[37] Bringing up children involves more economic difficulties for people living in the cities, where salaries are universally low. During the First Five-year Plan (1953-1957), nominal and real wages improved slightly, but after 1957 wages were held practically stable for two decades. In spite of marked improvement in recent years, Chinese wages still allow only a modest living standard. Moreover, wage increases have been dwarfed by inflation. The rate of inflation between 1979 and 1982 has been given officially at approximately 15 per cent.[38]

Obviously, under such circumstances, when young people start thinking of having a child, they must be prepared for a lower living standard than previously and another child will mean yet a further decline in the living standard of the family.

"Sending-down" campaigns

China's fertility decline owes much to the large-scale rustication campaigns of the past decades. These steps have included the "sending down" (*xia-fang*), both temporary and permanent, of urban cadres, the resettlement of entire urban families in villages and in frontier areas such as Xinjiang province, the assignment of university graduates to rural posts, the dispatch of urban medical workers to rural areas, and especially the transfer of urban secondary school graduates to rural villages and to frontier settlements (*shang shan xia xiang*), or "up to the mountains and down to the villages").[39]

Severe over-urbanization and the imbalance of the national economy brought about by the Great Leap Forward in the 1950s demanded drastic action. As a result, the majority of urban residents were summarily ejected from their cities. The quite extraordinary reduction in China's total urban size was caused by the mass deportations of the early 1960s and of the years after 1968.

From 1961 to 1964, about 30 million people were mobilized to go back to the countryside. The implied net migration loss in 1961 and 1962 was almost 20 million, around 14 million of which took place in 1962 alone. Additionally, the Socialist Education Movement of 1963-1964 removed millions of people from the cities, most of them temporarily, but some for good.[40]

Between 1966 and 1976, 17 million young people set out to the villages and small towns. The transfer was intensified in response to Mao's call of 23 December 1968, for young students to go to the country and be "re-educated" by poor and lower-middle class peasants.

The aforementioned numbers are greatly increased if one takes into account the downward transfer of officials (*ganbu xiafang*), the dispatch of urban medical workers starting before 1965, and the various dispersals of enterprises and their staff, skilled labourers, and criminal elements since 1949.[41/]

This massive migration is intimately connected with both increasing age at marriage and declining fertility. Millions of urban educated youths who were sent to the countryside at about 17 or 18 years of age remained unmarried in the villages until 10 years later, in hopes of returning to the city. Of the 17 million rusticated youths, just 900,000 had married by 1978. Thus, millions of young people returning in the late 1970s were nearly all unmarried, even though they were of marriageable age.

Those who managed to transfer back to urban areas after 1979 had to start at the bottom of a work unit, often as apprentices, several years after they had finished school, and therefore required several more years before they could establish themselves well enough to contemplate marriage.[42/]

While the campaign lasted, it obstructed what Caldwell has identified as the flow of wealth from the younger to the older generation. Rusticated urban youths not only did not return wealth to their parents, but also imposed a heavy burden on their parents by continuing to need financial support as long as they stayed in the countryside, where life was bitterly difficult. In addition, the exemption of one-child families from being resettled in the countryside also helped to erode the dominance of large families.

The Government's vigorous efforts to bridge cultural, educational and health-care gaps by the *xiafang* system and rustication of urban intellectuals and educated youths have had the unintended -- or perhaps intended -- consequence of assisting it to inculcate the small family norm and to make birth control knowledge, means and technical services accessible to the broad masses in China's vast rural areas.[43/]

It is worth stressing that a most important role in the drive to limit fertility was played by mobile medical personnel who, after 26 June 1965, were required to spend a certain part of the year attending to the medical needs of the rural population. They publicized the meaning of planned parenthood among the peasants, disseminated knowledge about birth con-

trol, conducted propaganda meetings, set up exhibitions, showed movies and organized "personal testimony" meetings featuring peasant women who were using IUDs or other types of contraceptives.

The fertility decline may also perhaps reflect the marital separation of a great number of cadres and members of the intelligentsia, who were removed from the cities during the Socialist Education Movement of 1963-1964 or the Cultural Revolution, and had no sexual relations for a long time. Some of these people in fact stopped having marital intercourse as long ago as the late 1950s, after the advent of the anti-rightist movement in 1957. As Caldwell points out, "The Cultural Revolution certainly separated many couples".[45]

Discussion and conclusions

The literature on the fertility transition in China is replete with references the 1982 population census of China and fertility survey information. The fact that some reduction in both urban and rural fertility preceded the intensification of organized family planning efforts during the 1970s indicates that it is difficult to assess the programme's effects on fertility net of socio-economic and institutional factors that encourage people to accept and practise effective contraception. The causes of the fertility decline in China are very complex, The explanation probably lies in various socio-economic changes. As a result, increasing numbers of people have become aware of alternatives to their traditional life styles and aspire to something different.[45]

Fundamental socio-economic changes in China, unlike the changes brought about by the family planning programme, have been gradual and strenuous. Transformations in family structure and functions and changes in the status of women have established a new relationship between the individual and society, giving individuals, especially women, a new decision-making power in forming their families.

The virtual elimination of the private sector has reduced the utility of children as a source of labour in family enterprises, while the mitigation of the economic uncertainties with which the poor had to cope before 1949 has reduced the value of children as a form of risk aversion. In China, as in other socialist states, employment, or at least a minimum income, is virtually guaranteed; health services are provided free of charge or at a very low cost; savings, the accumulation of secure assets, and institutionalized pension and insurance schemes have brought a greater degree of security to the large majority of Chinese families.

Consequently, the economic function of the traditional family, i.e. the support of elderly parents by children, is no longer crucial, and has been partly taken over by the collective, or the State, or institutions. All these profound cultural and institutional changes have the effect, intended or otherwise, of removing or undermining many of the forces that in the past tended to encourage and sustain the traditional way of life, with the high fertility norms and practices characteristic of virtually all agrarian pre-modernized societies.

China is undoubtedly in the midst of a massive cycle of extraordinary socio-economic change. Women especially are benefitting from this change. They are now moderately or fully freed from the constraints of the previous feudal marriage system. Their general levels of education are rising, and their employment is expanding year by year. Furthermore, recent studies have proven that these changes are taking place in rural areas as rapidly as electrification and road construction permit. Married women have more alternatives to marriage and child-bearing than had been the case and, as more women become educated and employed, they join categories that have been associated with reduced fertility -- either through postponement of marriage or through deliberately limited child-bearing.

All of the socio-economic factors usually associated with rising affluence have accompanied both urbanization and a radical change in urban settings, although still within a Chinese cultural context. Under modern urban conditions, marriage requires a willing mate, funds to pay for a wedding and the expenses of equipping the new household, access to housing, and an income, or the prospect of earning an income, that can support a family. As most of these resources became increasingly scarce, marriage and child-bearing were inevitably delayed. The delay was particularly marked for those millions of urban educated youths who were sent to the countryside.

Our study suggests that all these dynamic factors of the fertility transition were essentially interactive and accumulative processes, in which all the factors tended to develop concomitantly and the efficient functioning of any one of the factors tended to require the efficient functioning of all the others. That is, in the absence of other development concomitants, significant fertility change is most unlikely. None of these processes can be understood properly in isolation. It is the interaction among these factors, all operating within China's unique context conducive to reproductive change, that produced the rapid and extensive decline in fertility.

The rapid fertility decline during the 1970s has, for instance, coincided not only with the intensification of the family planning programme, but also

with the development of all these subsets of socio-economic factors and processes. The 1970s marked a culmination of various socio-economic changes in China that had been developing for several decades: the repeated rustication campaigns that had been taking place since the mid-1950s and peaked in 1968, the growth of education, changes in occupational opportunities, the rise in the status of women, changes in the costs and benefits of children, housing shortages in the urban areas, land shortages in the rural areas, changes in the family and marriage system, the rising age at marriage and increasing proportion of women entering into late marriage, the decline in mortality (especially infant mortality) and so on.

The fertility transition in the 1970s should therefore be regarded as an emergent phenomenon, not only of the general transition of Chinese society in the 1970s, but also of the transformations that began during the 1950s and continued during the 1960s. Thus, it would be naive to think that a changing demand for children, involving new perceptions of their economic and non-economic benefits and costs, would emerge suddenly in a simultaneous flash of mass insight. It is more logical that all these socio-economic changes in China would provide a latent motive for limiting children which would be crystallized over time.

In short, there are three points worth concluding. First, although the implementation of family planning programmes and their resulting effects on reproductive behaviour have certainly been influential, it is our contention that attempts to assess the achievements of China in fertility decline in the past three-odd decades must take into account not only the programmes but also the direct and indirect effects of various socio-economic changes on fertility.

Second, the experience of Western countries that have completed their demographic transitions is no reliable guide to what has taken place in China, which has experienced several distinct phenomena that are in sharp contrast with corresponding phenomena in the developed countries, and even with those in developing countries. China has undergone many specific changes that are unique in the world which we have delineated above. No such socio-economic changes have occurred either in the developed countries or in those now developing.

Third, many of the socio-economic forces are not unique to China, but have operated in varying degrees throughout the world. Given the commonalities, it is interesting to consider the extent to which the dynamics of China's fertility transition are relevant to reproductive transitions elsewhere

‗ that is, how far the factors underlying these dynamics are mediated through a cultural, social and political setting unique to China.

The preceding examination of the factors triggering China's fertility decline is by no means exhaustive. Some of the forces which lie behind the fertility transition are doubtless unknown to us, a fact that it behooves us to remember.

Footnotes

1. *Zhongguo Renkou Ziliao Shouce* (Handbook of Chinese Population Statistics), (Beijing, China Population Information Centre, 1983), p. 335, and *Global Estimates and Projections of Population by Sex and Age: 1988 Revision* (New York, United Nations, 1989).

2. Bongaarts, J. and S. Greenhalgh (1982). "An Alternative to the One-child Policy in China", *Population and Development Review*, vol. 11, No. 4, pp. 585-617; Chen, Shenli (1984). "Fertility of Women during the 42 Year Period from 1940-1981", In: *Analysis on China's National One-per-Thousand Fertility Sampling Survey,* (Beijing, China Population Information Centre); Coale, A.J. (1984). *Rapid Population Change in China, 1952-1982,* Committee on Population, (Washington D.C., National Academy Press); Mauldin, W.P. (1982). "The Determinants of Fertility Decline in Developing Countries: An Overview of the Available Empirical Evidence", *International Family Planning Perspectives,* vol. 8, No. 3, pp. 116-121; Wolf, A.P. (1986). "The Preeminent Role of Government Intervention in China's Family Revolution", *Population and Development Review,* vols. 12, No. 1, pp. 101-116.

3. *Zhongguo Renkou Ziliao Shouce. op. cit,* pp. 244-246.

4. Tien, H. Yuan (1984). "Induced Fertility Transition: Impact of Population Planning and Socioeconomic Change in the People's Republic of China", *Population Studies,* vol. 38, No. 3, pp. 385-400.

5. Caldwell, J.C. (1978). "A Theory of Fertility From High Plateau to Destabilization", *Population and Development Review,* vol. 4, No. 4, pp. 554-555.

6. Potter, J.E. "Effects of Societal and Community Institutions on Fertility", In: R.A. Bulatao *et al.* (eds.) *Determinants of Fertility in Developing Countries,* (New York, Academic Press), pp. 627-665.

7. Caldwell, J.C. (1976). "Toward a Restatement of Demographic Transition Theory", *Population and Development Review,* vol. 2, No. 3/4, pp. 332-366.

8. Parish, W.L. and M.K Whyte (1978). *Village and Family in Contemporary China,* (Chicago, University of Chicago Press) pp. 73-95.

9. Whyte, M.K. and W.L. Parish (1984). *Urban Life in Contemporary China* (Chicago, University of Chicago Press), p. 28-29.

10. Parish, W.L., and M.K. Whyte (1978). *op. cit.,* pp. 74-78.

11. Liu, Zheng (1981). "Population Planning and Demographic Theory, In: Liu Zheng, Song Jian *et al.* (eds.) *China's Population: Problems ond Prospectives,* (Beijing, New World Press), p. 23.

12. *Renming Ribao* (People's Daily), 11 November 1982, Beijing.

13. *Zhongguo Renkou Ziliao Shouce.* (Handbook of Chinese Population Statistics), (Beijing, China Population Information and Research Centre, 1988) p. 265.

14. Chen, Pichao (1985). "Birth Control Methods and Organization in China", In: E. Croll *et al.* (eds.) *China's One-Child Family Policy,* (New York, St. Martin's Press), pp. 136-138.

15. Chen, Pichao (1973). "Population Planning Policy Evolution and Action Programs", In: M.E. Wegman, Tsungyi Lin and E.F. Purcell (eds.) *Public Health in the People's Republic of China,* (New York, The Josiah Macy, Jr. Foundation).

16. Chen, Pichao (1985). "Birth Control Methods and Organization in China", In: *China's One-Child FamiIy Policy, op. cit.,* p. 137.

17. *Zhongguo Baike Nianjian* (Encyclopedia Yearbook of China), (1980). (Beijing, Chinese Encyclopedia Press), p. 559.

18. Chu, Leonard L., (1977). Planned Birth Campaigns in China 1949-1976, Case Study No. 5, (Honolulu, The East-West Communication Institute), p. 74.

19. World Bank (1984). World Development Report, (New York, Oxford University Press), p. 266.

20. Zhao, Jianmin and Jingjua Sun (1983). "Educational and Fertility Level of Women of Reproductive Age", *Population and Economics Special Issue,* pp. 80-82.

21. *Zhongguo Renkou Ziliao Shouce. op. cit.,* p. 85.

22. Li, Jieping and Wei Zhao (1983). "One-Child Certificate Holding Rates", *Population and Economics Special Issue,* pp. 137-140.

23. State Statistical Bureau (1985). *1982 Population Census of China,* (Beijing, Statistical Publishing House), pp. 390-391.

24. Salatt, J.W. (1972). *Women and Childcare in China,* Penguin Books, p. 65.

25. Li, Xinhuan and Zehong Zhang (1983). "Reproductive Women and Their Fertility Level", *Population and Economics Special Issue,* pp. 83-85.

26. *Ibid.*

27. Li, Jieping and Zhao Wei (1983). "One-child Certificate Holding Rates", *Population and Economics Special Issue,* pp. 137-140.

28. Singh, S. and J. Casterline (1985). "The Socio-economic Determinants of Fertility", In: J. Cleland *et al.* (eds.) *Reproductive Change in Developing Countries,* (New York, Oxford University Press), pp. 199-222.

29. Whyte, M.R. and W.L Parish (1984). *Urban Life in Contemporary China, op. cit,* pp. 116-124.

30. *Zhongguo Tongji Nianjian* (Statistical Yearbook of China), (Beijing, State Statistical Bureau, 1983), p. 345.

31. Kane, P. (1985). "The Single-child Family Policy in the Cities", In: *China's One-Child Family Policy, op. cit.,* p. 94.

32. Croll, E. (1981). *The Politics of Marriage in Cotemporary China,* (Cambridge, Cambridge University Press), p. 123.

33. *Ibid.,* p. 124

34. Xinhua News Agency, 1 May 1982, Beijing.

35. Kane, P. (1985). 'The Single-child Family Policy in the Cities", *op. cit,* p. 103.

36. Salatt, J.W. (973). "Institutionalized Motivation for Fertility Limitation", In: B.Y. Marilyn (ed.) *Women in China*, (Ann Arbor, The University of Michigan Press), pp. 93-136.

37. Liu, Zheg (1981). Population Statistics, (Beijing, Chinese People's University Press), p. 147.

38. Cheng, Chaoze (1987). Fertility Transition in China, unpublished MA thesis, Geography Department, University of Colorado, Boulder.

39. Bernstein, T.P. (1977). *Up to the Mountains and Down to the Villages,* (New York, Vail-Ballon Press), p. 5.

40. Kirby, RJ.R (1985). *Urbanization in China: Town and Country in a Developing Economy 1949-2000 A.D.,* (New York, Columbia University Press), p. 231.

41. Ebanks, G. Edward and Cheng Chaoze (1990). "China: A Unique Urbanization Model", *Asia-Pacific Population Journal,* vol. 5, No. 3, p. 39.

42. Whyte, M.K. and W.L. Parish (1984). *Urban Life in Contemporary China, op cit,* p. 116.

43. Cell, C.P. (1983). "Communication in China's Mass Mobilization Campaigns", In: G.C. Chu and F.L.K. Hsu (eds.) *China's New Social Fabric,* (London, Kagan Paul) pp. 25-46.

44. Caldwell, J.C. (1984). "New Data on Nuptiality and Fertility in China", *Population and Development Review,* vol. 10, No. 1, p. 77.

45. Freedman, R. (1979). "Theories of Fertility Decline: A Reappraisal", In: P.M. Hanser (ed.) *World Population and Development,* (New York, Syracuse University Press), pp. 63-79.

Determinants of
Contraceptive Method Choice
in Sri Lanka: An Update
of a 1987 Survey

Demographic factors continue to have
the dominant effect on method choice,
over socio-economic factors

By Anju Malhotra and Shyam Thapa*

Recent studies have emphasized the policy and programmatic importance of understanding the choice of contraceptive method use and the factors affecting contraceptive choice (Bulatao, Palmore and Ward, 1989; Tsui

* The authors of this article are Anju Malhotra of the Center on Population, Gender and Social Inequality, University of Maryland, United States; and Shyam Thapa of Family Health International, Research Triangle Park, North Carolina.

and Herbertson, 1989). The purpose of this article is to analyze the socio-cultural and demographic determinants of contraceptive method choice in Sri Lanka. The study is an update of a previous study on this topic by Kahn, Thapa and Gaminiratne (1989). The previous study analyzed the determinants of contraceptive choice at two time periods, 1975 and 1982. It considered four current contraceptive choices: no use, use of a traditional method, use of a modern temporary method and use of sterilization. The analysis showed that, both in 1975 and 1982, socio-demographic factors had a strong influence on whether any method was used. However, in both the time periods, the type of method chosen was primarily a function of demographic factors related to the couple's family-building stages rather than socio-economic factors, implying that in Sri Lanka there are few socio-economic barriers to accessibility and choice of contraceptive methods.

By extending the analysis to a recent time period (1987), this article examines changes in the pattern of contraceptive method choice in Sri Lanka. More specifically, we focus on three interrelated questions: (a) Do the demographic and socio-economic factors continue to exert the same type of influence over the use of any method versus the use of no method at all? (b) Does the influence of socio-economic factors continue to be attenuated, and has the effect of the family-building stage gained increasingly more in prominence? (c) Has the choice of birth-spacing methods become more pronounced and sterilization less used in recent years and, if so, which strata of population have experienced these changes? The first two questions bear on the importance of understanding the process of the diffusion of contraceptive innovation, while the third reflects on policy and programmatic issues, as the Government of Sri Lanka has attempted in recent years to emphasize the use of modern birth-spacing methods through its family planning programmes.

Data and methods

The data analyzed in this article come from the Demographic and Health Survey conducted in Sri Lanka during 1987. For purposes of the Survey, the total geographic area in Sri Lanka was stratified into nine socio-economic and ecological zones. Each zone was further stratified by urban, rural and estate areas. Because of civil disturbances, two zones representing the northern and eastern areas of the country were excluded from the Survey. These two zones comprise approximately 14 per cent of the total population of Sri Lanka and are relatively less advanced than others. Hence, the implication of this exclusion is that the fertility level and con-

traceptive prevalence estimated from the Survey can be slightly biased upward, relative to an estimate based on the entire population.

In the remaining seven zones, the total number of households listed for interviews was 8,119. From these household records, a total of 6,170 ever-married women aged 15-59 were identified for more detailed interviews. Field interviews took place during early 1987. The overall response rate was 95.1 per cent; in the capital metropolitan area, Colombo, the response rate was the lowest, 89.9 per cent.

The sample was designed to be self-weighting within each zone. However, in the estate sector in one zone, the survey design included an over-sampling. A more detailed description of the sampling procedures and estimates of the sampling errors are provided in the study report (Sri Lanka Ministry of Plan Implementation, 1988).

In the present analysis, the sample is limited to the 5,449 currently married women between the ages of 15 and 49 at the time of the Survey. The data set has been weighted (but scaled to the original sample size) to adjust for varying sampling probabilities and non-response among the strata.

As with the previous study, in modelling current contraceptive use, four possible outcomes are considered: (a) not currently using any method, (b) using a non-programme ("traditional") method, (c) using a modern temporary method and (d) sterilization. The term "choice" is used interchangeably with the current use of a method, assuming that the acceptance and use of a method involve at least some considerations of method choice on the user's part.

As also discussed in the previous study, the timing of the decision to get sterilized becomes an issue when determinants are specified. In some cases, the decision to be sterilized may have been made several years preceding the Survey. Nevertheless, since sterilization constitutes a significant share of the method mix in Sri Lanka, we have retained it in the analysis by limiting the explanatory variables to those that can be justified as being fixed prior to the time when sterilization decisions are made. In the interest of comparability, the socio-cultural and demographic explanatory variables used in the previous study have been retained.

Because the dependent variable involves four distinct choices, a multinomial logistic model is used as the analytical technique (Maddala, 1983). The results are presented first as coefficients and then as predicted probabilities. A separate set of coefficients is simultaneously estimated for each comparison of choices; the analysis of four contraceptive-choice outcomes

results in six possible comparisons. In order to get the predicted prob- abilities, simulations derived by evaluating the regression equation for dif- ferent combinations of the explanatory variables are used.

In the previous study, only the interaction effects of parity and marital duration were found to be statisticaily significant: hence, the inclusion of only this interaction term in that analysis. For maintaining comparability and, more importantly, in order to assess whether the interaction term con- tinues to exert similar types of influence in the recent time period, the present analysis specifies modelling similar to that in the previous study.

Results

Changes in contraceptive use and method mix from 1975 to 1987 are shown in table 1. Overall use in Sri Lanka continues to show an increase between 1982 and 1987, although not nearly as dramatically as was the rise between 1975 and 1982. The most striking feature of the 1987 method mix is an even greater prominence of sterilization: of the 62 per cent of the women currently practising contraception, about half were relying on sterilization while this was the case for less than 40 per cent of the women in 1982, and only about 30 per cent in 1975. The trend towards a somewhat lower use of

Between 1975 and 1987, there has been a large increase in the number of married women in Sri Lanka practising contraception.

**Table 1: Percentage of currently married women aged 15-49 using
contraception, by type of method, Sri Lanka, 1975-1987**

Method	1975	1982	1987	1982-1987 (% points)
All	**34.4**	**57.8**	**61.7**	**3.9**
Modern temporary	9.6	9.9	10.8	0.9
Pill	1.7	2.7	4.1	1.4
IUD	5.2	2.9	2.1	- 0.8
Condom	2.3	3.3	1.9	- 1.4
Other modern	0.4	1.0	2.7	1.7
Sterilization	10.6	22.0	29.8	7.8
Traditional	14.2	26.0	21.1	- 4.9
Rhythm	8.9	14.2	14.9	0.7
Withdrawal	1.6	5.1	3.4	- 1.7
Other traditional	3.7	6.7	2.8	- 3.9
None	65.6	42.2	38.3	- 8.5

Source: Sri Lanka Demographic and Health Survey, 1987, May 1988.

Notes: Data from the northern and eastern provinces have been excluded from the 1975 and 1982 surveys in order to make these two surveys comparable with the geographic areas covered by the 1987 Survey. All estimates in this and subsequent tables are based on weighted data; pregnant and infecund women are considered non-users.

traditional methods must be interpreted cautiously, however, because of the possible fluctuation in reporting and questionnaire wording from survey to survey. It has been suggested, for example, that traditional-method use may have been considerably underreported in the 1975 Survey, both because of insufficient probing and a lack of respondent identification of such methods as contraception (Caldwell *et al.,* 1986). Conversely, reporting may have been high during 1982 owing to greater awareness as well as probing. Although it does appear from the 1987 Survey that traditional methods may be losing some of their dominance, it is striking that this has not resulted in a corresponding increase in the use of modern temporary methods, which show a steady prevalence of around 10 per cent for all three surveys.

The demographic and socio-economic characteristics for the users of each method type, as well as non-users, for 1987 are presented in table 2.

Most of the differentials in user characteristics are along expected lines. Sterilized women (referring to women who are either sterilized themselves or whose husbands are sterilized) had been married longer and had from 1.3 to 1.9 more children than the women in the other groups. They were also married younger, reflecting to some degree the fact that they belonged to older cohorts at the time of the Survey. Women practising modern temporary methods had been married relatively recently and also had the lowest parity levels among users. This suggests there was both innovative behaviour and the motivation of child-spacing among younger women who were using these methods.

Users, on the whole, were slightly more urban than non-users and, except for those practising sterilization, they were better educated as well. The overall sample was relatively well-educated, with 59 per cent of women having at least some secondary education and, therefore, the differential for sterilized women is especially remarkable since these women were not even as well educated as those who use no contraception at all. It is possible that the selective nature of government campaigns was responsible for the higher prevalence of sterilization among the less educated (Thapa *et al.,* 1987).

Women practising either traditional or modern temporary methods, on the other hand, were relatively better educated compared with both non-users and sterilized women, as was the case with their husbands. We can observe ethnic differentials as well, with the relative prominence of Sinhalese among both modern temporary and traditional method users, and the Tamils and Moors among the non-users.

It must be noted that, owing to the elimination of the northern and eastern provinces, the 1987 Survey's sample of currently married women is somewhat less urban and considerably more Sinhalese than would be the case if the entire country had been sampled. For example, in its entirety, the 1975 Survey showed 18 per cent urban, and the 1982 Survey showed 24 per cent urban, among currently married women as opposed to the 16 per cent observed in the present case. Similarly, these two surveys sampled only 67 per cent and 71 per cent Sinhalese, respectively, as opposed to the very high 87 per cent in the current sample. In terms of the other characteristics, the present sample consists of better-educated, later-married women with longer marital durations and lower parities than was true for the previous surveys. Although some of this is probably due to selection bias, the change in characteristics is also reflective of overall educational improvements, later marriage and continued fertility decline in Sri Lanka.

Table 2: Mean values and percentage distributions of explanatory variables by method type, Sri Lanka, 1987

Variable	Modern temporary	Sterilization	Traditional	Non-use	Total
Marital duration (years)					
<5	0.29	0.02	0.19	0.37	0.22
5-14	0.52	0.45	0.48	0.36	0.43
15+	0.19	0.54	0.33	0.26	0.35
Age at marriage	20.60	19.40	21.80	21.30	20.80
No. of living children	2.50	4.00	2.70	2.10	2.82
Place of residence					
Urban	0.17	0.16	0.18	0.15	0.16
Rural	0.83	0.84	0.82	0.85	0.84
Ethnicity					
Sinhalese	0.92	0.87	0.93	0.83	0.87
Sri Lankan Tamil	0.02	0.03	0.01	0.03	0.02
Indian Tamil	0.02	0.06	0.02	0.07	0.05
Moor	0.04	0.04	0.04	0.06	0.05
Other	0.01	0.01	0.00	0.01	0.01
Wife's education (years)					
None	0.04	0.14	0.05	0.13	0.11
1-5	0.22	0.39	0.21	0.28	0.30
6-9	0.42	0.35	0.39	0.35	0.36
10+	0.31	0.13	0.35	0.23	0.23
Husband's education (years)					
None	0.02	0.06	0.02	0.05	0.05
1-5	0.21	0.36	0.22	0.31	0.30
6-9	0.42	0.42	0.38	0.36	0.39
10+	0.35	0.16	0.38	0.27	0.27
Unweighted N	554	1,657	1,121	2,117	5,449

Table 3: Direction and significance of polytomous logistic regression coefficients for six comparisons of choice of contraceptive methods, Sri Lanka, 1987

Variable	Modern temporary versus non-use	Sterilization versus non-use	Traditional versus non-use	Modern temporary versus non-use	Sterilization versus traditional	Modern temporary versus sterilization
Marital duration						
<5 years	–	– –	– –		– – –	+ + +
15+ years	– – –	+ +	+ +		+ + +	– – –
Age at marriage	– – –	– –	+ +	–	– – –	– –
No. of living children	+ + +	+ + +	+ + +		+ + +	– – –
Urban residence		+ +		+		
Ethnicity						
Sri Lankan Tamil	– –		– –		+	
Indian Tamil	–	– –	– –		+ + +	
Moor		– –	–	+	+ +	–
Other			–			
Wife's education						
None	–		– –		–	
6 - 9 years	+ +		+ +		– –	+ +
10 + years	+ + +		+ + +			+ + +
Husband's education						
None	+ +		+ +			
6 - 9 years	+ +		+ +			
10 + years		+ +			–	+ +
Interactions						
No. of children and marital duration:						
< 5 years	+ + +	+ + +	+ + +	+	– – –	+ +
15 + years	– – –	– –	– – –	–	–	
Ratio	.220	.438	.355	.321	.586	.266

Notes: **Positive relationships significant at + = 5 percent; ++ = 1 percent; +++ = 0.1 per cent; negative relationships similarly indicated by minus signs; blanks = non-significant**

32

The effect of both demographic and socio-economic factors on method choice is analyzed using a multinomial logit model in which the log-odds of the type of contraceptive use (or non-use) are modelled as a function of marital duration, age at marriage, number of living children, place of residence, and both spouses' education. Since the effect of parity on method choice is expected to be dependent on marital duration, an interaction effect between these two variables is also modelled. A summary of the results for the polytomous logistic regression is presented in table 3. For each of the six possible comparisons of method choices, a separate set of coefficients was estimated simultaneously. While the full coefficients are presented in the appendix table on pp. 34-35, the direction and significance of the coefficients are presented in table 3. Each of the three method choices is contrasted with non-use as well as with each other, and the share of the comparison choosing the first method choice is also shown. For example, among non-users and modern temporary method users, 22 per cent used modern temporary methods.

The first distinct feature regarding the determinants of contraceptive-choice in Sri Lanka emerging for these results is that both demographic and socio-economic factors are important in distinguishing those practising contraception from those not practising contraception. In looking at only the first three columns of table 3, a prominence of significant effects is observed for almost all of the independent variables. The results are mostly in the expected direction. Among demographic measures, there is a negative effect of short marriage durations for all methods and a positive effect of long marriage durations for sterilization and traditional methods. There is also a consistent and strong positive effect of the number of living children on contraceptive use of any type. Additionally, later marriage seems to discourage the use of efficient methods. This may be due to a greater sense of reproductive urgency among women who marry later.

The socio-economic effects on method choice versus non-use are also along predicted lines. Sinhalese (the reference group) are more likely to practise contraception than any other ethnic group. The use and non-use differentials, however, vary by method. Although all the other ethnic groups are less likely to use traditional methods when compared with the Sinhalese, the Moors (or Muslims) are distinguishable for favouring non-use as opposed to *any* method choice, particularly sterilization. The Indian Tamils, on the other hand, favour non-use over only temporary and traditional methods (see table). It also can be observed that, as would be expected, education increases contraceptive use but, interestingly, mostly for temporary (modern or traditional) methods. In contrast, urban residence is effective only in in-

Appendix: Parameter estimates for polytomous logistic model with current method use outcomes, Sri Lanka, 1987

Variable	Modern temporary versus non-users	Sterilization versus non-users	Traditional versus non-users	Modern temporary versus traditional	Sterilization versus traditional	Modern temporary versus sterlization
Constant	-0.728*	-1.371***	-1.715***	0.987	0.344	-0.643
Marital duration						
< 5 years	-0.980 ***	-3.491***	-1.069***	0.088	-2.421***	2.510 ***
5 - 14 years#						
15 + years	0.356	1.929 **	0.569 **	-0.212	1.360 ***	-1.573***
Age at marriage	-0.080 ***	-0.046 ***	0.008	-0.089 *	-0.054 **	-0.034 **
No. of living children	0.429 ***	0.858 ***	0.331***	0.098	0.527 ***	-0.429 ***
Place of residence						
Urban	0.163	0.372 **	0.175	-0.012	0.197	-0.208
Rural #						
Ethnicity						
Sinhalese #						
Sri Lankan Tamil	-0.554	-0.380	-1.149 **	0.594	0.769 *	-0.175
Indian Tamil	-1.050 **	0.051	-0.987 ***	-0.062	1.038 ***	-1.100 **
Moor	-0.616 *	-0.816 ***	-0.616 **	0.000	-0.200	0.200
Other	0.037	-0.720	-1.224 *	1.261*	0.504	0.757

Appendix: (continued)

Variable	Modern temporary versus non-users	Sterilization versus non-users	Traditional versus non-users	Modern temporary versus traditional	Sterilization versus traditional	Modern temporary versus sterilization
Wife's education						
None	-0.551 *	-0.228	-0.438 **	-0.113	0.209	-0.322
1 - 5 years#						
6 - 9 years	0.428 **	0.059	0.351**	0.077	-0.292 **	0.369 **
10 + years	0.695 ***	-0.059	0.623 ***	0.073	-0.682 ***	0.753 ***
Husband's education						
None	-0.137	0.076	-0.097	-0.040	0.173	-0.213
1 - 5years#						
6 - 9years	0.357 **	0.262 **	0.264 **	0.093	-0.002	0.095
10 + years	0.415 **	-0.065	0.387 **	0.028	-0.452 **	0.480 **
Interaction						
No. of children and marital duration:						
<5 years	0.857 ***	1.066 ***	0.537 ***	0.319 *	0.529	-0.210
15+ years	-0.434 ***	-0.696 ***	-0.251	-0.183 *	0.445 ***	0.262 **

Notes: Weighted regression with currently married women 15-49 years;
Omitted category
*P<0.05; ** P<0.0l; *** P<0.001.

creasing the likelihood of sterilization. It is rather surprising that the contraceptive practices of urban women are not distinguishable from those of rural women in any other respect.

The second remarkable feature of the results in table 3 is the lack of any major distinction between the users of modern temporary and traditional methods. This is clear from the relative absence of significant effects in column four. Other than the fact that late marrying women favour traditional methods and Moors favour modern ones, the users of the two temporary contraceptive choices are undistinguishable. Since temporary methods are most likely to be used for spacing purposes, this suggests that method efficiency is perhaps not a major concern in spacing behaviour.

That the contraceptive choice of Sri Lankans is motivated largely by the overarching family life-cycle goals of either termination or spacing, rather than by specific concerns within these goals, is also apparent in the mirror effects observed in columns five and six, where both temporary methods are contrasted with sterilization. Clearly, the issue at hand for Sri Lankans seems to be sterilization versus *either* traditional or modern contraception. That this choice is driven to a large extent by the couple's stage in the family life-cycle is also apparent from the strong effects of the demographic factors in these two columns. Couples with longer marital durations and larger numbers of living children are more likely to practise sterilization than either of the two temporary methods. The only non-mirror effect is for age at marriage: women who marry later are more likely to prefer traditional methods to sterilization, but are also more likely to prefer sterilization to modern temporary methods. Actually this effect may also be reflective of family-building goals. Although we have not tested for it, age at marriage may be interacting with parity. That is, while late marrying women may be doing some reproductive "catching up" at lower parities, and thus preferring traditional contraception to sterilization, at higher parities they may be showing their otherwise modern outlook by definitively finishing family building through sterilization.

The relative importance of demographic as opposed to socio-economic variables in our model is visually apparent from the prominence and strength of significant effects among the former, particularly in columns five and six. More rigorously, however, the same thing can be determined from the Model Chi Square values of models estimated both with and without each set of variables. The Model Chi Square value for the addition of demographic variables to a model containing only socio-economic variables is 1,480.8 with 18 degrees of freedom, indicating a vast improvement in the

model fit. On the other hand, the Model Chi Square value for the addition of socio-economic variables to a model containing only demographic variables is only 313.7 with 33 degrees of freedom; although still a significant improvement in the model fit, this contribution is obviously smaller than that of the demographic variables.

In looking at columns five and six, therefore, it can be seen that although family life-cycle goals are the prime differentiating factors in contraceptive method choice, there are some differentials by social position as well. The education effect points towards better educated women favouring temporary methods to sterilization. The greater likelihood of sterilization among Tamils, particularly Indian Tamils, can also be seen. Both of these effects may actually be less representative of personal choice if government programme efforts for sterilization are selective by education or ethnicity.

Overall, the model also shows significant parity-marital duration interactions, indicating that the effect of parity on a couple's decision to use contraception (and the type) is dependent on marital duration. This can be seen more clearly in table 4, where the effects of parity on method choice are presented as conditional upon marital duration. At shorter marriage durations (fewer than five years), women with more children are considerably more likely to use a contraceptive method, and especially an efficient one. At longer durations (15+ years), the effect of parity is largely negligible, except for the choice of sterilization over traditional methods. Presumably, if a couple's family-size goals have already been achieved at longer durations, parity levels are less material.

Table 4: Effect of number of living children on method choice conditional on marriage duration*

Marriage duration (years)	Modern temporary versus non-users	Steri-lization versus non-users	Tradi-tional versus non-users	Modern temporary versus tradi-tional	Steri-lization versus tradi-tional	Modern temporary versus sterili-zaion
<5	1.286	1.924	.868	.417	1.056	- .639
5 - 14	.429	.858	.331	.098	.527	- .429
15 +	- .005	.162	.080	- .085	.927	-.167

*Note: Calculated at the partial derivative of the regression equation (Kahn, Thapa and Gaminiratne, 1989). This partial derivative is evaluated for each category of marital duration in table 5.

The overall findings in tables 3 and 4 can be seen more comprehensively by examining the predicted probabilities of method choice, derived from the regression equation and shown in table 5. The predicted probabilities for each choice are calculated by evaluating the regression equation

**Table 5: Predicted probabilities of current method choice,
Sri Lanka, 1987***

Variable	Modern temporary	Sterilization	Traditional	Non-use
Age at marriage				
18	0.13	0.23	0.22	0.42
24	0.09	0.19	0.26	0.47
Marital duration <5 years				
No. of living children:				
0	0.03	0.00	0.07	0.90
3	0.33	0.17	0.26	0.24
Marital duration 15 + years				
No. of living children:				
0	0.09	0.21	0.22	0.49
3	0.07	0.28	0.23	0.41
6	0.06	0.37	0.24	0.45
Place of residence				
Urban	0.11	0.25	0.24	0.39
Rural	0.11	0.20	0.24	0.45
Ethnicity				
Sinhalese	0.12	0.21	0.26	0.42
Sri Lankan Tamil	0.09	0.20	0.11	0.61
Indian Tamil	0.05	0.27	0.12	0.55
Moor	0.08	0.14	0.18	0.61
Other	0.15	0.14	0.10	0.61
Wife's education (years)				
None	0.08	0.20	0.19	0.53
1 - 5	0.09	0.23	0.20	0.48
6 - 9	0.13	0.20	0.27	0.40
10 +	0.15	0.17	0.32	0.37
Husband's education (years)				
None	0.10	0.23	0.22	0.45
1 - 5	0.09	0.21	0.21	0.48
6 - 9	0.12	0.22	0.25	0.40
10 +	0.13	0.18	0.28	0.40
Total predicted	0.11	0.21	0.24	0.44
Observed	0.11	0.30	0.21	0.38

*Note: Calculated by evaluating the regression equation for each value of the variable of interest (e.g. urban, rural), holding all other variables in the model constant at their means. Predicted log-odds are then transformed back into probabilities.

for different values of the independent variables, holding all other variables constant at their means. For each specification of the independent variable, the values of the predicted probabilities across the four choices in the dependent variable add up to 1.00.

Here it can be observed more summarily that women marrying later have a somewhat higher probability of non-use and traditional method use, and somewhat lower probability of modern method (temporary or permanent) use. We have suggested that this may be due to great reproductive urgency among these women, particularly at lower parities. Next, higher probabilities of any method use can be observed among couples with short marriage durations and higher parities, but only a greater probability of practisiig sterilization among couples with longer marriage durations and high parities. These predicted probabilities are consistent with normally expected family life-cycle goals. Among the socio-economic variables, we observe the differentials mostly by ethnicity and education (the wife's more so than the husband's). The only difference among urban and rural residents is the higher probability of sterilization among the former. On the other hand, it can be seen that Indian Tamils have the lowest probability of modern temporary method use, but the highest probability of sterilization. Sinhalese are also distinguishable for a higher probability of using traditional methods. There are also reasonably strong differences by education: it depresses the likelihood of sterilization, but increases the likelihood of temporary method use.

Conclusion

The determinants of contraceptive method choice in Sri Lanka in 1987 seem to be characterized by three major features. Fist, both demographic and socio-economic factors are important in distinguishing users from non-users: those who use some type of contraceptive method are not only motivated to do so by their family-building stage, but are also more likely to be urban, Sinhalese and better educated. Second, and a remarkable feature peculiar to Sri Lanka, there is an almost total lack of differentials among users of temporary modern and traditional methods. This, in part, is related to the third feature, and that is the relative dependence of method choice on family life-cycle goals rather than on socio-cultural differentials: the use of sterilization is closely associated with the goal of terminating child-bearing, while temporary methods of either type (modern or traditional) are being used for child-spacing.

The consistency of these results with those found in the earlier study using 1975 and 1982 data is remarkable. Even though the surveys cannot be considered to be strictly comparable owing to the issue of sample design, the stability of what determines method choice in Sri Lanka in both the current and previous studies is both striking and noteworthy. The fact that the determinants have changed but little over time also tells us, however, that (a) the choice of birth-spacing methods has not become more pronounced over time; if anything, the use of sterilization has increased, and (b) demographic factors continue to have the dominant effect on method choice, over socio-economic factors. The data also suggest that government programmes have not yet achieved success in promoting the use of modern temporary methods, which has shifted little from the plateau of about 10 per cent since 1975.

Overall, the data analyzed in this article show that contraceptive use continued to rise, albeit at a slower rate, in the 1980s in Sri Lanka. However, this has occurred without necessarily any structural changes in the patterns of contraceptive use. It appears that the relatively small role played by the modern methods of contraception in Sri Lanka is not likely to easily shift.

References

Bulatao, R.A., J.A. Palmore and S.E. Ward (eds.) (1989). *Choosing a Contraceptive: Factors in Method Choice in Asia and thc United States,* (Boulder, Colorado, Westview Press).

Caldwell, J., K.H.W. Gaminiratne, P. Caldwell, S. De Silva, B. Caldwell, N. Weeraratne and P. Silva (1986). "The role of traditional methods of fertility control in Sri Lanka", *Studies in Family Planning,* vol. 18, No. 1.

Kahn, J.R, S. Thapa and K.H.W. Gaminiratne (1989). "Sociodemographic determinants of contraceptive method choice in Sri Lanka: 1975-82", *Journal of Biosocial Science Supplement* No. 11.

Maddala, G.S. (1983). *Limited-Dependent and Qualitative Variables in Econometrics.* (Cambridge, Cambridge University Press).

Sri Lanka Ministry of Plan Implementation (1988). *Sri Lanka Demographic and Health Survey, 1987,* Department of Census and Statistics, Ministry of Plan Implementation, Colombo.

Thapa, S., D. Abeywickrema and L.A. Wilkens (1987). "Effects of compensatory payments on vasectomy acceptance in urban Sri Lanka: a comparison of two economic groups", *Studies in Family Planning,* vol. 18, No. 6.

Tsui, A.O. and M.A. Herbertson (eds.), (1989). "Dynamics of contraceptive use", *Journal of Biosocial Science Supplement* No. 11.

Determinants of Contraceptive Method Choice in an Industrial City of India

*A report on a special programme offering a
'cafeteria approach' to method selection*

**By Asha A. Bhende, Minja Kim Choe, JR. Rele
and James A. Palmore** *

Even though India instituted the first national family planning programme in the world, its contraceptive prevalence rate is still relatively low. In 1980, a national survey estimated that 35 per cent of the currently

* The authors of this article are Asha A. Bhende, International Institute for Population Sciences, Deonar, Bombay, India; and Minja Kim Choe, (the late) J.R. Rele and James A. Palmore, all of the East-West Population Institute, Honolulu, Hawaii, United States. An earlier version of this article was presented as a paper at the "South Asia Conference on Population Trends and Family Planning." Delhi, India, March 1989.

married women aged 15-44 years were currently using contraceptives, of whom 63 per cent were using sterilization (Khan and Prasad, 1983, pp. 112, 120). As late as 1984-1985, close to the time our study was carried out, oflicial government estimates based on service statistics still showed only 36 per cent of the eligible couples as being currently protected (Ministry of Health and Family Welfare, Government of India, 1986, p. 14); of these, 70 per cent were using sterilization (*Ibid*., p. 187).

India's national programme has had a history of emphasizing particular contraceptive methods. In recent years, the programme first emphasized the IUD, then shifted to male sterilization, then switched to female sterilization, and lately is promoting female sterilization and the IUD (see, for example, Rele *et al*., 1989; Cassen, 1978: chapter 3; Srikantan *et al*., 1984) and is moving towards a "cafeteria approach" (Palmore and Bulatao, 1989, p. 20). Not surprisingly, in this context, little research has been carried out on the determinants of contraceptive method choice. When there is limited choice, and the primary concern of policy makers is motivating couples to use any method at all, research on method choice has low salience (Palmore and Bulatao, 1989; Tsui, 1989; Mundigo *et al*., 1989).

In a few areas of India, however, special programmes have offered a "cafeteria approach" to method selection. This article deals with one such programme: the TISCO (Tata Iron and Steel Company) Family Welfare Programme in Jamshedpur, an industrial city in Bihar State. By the early 1980s, Jamshedpur had a crude birth rate under 20 (table 1) and close to 60 per cent current contraceptive use (table 2).

The TISCO Programme[1/]

Since 1958, TISCO has been involved in the family welfare programme of Jamshedpur, covering not only employees of the company but also serving non-employees living in the same area. The total population covered by the TISCO programme exceeded half a million (553,000) at the time of this study, with 438,000 in the Jamshedpur Notified Area, 40,000 in rural areas served by the Tata Steel Rural Development Society, and 75,000 in peripheral areas.

The programme provided both clinical services and motivational and educational programmes. The clinical services included nine centres in addition to regular government clinics, with contraceptive counselling for conventional contraceptives and the IUD, and two clinics providing vasectomy on a regular basis. "Camps" at all the clinics provided periodic vasectomy and laparoscopic tubectomy services.

Table 1: Selected demographic characteristics of Jamshedpur and India as a whole

	Jamshedpur (1982-1984)	India (1982)	India's goal for the year 2000
Crude birth rate	19.81	34.	21.
Total fertility rate	2.37	4.72 (rural) *	
		3.3l (urban) *	
Crude death rate	7.	12.	9.
Infant mortality rate	39.	114.	60.

Sources: Bhende *et al*., 1985 and Ministry of Health and Family Welfare, Government of India, 1986.

* *Note:* For 1980.

Table 2: Percentage currently using contraceptives, by method, Jamshedpur and India as a whole

	Jamshedpur 1984		India	
	All women	Exposed women	1982-83	1983-84[a]
Female sterilization	23	26	22	24
Male sterilization	11	13		
Condom	9	10		
Female temporary method	5	6		
Natural methods	10	11		
Any methd[b]	59	66	28	33

Sources: Bhende *et al*., 1985 and Ministry of Health and Family Welfare, Government of India, 1984, p. 147. The figures for India as a whole refer to currently married women aged 15-44.

Notes: [a] Provisional;
[b] Owing to rounding, the percentage for any method may not be equal to the sum of the percentages for individual methods.

The motivational and educational programmes were many and included such innovations as a dance drama on family planning, a recorded cassette programme of satisfied family planning acceptors, a birth rate competition among the various departments of TISCO, training camps for opinion leaders, special orientation programmes for officers and staff of welfare agencies in the city, family life education, and a special programme for future parents.

The TISCO programme also offered higher incentives for acceptors than did the national programme. Beginning in 1967, 200 rupees (US\$l.00 = then about Rs7.5) was offered to sterilization acceptors who were TISCO employees. Beginning in 1970, non-employees were offered Rs100. Later these incentives were increased, and by 1983 they had become Rs.500 (US\$l.00 = then about Rs10.9) for employees and Rs400 for non-employees. Employees were also granted leave of one day for a vasectomy and seven days for a tubectomy. For IUD acceptance, the incentive was Rs12. Further, sterilization motivators received Rs20 per case motivated.

Data and methods

In 1983, TISCO commissioned an independent evaluation of its programme by the International Institute for Population Sciences (IIPS), Deonar, Bombay. IIPS used both clinical records and a sample survey of the Jamshedpur Notified Area conducted in 1984. In this article, only the data from the survey are used.

Full details on the sample survey are provided in the final report published by IIPS and, hence, are not repeated here. What is important for our purposes is that the sample survey was a probability sample of the city, although a few areas of the city were excluded.[2/] In all, 2,376 currently married women in the age group 15-44 were interviewed (Bhende *et al*., 1985). What makes these data useful for our purposes is the fact that contraceptive acceptance levels in Jamshedpur were higher than the national level and no single method dominated acceptance, hence providing a rare look at what determines contraceptive method choice in the Indian context when true choice is really possible (table 2).

The determinants of contraceptive method choice can be identified and elaborated using multivariate analysis. To decide which variables to include as potential determinants, we were guided by the framework proposed by Rodolfo Bulatao (1989), who proposed four dimensions:

● Contraceptive goals (spacing or limitation);

- Contraceptive competence (the ability to use methods effectively);
- Contraceptive evaluation (assessment of the moral and practical aspects of using a specific method -- including side effects); and
- Contraceptive access (including not only geographic but also economic and other aspects of accessibility)

As might be expected, our final set of covariates are mostly indirect measures of Bulatao's dimensions. Those we used are listed below:

Contraceptive goals:

    number and sex of living children

    marriage duration

    ideal age to have last child

    want more children or not

    whether or not a large family is considered advantageous

    whether last child died

Contraceptive competence:

    husband's education

    wife's education

Contraceptive evaluation:

    religion

    ethnicity · mother tongue

Contraceptive access:

    husband's occupation

    husband's place of employment

Husband's occupation and place of employment were treated as contraceptive access variables because of the ready accessibility provided to TISCO and other Tata employees. The covariates and their distributions in the sample are summarized in table 3. All analyses were limited to "exposed" women: women were excluded if they were currently pregnant, not pregnant but in post-partum amenorrhea, or had reached menopause.

The statistical model used for the analysis was multinomial logit regression (Maddala, 1983; Choe, 1989). The method is appropriate for studying the relationships between a number of covariates and a dependent variable that has more than two possible outcomes. The contraceptive method currently used is the dependent variable, with the possible outcomes being female sterilization, male sterilization, condom, female temporary method, natural methods, and no method. In the Indian context, it is important to separate the male and female methods not only for obvious cultural reasons but also because of different promotional strategies that have been used.

Table 3: Characteristics of exposed women in the survey

Region/caste	Muslim	13%
	Hindu/scheduled caste	12%
	Hindu/other	75%
Mother tongue	Hindi, Urdu	43%
	Bengali, Oriya	34%
	Southern Indian	11%
	Punjabi	8%
	Other	4%
Husband's occupation	Professional, managerial	33%
	Skilled and unskilled workers	54%
	Other	13%
Husband's employer	TISCO	30%
	Other Tata	33%
	Others	37%
Women's age at consummation of marriage	Less than or equal to 15	32%
	16 to 19	41%
	20 or older	27%
Husband's average years of formal education		10.1 years
Women's average years of formal education		7.1 years
Average marriage duration		13.9 years
Number and sex of children	No children	7% living
	Have children, no sons	13%
	One son	35%
	Two or more sons	45%
Last-born child has died		9%
Ideal age at which to have last child:	30 years or younger	24%
Want no more children		72%
Not advantageous to have a large family		85%

The inclusion of sterilization among the choices could introduce methodological problems for two reasons. Many of these decisions could have been made in the past. This is potentially problematic because Bihar, the State where Jamshedpur is located, was one of the States where the national, compulsory, extensive sterilization efforts of 1975-1978 were most heavily emphasized; hence we could be looking at choices not made in a "cafeteria" environment. It is also potentially problematic because choices in the past would mean that some of the covariates, all of which were measured as of 1984, would be referring to times after the choices had been made. After examining the reported dates of sterilization in our data set,

however, we decided that these problems would be minimized. In our data set, most of the sterilizations among women occurred after that national campaign, with the largest single number of sterilizations having occurred in 1980.

The full model included some attitudinal variables. Recognizing that the effects of some background variables (e.g. religion, mother tongue, husband's occupation, husband's education and wife's education) operate in part through these attitudes, including the attitude variables in the model could lead to an over-adjustment of the total effects of these background variables. A reduced model is therefore also presented, without the attitude variables, to show the total effects of the background variables after adjusting for the other variables in the model. Together the two models help to separate the total effects of each of the background variables into their direct effects and the indirect effects operating through the attitude variables. In this article, the outputs for the two models are viewed from this perspective, and, wherever indicated, the effects are identified and discussed.

Results

The results for the full model are given in tables 4 and 5. Table 4 gives regression coefficients, with significance at p.05 indicated by an asterisk. Using these coefficients, the adjusted proportions, using each method for different values of any given covariate and assuming average values for all other covariates in the model, can be estimated. These proportions are given in table 5. Similarly, the results of the reduced model, excluding the attitude variables, are given in tables 6 and 7. A detailed discussion of the effects of each of the covariates on contraceptive use and method choice based on these analyses follows.

Religion/caste

This covariate is divided into three categories: Muslims, Hindu scheduled castes, and the remaining majority of the population consisting of Hindu other castes and others. The analysis indicates that Muslims and the Hindu scheduled casts show significantly lower contraceptive use than the majority group comprising 75 per cent of the population. It also shows that Muslims seem to prefer non-permanent and natural methods, with significantly lower use of both male and female sterilization. The attitudinal variables seem to explain a major part of their lower use of female sterilization: the differential in the use of female sterilization is no longer statistical-

Table 4: Multinomial logit regression coefficients for P (using a given method)/P (using no method)[a/]

Covariate	Female sterili- zation	Male sterili- zation	Condom	Female methods	Natural methods
Religion is Muslim	-0.48164	-0.88420 *	-0.06366	-0.00193	-039296
Religion is Hindu; person is from scheduled caste	-0.51417	-0.05295	-0.60647	-0.18334	-0.62828
Mother tongue is:					
Bengali, Oriya	0.15175	0.17574	0.33885	0.51852	1.02211 *
Southern Indian	0.40088	0.24004	0.27890	0.71015	0.60222 *
Punjabi	-0.10268	0.00854	0.65076	0.68457	0.41579
Other language	-0.15471	-0.23981	0.78491	1.02101	1.37980 *
Husband's occupation:					
Manager/professional	-0.18648	0.12245	0.30994	-0.36230	-0.05218
Other	0.05757	0.15864	-0.70320 *	0.26899	-0.23488
Place of employment:					
TISCO	0.52432 *	0.79411 *	0.33865	0.72075 *	0.35650
Other Tata	0.44854 *	0.70497 *	0.26070	0.45831	0.11169
Age at consummation:					
≤ 15years	0.23317	0.33873	-0.26656	0.76988 *	-0.08154
16 - 19years	0.09971	-0.16508	-0.32178	0.31689	-0.03216

Table 4: (*continued*)

Covariate	Female sterili-zation	Male sterili-zation	Condom	Female methods	Natural methods
Husband's education (no. of years of formal education)	0.01705	0.00481	0.00442	0.05062	0.07948 *
Wife's education (no. of years of formal education)	-0.01848	0.01967	0.16705 *	0.17914 *	0.10416 *
Duration of marriage (years)	0.11788 *	0.05433	-0.07318	-0.14620 *	0.06137
Duration of marriage squared	-0.00522 *	0.00008	0.00047	0.00231	-0.00184
Have no children	- 1.61407 *	-1.15373	-0.86528	- 0.78924	-1.20820
Have children, no sons	-1.50999 *	-1.39279 *	0.03045	0.47870	0.01175
Have one son	-1.20243 *	-1.12677 *	-0.21003	-0.38009	-0.42431 *
Last-born child dead	-0.04710	-0.48626	-0.55828	-1.18611	-0.33486
Ideal age at which to have last child: 30 years or less	0.40886 *	0.32821	0.26756	0.31509	0.04886
Want no more children	3.30426 *	2.57879 *	1.43486 *	2.70811 *	1.42349 *
Advantageous to have large family	0.26741	0.58990 *	0.63933 *	0.63338 *	0.18905

Notes: a/ Estimated coefficients for any other comparisons can be computed by subtraction.

* = Significant at p.05.

Table 5: Adjusted proportions using each method for selected groups[a/]

Group	No method	Female sterili-zation	Male sterili-zation	Condom	Female methods	Natural methods
All	0.3510	0.2688	0.1187	0.0938	0.0467	0.1209
Religion is Muslim	0.4227	0.2266	0.0668	0.1150	0.0574	0.1116
Religion is Hindu; person is from scheduled caste	0.4235	0.2197	0.1536	0.0669	0.0479	0.0884
Other religion	0.3260	0.2829	0.1247	0.0945	0.0443	0.1275
Mother tongue is:						
Hindi, Urdu	0.3947	0.2785	0.1236	0.0839	0.0370	0.0824
Bengali, Oriya	0.3096	0.2542	0.1155	0.0924	0.0487	0.1796
Southern Indian	0.3026	0.3188	0.1204	0.0850	0.0577	0.1154
Punjabi	0.3494	0.2225	0.1103	0.1424	0.0649	0.1106
Other language	0.2935	0.1774	0.0723	0.1368	0.0763	0.2436
Religion Muslim, language Hindi or Urdu	0.4735	0.2338	0.0692	0.1024	0.0453	0.0757

Table 5: (*continued*)

Group	No method	Female sterilization	Male sterilization	Condom	Female methods	Natural methods
Husband's occupation:						
Skilled/non-skilled	0.3452	0.2791	0.1099	0.0912	0.0500	0.1247
Manager/professional	0.3528	0.2367	0.1269	0.1271	0.0355	0.1210
Other	0.3527	0.3020	0.1316	0.0461	0.0668	0.1008
Place of employment:						
TISCO	0.2983	0.2850	0.1398	0.0929	0.0566	0.1273
Tata	0.3244	0.2873	0.1391	0.0934	0.0474	0.1084
Other	0.4183	0.2366	0.0886	0.0928	0.0386	0.1250
Age at consummation:						
$\leq$ 15 years	0.3228	0.2780	0.1468	0.0821	0.0635	0.1067
16 - 19 years	0.3648	0.2749	0.1002	0.0878	0.0456	0.1266
$\geq$ 20 years	0.3587	0.2446	0.1163	0.1192	0.0327	0.1286

Table 5: (*continued*)

Group	None method	Female sterili-zation	Male sterili-zation	Condom	Female methods	Natural methods
Education of husband:						
0 years	0.4072	0.2624	0.1312	0.1041	0.0324	0.0627
4 years	0.3864	0.2666	0.1269	0.1006	0.0377	0.0818
7 years	0.3690	0.2684	0.1232	0.0975	0.0420	0.0993
12 years	0.3392	0.2683	0.1158	0.0915	0.0496	0.1357
Education of wife:						
0 years	0.4082	0.3567	0.1200	0.0331	0.0151	0.0669
4 years	0.3828	0.3107	0.1217	0.0606	0.0290	0.0951
7 years	0.3526	0.2707	0.1190	0.0922	0.0458	0.1198
12 years	0.2805	0.1964	0.1044	0.1690	0.0892	0.1604
Marriage duration:						
5 years	0.3193	0.2793	0.0655	0.1469	0.0922	0.0968
10 years	0.3133	0.3341	0.0848	0.1036	0.0518	0.1124
15 years	0.3229	0.3234	0.1159	0.0785	0.0343	0.1251
20 years	0.3517	0.2549	0.1680	0.0644	0.0269	0.1341

Table 5: (*continued*)

	None method	Female sterilization	Male sterilization	Condom	Female methods	Natural methods
Last born child: died	0.4147	0.3043	0.0901	0.0667	0.0187	0.1054
Last born child: living	0.3440	0.2646	0.1216	0.0967	0.0509	0.1222
Have no children	0.5412	0.1709	0.1110	0.0695	0.0371	0.0703
Have children, no sons	0.3984	0.1396	0.0643	0.1252	0.0972	0.1753
Have one son	0.4306	0.2052	0.0907	0.1064	0.0445	0.1225
Have two or more sons	0.2423	0.3843	0.1575	0.0739	0.0366	0.1054
Ideal age at which to have last child:						
≤ 30	0.2998	0.3137	0.1303	0.0983	0.0507	0.1072
> 30	0.3672	0.2553	0.1149	0.0922	0.0453	0.1251
Want no more children	0.2090	0.3985	0.1441	0.0830	0.0587	0.1067
Want more children	0.7361	0.0515	0.0385	0.0696	0.0138	0.0905
Advantageous to have large family	0.4275	0.2605	0.0874	0.0662	0.0331	0.1253
Not advantageous to have large family	0.3380	0.2692	0.1246	0.0992	0.0493	0.1197

Note: a/ The adjusted proportions are estimated by setting covariates included in the model but not specified by the row heading at their sample mean values.

Table 6: Multinomial logit regression coefficients for P (using a given method)/P (using no method) (reduced model)[a]

Covariate	Female sterili-zation	Male sterili-zation	Condom	Female methods	Natural methods
Religion is Muslim	-0.87694 *	-1.26757 *	-0.35285	-0.40155	-0.55315
Religion is Hindu; person is from scheduled caste	-0.72774 *	-0.24477	-0.74249 *	-0.38231	-0.71055 *
Mother tongue is :					
Bengali, Oriya	0.17810	0.19420	0.34533	0.53864	1.03652 *
Southern Indian	0.41871	0.24879	0.27462	0.72106	0.61712 *
Punjabi	-0.14636	-0.03719	0.60783	0.63919	0.40799
Other language	0.01147	-0.08679	0.88323	1.18481 *	1.46565 *
Husband's occupation:					
Manager/professional	-0.21668	0.10980	0.31044	-0.37466	-0.06079
Other	0.10348	0.20079	-0.67037 *	0.31186	-0.22090
Place of employment:					
TISCO	0.47000 *	0.75346 *	0.31960	0.67730 *	0.32986
Other Tata	0.31497	0.60578 *	0.20555	0.35590	0.06190

Table 6: (*continued*)

Covariate	Female sterili-zation	Male sterili-zation	Condom	Female methods	Natural methods
Age at consummation:					
≤ 15 years	0.12390	0.24942	-0.31748	0.67514 *	-0.13285
16 - 19 years	0.10206	-0.16374	-0.31845	0.31713	-0.03620
Husband's education (no. of years of formal education)	0.01652	0.00566	0.00645	0.05137	0.07864 *
Wife's education (no. of years of formal education)	0.02110	0.05235 *	0.18758 *	0.21318 *	0.12008 *
Duration of marriage (years)	0.31084 *	0.20666 *	0.01183	0.01428	0.14676 *
Duration of marriage squared	-0.00936 *	-0.00329 *	-0.00151	-0.00125	-0.00369 *
Have no children	-2.46950 *	-1.81067 *	-1.21910	-1.47989	-1.57964 *
Have children, no sons	-2.32824 *	-2.00002 *	-0.28419	-0.15692	-0.33075
Have one son	-1.41187 *	-1.25335 *	-0.25116	-0.51137 *	-0.50607 *
Last-born child dead	-0.35459	-0.69946	-0.65917	-1.40745	-0.45531

Notes: **a/ Estimated coefficients for any other comparisons can be computed by subtraction.**
* = Significant at p.05.

55

Table 7: Adjusted proportions using each method for selected groups (reduced model)[a/]

Group	No method	Female sterili- zation	Male sterili- zation	Condom	Female methods	Natural methods
All	0.3647	0.2784	0.1139	0.0866	0.0454	0.1110
Religion is Muslim	0.5041	0.1960	0.0539	0.0962	0.0463	0.1033
Religion is Hindu; person is from scheduled caste	0.4658	0.2103	0.1386	0.0602	0.0436	0.0816
Other religion	0.3247	0.3035	0.1234	0.0882	0.0446	0.1157
Mother tongue is:						
Hindi, Urdu	0.4103	0.2845	0.1174	0.0773	0.0355	0.0750
Bengali, Oriya	0.3220	0.2668	0.1119	0.0857	0.0478	0.1659
Southern Indian	0.3139	0.3309	0.1152	0.0778	0.0559	0.1063
Punjabi	0.3760	0.2252	0.1037	0.1301	0.0617	0.1033
Other language	0.2862	0.2008	0.0751	0.1304	0.0811	0.2265
Religion Muslim, language Hindi or Urdu	0.5587	0.1974	0.0548	0.0846	0.0358	0.0688

Table 7: (*continued*)

Group	No method	Female sterili- zation	Male sterili- zation	Condom	Female methods	Natural methods
Husband's occupation:						
Skilled/non-skilled	0.3583	0.2899	0.1051	0.0837	0.0484	0.1145
Manager/professional	0.3716	0.2421	0.1217	0.1184	0.0345	0.1117
Other	0.3551	0.3186	0.1273	0.0424	0.0656	0.0910
Place of employment:						
TISCO	0.3102	0.2970	0.1347	0.0861	0.0552	0.1167
Other Tata	0.3497	0.2868	0.1311	0.0867	0.0452	0.1006
Other	0.4227	0.2530	0.0864	0.0853	0.0382	0.1143
Age of consummation:						
≤ 15 years	0.3491	0.2780	0.1379	0.0761	0.0603	0.0986
16 - 19 years	0.3718	0.2897	0.0971	0.0810	0.0449	0.1156
≥ 20 years	0.3675	0.2586	0.1131	0.1100	0.0323	0.1185

Table 7: (*continued*)

Group	No method	Female sterili- zation	Male sterili- zation	Condom	Female methods	Natural methods
Education of husband:						
0 years	0.4212	0.2720	0.1242	0.0937	0.0311	0.0578
4 years	0.4002	0.2761	0.1207	0.0913	0.0363	0.0753
7 years	0.3834	0.2779	0.1176	0.0892	0.0406	0.0913
12 years	0.3530	0.2779	0.1114	0.0848	0.0483	0.1245
Education of wife:						
0 years	0.4784	0.3142	0.1028	0.0298	0.0130	0.0618
4 years	0.4195	0.2997	0.1111	0.0553	0.0267	0.0876
7 years	0.3673	0.2796	0.1138	0.0850	0.0444	0.1100
12 years	0.2676	0.2264	0.1078	0.1582	0.0939	0.1461

Table 7: (continued)

Group	None method	Female sterilization	Male sterilization	Condom	Female methods	Natural methods
Marriage duration:						
5 years	0.4668	0.1872	0.0490	0.1402	0.0678	0.0889
10 years	0.3449	0.3245	0.0796	0.0982	0.0490	0.1038
15 years	0.2787	0.3853	0.1197	0.0697	0.0364	0.1102
20 years	0.2703	0.3439	0.1834	0.0551	0.0305	0.1168
Last-born child died	0.4798	0.2653	0.0793	0.0625	0.0166	0.0965
Last-born child living	0.3532	0.2784	0.1175	0.0890	0.0499	0.1120
Have no children	0.6673	0.1134	0.0776	0.0578	0.0256	0.0583
Have children, no sons	0.5098	0.0998	0.0490	0.1125	0.0735	0.1554
Have one son	0.4391	0.2149	0.0891	0.1002	0.0444	0.1123
Have two or more sons	0.2172	0.4361	0.1543	0.0637	0.0366	0.0922

Note: [a]/The adjusted proportions are estimated by setting covariates included in the model but not specified by the row heading at their sample mean values.

ly significant when the attitudinal variables are included. The lower use of female sterilization among Muslims seems to be due to their family-size objectives. Muslims also use male sterilization less; this finding persists even with the inclusion of the attitude variables. This apparently leads to their preference for non-permanent and natural methods, especially the condom. The lower contraceptive use among the Hindu scheduled castes is essentially due to their lower use of female sterilization, condoms and natural methods.

Mother tongue

The speakers of Hindi/Urdu languages show the lowest use of contraception, while the highest use is found among those classified as "others". The high prevalence among the latter is essentially due to their greater use of natural methods. When the natural methods are excluded, the highest use is found among speakers of South Indian languages who prefer female and male sterilization, while the Bengali/Oriya speakers show the lowest prevalence. A special preference for the condom is displayed by the speakers of Punjabi and "other" languages, and by Muslims. The differentials in contraceptive use according to mother tongue remain essentially unaltered whether or not attitudinal variables are included in the model. Hence, the observed differences in contraceptive use and choice by mother tongue are for reasons other than their family-size preference.

When religion and mother tongue are combined, the results reveal the stark finding that Hindi/Urdu-speaking Muslims show consistently low contraceptive use for all methods. This emphasizes the possible influence of the socio-religious environment on contraceptive acceptance. This result is not due to differentials in knowledge: there are no significant differences in the awareness of contraceptives in general between Muslims and other religious groups. When non-users were asked about the reasons for not using contraception, Muslims often replied: "It is against my religion" (Bhende *et al.,* 1985). The need for specialized programmes for special groups is obviously suggested by the findings above.

Husband's occupation

Husband's occupation is divided into three categories: managers/professionals, skilled/non-skilled workers and others. Husband's occupation does not affect the overall use of contraception, but it does seem to influence method choice. Managers/professionals tend to prefer the condom, while female sterilization is preferred by the "others".

Place of employment

Place of employment has three categories: employees of TISCO, other Tata, and others. The TISCO and other Tata employees show significantly higher contraceptive acceptance than the others. This is especially due to their higher acceptance of both male and female sterilization. The special TISCO programme, described previously, seems to have worked.

Age at consummation of marriage

One of the distinguishing features of Indian family-building norms is an early age at marriage. Because of this, the age of actual consummation of marriage is often separated from the age of marriage by a special ceremony which takes place sometimes months or years after the age at marriage. Owing to its demographic significance, what is considered here is the age at consummation of marriage. This variable does not, however, have much effect on overall contraceptive use, although it does affect method choice to some extent. Females whose age at consummation of marriage is less than 15 show a higher use of sterilization, whereas when age at consummation is 20 years or above, the couples tend to display a selective preference for condoms at the cost of female methods.

Husband's education

Husband's education shows a moderate positive association with the overall use of contraception. This results entirely from the strong positive relationship of the husband's education with the use of natural methods. When the natural methods are excluded, there is no relationship between husband's education and contraceptive use.

Wife's education

Wife's education shows a strong positive relationship with the overall use of contraception. Interestingly enough, this arises from strong positive relationships with all non-permanent methods, and negative relationships with male and female sterilization.[3/] As in the case of husband's education, if the natural methods are excluded, the level of overall use of contraception by wife's education remains more or less constant. When the attitudinal variables are deleted from the model, it reduces the negative relationship of wife's education with male and female sterilization, and makes the positive relationship with the overall use of contraception even stronger. This indicates that a part of the influence of wife's education on contraceptive use operates through more favourable attitudes towards the small family norm with higher education.

The effect of wife's education is much stronger than the effect of husband's education on both overall use and method choice. The effect of wife's education on whether or not the couple chooses temporary methods over permanent methods is particularly noticeable. This might be interpreted as reinforcing the importance of contraceptive competence and contraceptive evaluations in method choice.

Marriage duration

In the full model, overall contraceptive use remains remarkably constant up to 20 years of marriage duration, with a slight drop thereafter. This slight drop after 20 years of marriage duration is due essentially to a corresponding drop in female sterilization. With this exception, generally with advancement of marriage duration, there is a gradual shift from temporary methods to male and female sterilization, as would be expected. Looking at the individual methods, female sterilization has an "inverted-U" relationship, male sterilization has an accelerated positive relationship, condom and female temporary methods show a downward trend, and natural methods show a very mild upward trend with marriage duration (see figure).

Figure: Contraceptive method choice by marriage duration
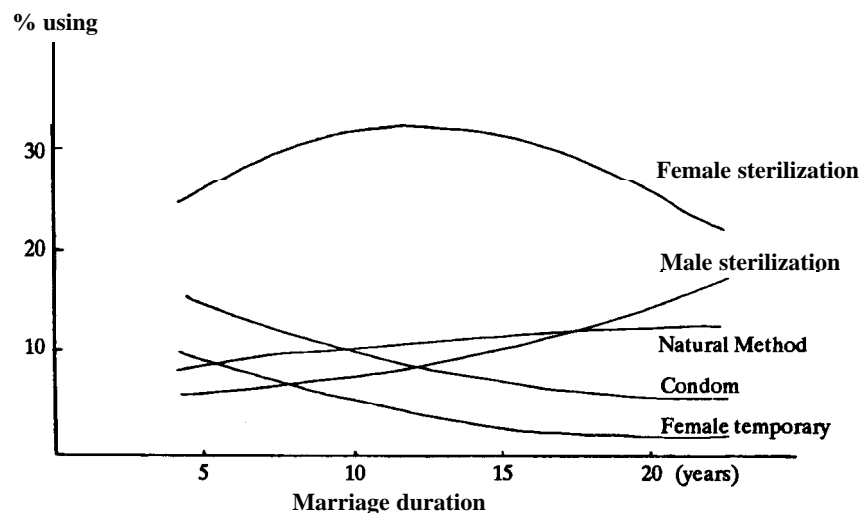
In the reduced model without the attitude variables, there appears to be a strong positive association of marriage duration with overall contraceptive use. Also the relationships with male and female sterilization are accentuated. This clearly indicates the influence of the attitude variables in these relationships. As women advance in marriage duration (and age) and fulfill their family size ideals, they are more likely to "want no more children", and resort to permanent methods.

Survival status of last child

The survival status of the last child does seem to affect the use of contraception, but the effect is not statistically significant. This may be due to the small number of deaths among children in the Jamshedpur population. Also, it is apparent that the effect of this covariate is suppressed owing to adjustment for the number and sex of living children, because, in an alternative model where the latter covariate is removed, the effect of the survival status of the last child becomes significant. Women whose last child was living had higher contraceptive acceptance in general and for all individual methods, with the exception of female sterilization.

Number and sex of living children

The use of contraception tends to rise as the number of children, and especially the number of sons, goes up. Thus, a very high proportion of women having two or more living sons are current users of contraception, with a singular focus on male or female sterilization. The influence of the sex of the last child was also assessed in one model, but no clear result emerged. The use of sterilization among women with no children seems surprisingly high. Two factors may explain this unusual fact. First, it is possible that in some cases children may have died after the wife was sterilized. Second, and perhaps a more important factor, is that in the process of statistical adjustment, the group is very artificially defined as having the mean values of all other covariates in the model, such as a marriage duration of 14 years and 72 per cent wanting no more children. Thus, in the reduced model without the attitude variables, the proportion of users in the no children category is somewhat reduced.

Attitude variables

The attitude variables are very strong indicators of the use or non-use of contraception, as well as method choice. Women who want no more children show significantly higher contraceptive acceptance in total and for all individual methods. Women who indicated the ideal age to have their

last child as 30 years of age or less had higher contraceptive acceptance, especially for female sterilization. Women who felt it was not advantageous to have a large family also showed higher contraceptive prevalence, through the use of male methods (male sterilization and condom). Each of these attitude variables seems to have made very specific contributions to contraceptive acceptance and method choice. The attitude variables are also important because the effects of some of the background variables on contraceptive use and method choice operate through these attitude variables.

Summary and conclusions

For most of India, studies of method choice have not been possible because overall acceptance rates are low and are dominated by one method. Jamshedpur provides an interesting contrast, with high overall levels of contraceptive use and method choices more nearly approaching the "cafeteria" ideal.

In the Jamshedpur context, our multinomial logit analysis revealed a number of important results. Religion and caste are important determinants of acceptance and method choice. Muslims and the Hindu scheduled castes showed significantly lower contraceptive use than the majority population. Muslims seem to prefer non-permanent (condoms) and natural methods and have significantly lower use of both male and female sterilization. It is thought that this is a result of both their family-size preferences as well as more direct religious influences. The lower contraceptive use among the Hindu scheduled castes is essentially due to their lower use of female sterilization, condoms and the natural methods.

Mother tongue also has a substantial influence on contraceptive use and method choice. Hindi/Urdu-speakers have the lowest contraceptive use, although they have significant sterilization use. The Bengali/Oriya-speakers show a special preference for natural methods, Punjabis for condoms, and South Indians for sterilization. Interestingly enough, when religion and mother tongue are combined, it brings out the stark finding that Hindi/Urdu-speaking Muslims show consistently low contraceptive use for all methods. This emphasizes the influence of the socio-religious environment on contraceptive acceptance, and suggests the need for specialized progranmres for special groups.

Husband's occupation does not affect the overall use of contraception, but it does have some influence on method choice. Place of employment, on the other hand, has substantial effects. TISCO and other Tata employees

show significantly higher contraceptive acceptance than others. This is especially due to their higher acceptance of both male and female sterilization. This result clearly points to the superior family welfare programmes of the TISCO and other Tata groups.

Husband's education shows a moderate positive association with the overall use of contraception, but this is entirely due to its strong positive relationship with the use of natural methods. Strikingly, wife's education shows a strong positive relationship with the overall use of contraception. This arises from strong positive relationships with all non-permanent methods, and negative relationships with male and female sterilization. Part of the influence of wife's education on contraceptive use operates through more favourable attitudes towards the small family norm with rises in education.

Overall contraceptive use remains remarkably constant up to 20 years of marriage duration, with a slight drop thereafter. The drop in later years is conceivable when the women consider themselves to be sub-fecund, and they resort more to natural methods. Simultaneously, the use of contraception tends to rise as the number of children, especially sons, goes up. Women whose last child was living had higher contraceptive acceptance in general and for all individual methods, with the exception of female sterilization.

Clearly then, the Jamshedpur population did exercise choice in clear patterns when the choices were made available. As the national programme moves closer to the "cafeteria" ideal, it may become possible to observe whether or not the choice patterns in Jamshedpur will be found in other areas of the country and whether the high levels of overall use in Jamshedpur are at least partly due to the fact that choices were offered.

Footnotes

1.   This discussion relies heavily on Bhende *et al.,* 1985, pp. 1-3.

2.   Jungsalai, Parsudi, Khasmahal, Mango and Shastri Nagir were not included.

3.   Note that in table 4 the multinomial logit regression coefficient for male sterilization is positive (0.01967), but the trend in table 5 is slightly negative (0.1200, 0.1217, 0.1190 and 0.1644, respectively). The former is misleading and occurs because the base category, which is of no use, shows a steeper negative trend (0.4080, 0.3838, 0.3526, 0.2805). The ratios 1200/4082 = 0.2940; 1217/3828 = 0.3179; 1190/3526 = 0.3372; 1044/2805 = 0.3722 show the apparent positive trend seen in the table.

References

Bhende, Asha A., S. Mukerji and Sunanda Mitra (1985). *The TISCO Family Welfare Programme in Jamshedpur,* (Deonar, Bombay, International Institute for Population Sciences).

Bulatao, Rodolfo A, (1989). *"Toward a Framework for Understanding Contraceptive Method Choice",* In: Rodolfo A. Bulatao, James A. Palmore and Sandra E. Ward (eds.), *Choosing a Contraceptive: Method Choice in Asia and the United States,* (Boulder, Colorado, Westview Press), Chapter 14, pp. 277-304.

Cassen, R.H. (1978). *India: Population, Economy, Society,* (Delhi, The Macmillan Company of India, Ltd.).

Choe, Minja Kim (1989). "Multinomial Logit Analysis of Contraceptive Method Choice", In: Rodolfo A. Bulatao, James A. Palmore and Sandra E. Ward (eds.), *Choosing a Contraceptive: Method Choice in Asia and the United States, op. cit.,* Chapter 15, pp. 307-313.

Khan, M.E. and C.V.S. Prasad (1983). *Family Planning Practices in India: Second All India Survey,* (Baroda, Operations Research Group).

Maddala, G.S. (1983). *Limited-Dependent and Qualitative Variables in Econometrics,* No. 3, (Cambridge, Cambridge University Press).

Ministry of Health and Family Welfare, Government of India (1984). *Family Welfare Programme in India: Year Book 1983-1984,* (Delhi, Government of India).

_____ (1986). *Family Welfare Programme in India: Year Book 1984-1985,* (Delhi, Government of India).

Mundigo, Axel I., James F. Philipps and Apichat Chamratrithirong (1989). "Determinants of Contraceptive Use Dynamics: Research Needs on Decision and Choice", In: Amy Ong Tsui and M.A. Henderson (eds.), *Dynamics of Contraceptive Use,* (Cambridge, Parkes Foundation), (*Journal of Biosocial Science,* Supplement No. ll), pp. 9-16.

Palmore, James A. and Rodolfo A. Bulatao (1989). "The Contraceptive Method Mix: An Overview", In: Rodolfo A. Bulatao, James A. Palmore and Sandra E. Ward (eds.), *Choosing a Contraceptive: Method Choice in Asia and the United States, op. cit ,* Chapter 1, pp. 3-24.

Rele, J.R, P.N. Kapoor and M.E. Khan (1989). "Determinants and Consequences of Contraceptive Method Choice in India", In: Rodolfo A. Bulatao, James A. Palmore and Sandra E. Ward (eds.), *Choosing a Contraceptive: Method Choice in Asia and the United States,* (Boulder, Colorado, Westview Press), Chapter 10, pp. 191-211.

Srikantan, K Sivaswamy, K. Balasubramanian and Surekha Nikam (1984). "The Performance of India's Family Planning Programme", In: Tim Dyson and Nigel Crook (eds.), *India's Demography: Essays on the Contemporary Population,* (New Delhi, South Asian Publishers Pvt. Ltd.), pp. 160-174

Tsui, Amy Ong (1989). "The Dynamics of Contraceptive Use: An Overview", In: Amy Ong Tsui and M.A. Henderson (eds.), *Dynamics of Contraceptive Use, op. cit,* pp. 1-7.

1990 Singapore Census[*]

The tradition of decennial population censuses in Singapore was introduced by the British colonial administration in 1871, although it has been claimed that the first census was carried out in 1824 (Shantakumar, 1986). Modern censuses, conforming to international recommendations, have been carried out in 1970, 1980 and 1990. The 1990 population census is the most comprehensive enumeration ever undertaken in Singapore, utilizing computer-based integrated or relational databases which are similar to *pseudo* population registers (Shantakumar, 1990). The 1990 census was a bold experiment in data collection methodology (Lau, 1990), very similar to population registers elsewhere.[1] It used an integrated relational database system to gather information from households. Administrative records of persons accessed through unique identification numbers, computerized reticulation of census districts and the creation of a pre-census household database were among the innovations making extensive use of information technology. A comprehensive household database is expected to be established.

In the main enumeration, the usual socio-economic and demographic information was sought, including language, religion and income. Working persons provided information on business or work activity, mode of transport and incomes. Educational attainment by field and country of study, year and the currently enrolled provided further data. For ever-married women, data were collected on age at first marriage, number of children ever born and age when the first child was born. For the elderly (60 + years of age), mobility status was covered. In all, 68 items of information were gathered, including housing characteristics.

The new approach uses administrative records already captured in computer databases[2] , i.e. from the ministries of Home Affairs, National Development, Labour, Education, and Communications and the Depart-

[*] By G. Shantakumar, Senior Lecturer, Department of Economics and Statistics, National University of Singapore, Singapore, and Visiting Fellow, International Institute for Population Sciences, Bombay, India, September-November 1991.

ment of Statistics. Data from various sources were merged into a single database through unique identification numbers allocated to identity cards which are also used for local licenses and international passports.

Preliminary analyses

The 1990 census results were officially released as highlights through the various media (Department of Statistics, Highlights, 1991). Some results were based on full coverage while some were based on a 10 per cent priority sample.

Although there were 3.003 million people enumerated in the 1990 census, non-residents (non-citizens and guest workers) contributed some 10 per cent of this total. In the 1980 census, corresponding figures were 2.414 million and 6 per cent, respectively. In the decade, the number of foreign workers and their families and even dependents of residents (citizens and permanent residents) admitted into Singapore increased. The growth rate of the total population was 2.2 per cent per year during the period 1980-1990, some of the increase being accounted for by immigration.

Population ageing is reflected by the increasing median age from 24.4 to 29.8 years in the decade; persons aged 60+ contributed 9.1 per cent of total when compared with 7.5 per cent in 1980.[3/] The age-dependency ratio per 100 adults aged 15-59 has declined from 55 to 47, mainly from young age dependency declines (43 to 34) while old age dependency increased from 12 to 13.

The mean number of children born per ever-married female is now 2.9 down from 3.4, which is also reflected in the increasing number of single women aged 30-39 from 13.4 to 17.6 per cent. Student enrolment for ages 6 to 16 increased from 90.0 to 96.6 per cent while those with secondary or higher education also went up from 20.5 to 39.1 per cent. General literacy (in any language) went up to 90.1 from 83.5 per cent while the proportion of English-speaking households constituted 20.3 per cent, up from 11.6.

Increasing affluence is also shown by the decreasing mean household size of 4.2 persons, with the one-family nucleus dominating the family structure. About 90 per cent of residents owned the house or flat they occupied.

Labour force participation increased marginally from 63.2 to 64.9 per cent, with more women entering the workforce (44 to 50 per cent) while a slight decline in male rates is evident. Workforce in the top occupational cadre constituted 24 per cent (18 per cent in 1980), while for the manufacturing sector there was a decline from 30 to 28 per cent.

Table 1: Ethnic groups comprising population of Singapore

Ethnic group	1980 (per cent)	1990 (per cent)
Chinese	78.3	77.7
Malays	14.4	14.1
Indians	6.3	7.1
Others	1.0	1.1

Demographic and social characteristics

Being a multi-ethnic and multi-cultural society, it is interesting to see the compositional changes in population. Basic characteristics such as age, sex, citizenship, ethnic group and marital status are based on complete counts. Information on economic and other characteristics (housing, education, transport, religion and employment) is based on a 10 per cent sample of households selected for priority enumeration and processing (Department of Statistics, Data Release, 1991). Ethnic composition was virtually unchanged in the decade (see table 1). Although Indians (this term includes all people of South-Asian origin) seem to have increased their share in the total population, contrary trends rule out this. For instance, it is well known that Indian emigration was out of proportion in the total population in the 1980s. Indian workers and professionals entering Singapore were excluded from the total resident population if they were non-residents. There is a remote possibility that the 1980 enumeration of Indians could be an undercount especially of the older males who frequently return to their country of origin and may not be easily enumerated.

Although the Malay population is youthful when compared with the rest of the population, the ageing aspect of the entire population cannot be ignored. Malays and Indians have, in the past, lagged behind in fertility decline and this could explain the ethnic age differentials. In terms of the elderly population (60 +), the information in table 2 is pertinent.

Table 2: Elderly population by ethnic group

Ethnic group	1980 (per cent)	1990 (per cent)
Chinese	8.0	9.3
Malays	4.8	7.2
Indians	6.2	9.8
Others	9.5	11.3

Table 3: Age dependency ratio (per 100 adults 15-59 years)

Age dependency	Chinese		Malays		Indians		Others	
	1980	1990	1980	1990	1980	1990	1980	1990
Total	**54**	**46**	**56**	**56**	**46**	**51**	**52**	**66**
Under 15 years	42	32	49	45	37	36	38	47
60+ years	12	14	7	11	9	15	14	19

Owing to drastic fertility declines and high longevity levels, the Chinese ethnic group has already exhibited signs of an ageing population structure. Only in the 1990s have Malay and Indian age structures shown escalating trends. Age dependency ratios reflect these trends.

For the Chinese, the young dependency ratio has steeply declined when compared with Malays and Indians, underscoring the rapidity of population ageing. Declines in Malay and Indian youth dependency ratios are moderate (-4 and -1 percentage points, respectively) whereas there is a 10 percentage point decline for the Chinese. In terms of old age dependency ratios, the increases are + 2, + 4 and +6 percentage points for the respective ethnic groups. Together, the ratios reveal that (a) Chinese ageing has been and will be quite rapid unless higher fertility becomes the norm; (b) Malay and Indian populations are still relatively youthful; (c) ageing among the Malay and Indian populations will also follow, in *tandem,* from further fertility declines. Further evidence can be gleaned from table 4.

Table 4: Proportion of females (30-39 years) single and mean number of children born to married females

Ratios	Chinese		Malays		Indians		Others	
	1980	1990	1980	1990	1980	1990	1980	1990
Proportion single among females aged 30-39 years (%)	14.1	18.7	10.2	12.0	9.9	15.6	15.8	13.8
Mean no. of children born per married female	3.4	2.9	3.9	3.4	3.4	2.8	2.8	2.4

Table 5: Proportion of population single

Age Group (years)	Chinese		Malays		Indians	
	1980	1990	1980	1990	1980	1990
25-29	35.2	42.3	25.6	24.9	31.4	32.4
30-34	17.4	21.8	13.1	13.4	13.1	18.2
35-39	9.1	15.2	5.6	10.1	4.9	12.3

The proportion of single females aged 30-39 is highest for Chinese, followed by Indians and Malays, reflecting their respective fertility levels. The decline in mean number of children per married female is apparent across all ethnic groups, most significantly among Indians, followed by Chinese and Malays. The proportion single for the three ethnic groups in various age groups is also characteristic of the trends in Singapore, further contributing to fertility declines and an older population as shown in table 5.

The proportion childless among women seems to have increased at older ages (up to 39), too. This also signifies postponement of marriage, higher age at marriage and falling fertility (table 6). Significant increases are noticeable for Chinese and Indian ever-married females aged 30-34 years, while the increase was marginal for Malays. The pattern is repeated for the other age groups as well.

In terms of religion, most of the population professed Buddhism or Taoism, followed by Christianity, Islam, no religion and Hinduism. A significant increase in the Christian population is noticeable (10 to 13 per cent) while those having no religion increased marginally from 13 to 14 per cent. These changes occurred mainly among the Chinese, as can be seen from table 7. Although Hindus have recorded a decline in their share while Muslims have correspondingly increased among Indians, this could reflect increasing trends in the number of Muslims from South Asian countries being offered permanent residence in Singapore. Almost all Malay are Muslims.

Table 6: Proportion of women childless (per cent)

Age group	Chinese		Malays		Indians	
	1980	1990	1980	1990	1980	1990
25-29	20.6	37.9	13.0	15.8	16.7	27.3
30-34	7.0	14.6	6.8	7.5	5.0	13.3
35-39	2.8	6.5	3.4	5.2	2.4	7.2
40-44	2.4	4.5	2.7	3.0	2.7	5.1
45-49	2.1	2.7	2.6	3.3	2.4	2.9

Table 7: Religion by major ethnic group

Religion	1980	1990
Chinese	100.0	100.0
Buddhism/Taoism	72.6	68.0
No religion	16.3	17.6
Christianity	10.7	14.1
Other	0.4	0.3
Malays	100.0	100.0
Islam	99.6	99.7
Other	0.4	0.3
Indians	100.0	100.0
Hinduism	56.5	53.2
Islam	21.8	26.3
Christianity	12.5	12.8
Other	9.2	7.7

The general literacy rate has increased from 83.5 to 90.1 per cent, with Malays and Indians having the highest levels (91.7 and 93.0 per cent, respectively). Student enrolment was 97 per cent among those residents aged 6-16 years; the ratios were 98, 94 and 91 per cent for the Chinese, MaIays and Indians, respectively. University education attainment was highest for Chinese (5.0 per cent), followed by Indians (3.8 per cent) and MaIays (0.6 per cent).

Economic characteristics[4/]

Economic activity for the population aged 15 + is shown by percentage below:

Activity stalus	1980	1990
No. ('000)	1,760.8	2,335.4
Total %	100.0	100.0
Economically active	63.2	64.9
Working	61.0	63.6
Unemployed	2.2	1.3
Economically inactive	36.8	35.1

Table 8: Participation rates by ethnic group and sex

Ethnic group	Male		Female			
	1980	1990	1980	1990	1980	1990
Chinese	80.8	78.2	44.5	49.6	62.6	63.8
Malays	83.2	76.6	44.6	45.1	64.7	60.7
Indians	84.0	82.8	44.1	53.4	67.6	69.8
Total	**81.5**	**79.2**	**44.3**	**50.3**	**63.2**	**64.9**

The labour force has expanded by an average of 3.1 per cent per annum and currently constitutes 65 per cent of the population. Unemployment has consistently declined.

With more females entering the workforce, the labour force participation rate has increased from 63 to 65 per cent. Indeed, female rates went up from 44 to 50 per cent while a decline in male rates is evident (82 to 79 per cent) (table 8). Except for the prime working ages, male participation rates declined significantly in the youngest and the oldest age groups. At ages below 24, more males were still in school (tertiary) and the elderly (60+) had a propensity to retire and withdraw from the labour market.

By contrast, the female rates have increased in all ages and substantially in the prime working ages. At younger ages, the trend was similar to that of males. The unimodal female participation curve is being replaced by an emerging hump (around 40 years) for married females, although the peak remains at 20-29 years.

A slight decline in Malay participation rates is due to a significant decrease in male levels. However, in spite of Chinese and Indian male participation declines, overall rates have increased slightly. Indian women have the highest participation rates, above the national levels, followed by Chinese and Indians. For the Chinese, their participation levels have already reached high levels but with more Indian women entering the workforce, the trends are not surprising.

An indicator of skills upgrading can be discerned from the share of the workforce in professional and managerial jobs. These percentage levels have generally been upward, except for Indians, as shown on the next page:

Ethnic group	1980	1990
Chinese	19.0	27.2
Malays	6.8	11.0
Indians	17.6	17.5

In general, the percentage occupational composition was as follows:

Occupation	Males		Females	
	1980	1990	1980	1990
Professional, technical	11.5	15.3	11.9	16.4
Administrative, managerial	8.6	11.0	1.9	3.9
Clerical, sales, services	22.5	18.9	39.8	38.5
Production and others	57.4	54.8	46.4	41.2

Males predominate in production and clerical jobs followed by professional and administrative occupations. For females, production and clerical jobs were common, although a good proportion are in professional and technical jobs. Industry-wise, males predominate in manufacturing, commerce and services, whereas females are mainly in manufacturing, services and commerce -- more so than their male counterparts. The percentage distribution is presented below:

Industry	Males		Females	
	1980	1990	1980	1990
Manufacturing	24.7	25.6	40.4	32.8
Construction	9.3	13.9	1.4	1.3
Commerce	21.4	21.7	21.1	22.5
Transport, communications	14.3	12.1	5.0	5.2
Financial, business	7.1	9.3	9.2	2.9
Services	20.0	16.1	21.7	25.0
Others	3.2	1.3	1.2	0.3

Transport to work and school

Transport is quite a crucial factor in the Singapore context, as the country is compact, dense and urban work-oriented. With increasing congestion on the roads, the Government has been pursuing fiscal policies to discourage growth in the car population. However, increasing affluence seems to have been the norm. Those commuting to work by car alone went

up from 14 to 17 per cent. Bus and the MRT (metro-rail) accounted for 56.0 per cent (this was accounted for by bus transport alone in 1980). Since the mode of transport is related to occupation, more well-paid workers commuted by car, i.e. 64 per cent of administrative and managerial workers and 34 per cent of professional and technical workers. In other occupations, public transport was common.

A fair number of students commuted by bus (58 per cent) while 29 per cent walked, mainly to primary schools. For secondary-plus students, the MRT was popular, with bus transport declining slightly.

Households and housing

Ownership of occupied households increased significantly, arising from government encouragement and provision of cheaper public housing, across all ethnic group, as can be seen from the following percentages:

Ethnic group	1980	1990
Chinese	62.0	90.2
Malays	49.9	94.1
Indians	42.3	85.2
Total	**58.9**	**90.2**

In fact, the population of households living in public housing increased from 68.5 to 85.7 per cent with significant uptrends for all ethnic groups. Also, more public apartment households have upgraded to large flats, 49 per cent living in four-room or larger flats compared with 19 per cent in 1980. In fact, all ethnic groups enjoyed better housing in 1990: corresponding *increases* for Chinese, Malay and Indian households were 28, 32 and 24 percentage points for four-room a larger flats.

Households (family sizes) are now smaller as a result of declining fertility and the increasing trend in nuclear families. The mean household size has fallen for all ethnic groups as follows:

ElhnIc group	1980	1990
Chinese	4.8	4.2
Malays	5.5	4.7
Indians	4.3	4.1
Tolal	**4.9**	**4.2**

One-family nuclear households increased from 81 to 85 per cent, as for ah ethnic groups. Most comprised two-generation families. The standard of housing has increased as measured by the average number of persons per house, which dropped from 5.1 to 4.4, across all dwelling types, especially in public flats.

The future population

The *expected* population in 1990 was 2.7 million persons, derived by the balancing equation approach in the inter-censal period (1980-1990). [5/] However, the 1990 population count, being comprehensive and accurate, nullifies the inter-censal estimates which thus may have to be revised up-wards, as they may exclude some of the *non-resident* population in the inter-censal period. As a result, population projections based on the inter-censal age distributions may have to be revised.

The total population count in 1990 is complete and can be used to derive projections into the next century. Fertility (age-specific fertility rates) and total fertility rates (TFRs) for 1990 have been estimated. Life tables by sex are also available for 1988. A preliminary set of three component projections by age and sex were derived, using the following assumptions:

Projection (1990-2050)	Assumptions	
	Mortality (e^o_o)	Fertility (TFR)
A	MaIe 72 - 78 Female 77 · 82	1.83 constant
B	As for A	1.83 - 2.10
C	As for A	1.83 - 3.00

It may be noted that mortality (survivorship functions) is based on the Ansley Coale model "West" tables which portray gradual increases in the expectation of life (e^o_o) . Fertility assumptions are based on late-peak United Nations patterns of gradual increases: constant fertility for A; increasing fertility to replacement level for B; increasing fertility beyond replacement fertility for C.

The component methodology is the basis of the PEOPLE software package, [6/] which was utilized for these derivations. A summary of the projections by broad age groups is given in table 9.

Table 9: Population projection by broad age group

Age group (years)	1990 census	Projection (per cent): year 2030		
		A	B	C
< 15	23.3	17.2	17.8	19.8
15 - 59	67.7	55.1	54.7	53.7
≥ 60	9.0	27.7	27.4	26.5

Table 10: Age dependency ratios for year 2030

Age group (years)	1990 census	Projection		
		A	B	C
		(per 100 adults aged 15-59)		
< 15	34	31	33	37
≥ 60	13	50	50	49
Total	**47**	**81**	**83**	**86**

Table 11: Summary of key indicators from population projections

Indicator	Census 1990	Projection (2030)		
		A	B	C
Median age (years)	29.80	41.80	41.40	40.10
Sex-ratio (male/female)				
All ages	102.30	98.90	99.00	99.20
60 years	87.30	85.00	85.00	85.00
Crude birth rate (0/00)	16.89	10.66	11.40	13.83
Crude death rate (0/00)	5.63	12.93	12.78	12.29

Source: **Author's projections**

Without going into further analyses, the dependency ratio alone confirms the impending ageing problem by the year 2030. Projection C is too optimistic and Projection B is probable, but Projection A is more or less certain to continue. Migration is assumed to be nil and the 1990 base population *excludes* the 300,000 non-residents enumerated so far.

Even if fertility were to take an unprecedented leap in the next century, the old-age burden cannot be ignored. The baby-boom cohorts of the 1950s and early 1960s will reach old age by the 2030s and the current low fertility levels will not alter the composition of older persons of the future population very much.

In the very long run (say about the year 2050), there is the possibility of reversing the population structure by assumption C. Indeed, by Projection C, the age dependency ratios in 2050 will be 42.9 per cent for the young (<15 years) and 37.6 per cent for the elderly (≥ 60 years). Thus the total dependency ratio will be 80.5 per cent, suggesting a larger younger population, thus decreasing the old-age dependency burden in demographic terms.[7]

Conclusions

Other information on incomes, leisure, child care, religion and fertility are still being processed and will not be available for some time.[8] The information revealed by the 1990 census gives a snapshot of the success of population policies of the past and even of the present. For example, housing, education, transport and work policies are on target not to mention past anti-natalist policies. Increasing trends in nuclearity and proportion unmarried are being tackled through selective incentive-oriented pro-natalist population policies. Thus, it is becoming increasingly important to address the problem of a future elderly population.

Footnotes

1.   It has been reported that Thailand, Indonesia and the Philippines intend to introduce a computer-linked registration system in the near future. Tbe prospects of utilizing this type of system for the next census rounds cannot be ruled out.

2.   Establishments have their own registration numbers. Computerized reticulation, through a proximity code, linked addresses and locations making the physical house-numbering phase redundant. A pre-census survey on employers gathered information on occupation, place of work and firms' activities. Such information was used as a data dictionary for automatic or computer-assisted coding of occupations in the final census

enumeration. The pre-census household database was created by merging individual data from various data hubs and the reticulated household frames. This served as a sampling frame, a base for pre-printing of basic data on census schedules, as well as a control for fieldwork and for the development of computerized systems for verification and data processing for final analyses. Field enumeration was carried out through pre-printed data forms, which had to be verified or updated while new information was recorded either by residents or enumerators.

3. These and subsequent analyses are based on the resident population count.

4. The analyses refer to 10 per cent of the total population, which *includes* non-residents.

5. The 1980 census-based population was carried forward by the *net* natural increase (births and deaths) and could have left out net immigration. The 1990 census count of some 3.0 million differs from the inter-ccnsal estimate of 2.7 million. Final census reports are expected to evaluate or explain the differences.

6. ESCAP made available PEOPLE software, version 2.0, for the projection exercise.

7. Official projections are yet to be published. If the non-resident population is also included, the 4 million target (as set by the Government) can be achieved by the year 2050, provided the three-child norm is encouraged throughout the population and *not* on a selective pro-natalist basis as at present.

8. The Population Census Office will publish a series of monographs on various subjects, sometime in early 1992. The official monograph on "The Aged Population" is in draft form and will be published in March-April 1992. The analyses for all monographs are based on priority samples.

References

Department of Statistics (1991). *Census 1990 Highlights,* Census of Population Office, Singapore.

_____ (1991). *Census of Population 1990: Advanced Data Release,* (Singapore, SNP Publishers Pte. Ltd).

Lau Kak-En (1990). "A New Approach to the Conduct of the 1990 Singapore Census of Population", *Singapore Journal of Statistics,* Inaugural Issue, vol. I, Oct., Singapore, pp. 116-132.

Shantakumar, G. (1986). "The Demography of Singapore: A Selective Survey of the Scholarly Literature", In: Basant K. Kapur (ed)., *Singapore Studies: Critical Surveys of the Humanities and Social Sciences,* (Singapore, Singapore. University Press), pp. 243-302.

_____ (1990). "Utility of Population Registers for Population and Housing Censuses in Singapore: Some Possible Strategies", Singapore Journal of Statistics, Inaugural Issue, vol. I, Oct., pp. 104-115