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COVER PHOTOGRAPH

A young woman in Sichuan prov ince of China car ries her child in a bas ket on her back (photo copy right IFAD/M. Zaugg).

As explained in the first article in this issue of the *Asia-Pacific Population Journal*, entitled "Socio-economic determinants of induced abortion in China", evidence points to the important impact of women's socio-economic characteristics on obtaining abortion in the country.

India, through an article on indicators of women's empowerment and another one on the nutritional status of children in its north-east region, is featured next in this issue.

Finally, the Demographers' Notebook looks closely into the rapid fertility decline oc cur ring at pres ent in the is lands of Mal dives, considered until recently as one of the coun tries in South Asia with high fer til ity.

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Socio-Economic Determinants of Induced Abortion in China 5

It is widely argued that abortion policy is an important component of China's family planning programme. Both the local abortion studies and annual abortion numbers in China have pointed to the policy relevance of the abortion trends. Are socio-economic factors also affecting women's abortion behaviours in China? Few abortion studies have addressed the issue largely owing to the lack of empirical data. Using data from China's first reproductive health survey conducted in 1997, this study examines socio-economic patterns and determinants of induced abortion in China. Evidence points to the important and statistically significant impact of women's socio-economic characteristics on obtaining abortion. More "modernized" characteristics are significantly associated with a higher abortion rate, and there are also abortion patterns peculiar to the Chinese context. Women's knowledge and attitudes towards abortion also have significant and independent impacts on their abortion experiences. The results have important policy implications.

Indicators of Women's Empowerment in India 23

This paper is an attempt to identify the association between indirect and direct indicators of women's empowerment and its evidence in two demographically contrasting states (Uttar Pradesh and Tamil Nadu) in India. In 1998-1999, for the first time, the National Family Health Survey in India collected information on the direct indicators of female autonomy (empowerment) such as decision-making, mobility and access to economic resources that can be viewed both as an outcome and a process. Education and work participation of women, the so-called indirect indicators of empowerment, show a stronger association with the direct indicators of autonomy. However, there are sociocultural variations in the level of empowerment. Women in Uttar Pradesh have the least autonomy in freedom of movement, which turns out to be an important indicator of the evidence of empowerment. Above all, education of women is the single leading indicator of female autonomy in India.

Nutritional Status of Children in North-East India **39**

The north-eastern region of India is the most interior and inaccessible part of the country. Studies of the region, particularly of the nutritional status of children, are lacking in the absence of anthropometric measures. This paper makes an attempt to describe the nutritional status of children of north-east India using height-for-age, weight-for-age and weight-for-height anthropometric measures of children under three years of age. Children's physical characteristics, the parents' background and their household characteristics' contribution to weight-for-age are investigated using multilevel regression analysis. In north-east India (excluding Assam) more than a quarter of all the children aged 1-35 months are stunted and more than one fifth are underweight. Stunted growth ranges from 27.6 per cent to 44.6 per cent. Wasting among children is found to be 5 to 14 per cent.

It has been seen from the present analysis that children who are breastfed for the prescribed optimum duration of four to six months are nutritionally better off than those breastfed even beyond their first birthday. Anaemic children and children who had suffered from diarrhoea, cough and fever two weeks prior to the survey tend to rank poorly on the nutritional index. The health and education of the mother have a significant influence on the nutrition of children, but the father's health does not have the same effect on the child. Children with good living environments are associated with proper nutrition. The intrahousehold correlation coefficient is 24 per cent, indicating strong household clustering and prevalence of a wider disparity in nutritional status of children in different households.

The results of this study suggest, among others, programmes at the community level to educate women on proper breastfeeding practices, household hygiene, basic health care and safe cooking practices.

Rapid Fertility Decline in the Maldives: An Assessment **57**

Until recently, the Maldives had been considered as one of the countries in South Asia with high fertility. However, recent evidence suggests the beginning of a fertility decline. The total fertility rate of the country, which stood at 6.4 children per woman during the early 1990s, declined to 5.7 in 1995. The recent data from the Population and Housing Census of Maldives showed a further drop in the total fertility rate to 2.8 in 2000. While this is an indication of the beginning of the fertility transition in Maldives, the magnitude of the decline — almost three children per woman in the past five years — is so rapid that the quality of data on current fertility is not beyond question.

The assessment of the data quality and indirect estimates of fertility support the view that the fertility decline reported in the censuses of Maldives is fairly accurate. While the absence of a fertility survey in Maldives does not permit the analysis of the proximate determinants of fertility, some evidence of the positive socio-economic changes occurring in Maldives, such as the increased use of contraception, schooling opportunities in the rural areas and political endorsement of family planning at the highest level, provides an explanation for the rapid fertility decline occurring in the islands.

Socio-Economic Determinants of Induced Abortion in China

The extent to which women choose induced abortion is, in all likelihood, determined by both their background characteristics and the nation's parity-specific fertility policy.

By Chen Wei*

China, which has the world's largest population and the most stringent family planning programme, has experienced one of the world's most remarkable fertility declines. A number of censuses and surveys in China, plus an extensive body of international studies, have consistently documented and examined the rapid fertility transition in the country over the last 30 years (see for example Lin, 1986; Peng,1991; Hull and Yang, 1991; Liu, 1992; Gu, 1994; Chen, 1995; Zha, 1996; Feeney, 1994 and Yu 2000). Explanations of the Chinese fertility decline have concentrated on the dominant role of China's family planning programme, and to a lesser extent on social and economic development (see for example Birdsall and Jamison, 1983; Poston and Gu, 1987; Liu, 1992; Peng and Huang, 1993; Yang, 1994 and Poston 2000). China's family planning programme is directly related to changes in the proximate determinants of fertility and induced abortion is recognized as a major contributor to the fertility decline.

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According to data published by the Ministry of Health of China, the number of induced abortions was very small prior to the beginning of the family planning programme in the early 1970s. During this period there were no restrictions on the number of children allowed per family, so most pregnant women chose delivery over induced abortion. The family planning programme (parity-specific regulating), was closely followed by an increasing trend in abortions in the late 1970s and a tremendous rise in abortions in the early 1980s. Based on those data, Hardee-Cleaveland and Banister (1988) point to the relevance of the one-child family planning policy to the fact that induced abortions and applications of IUDs, sterilization and other contraceptive methods increased by leaps and bounds in China in the early 1980s. The family planning programme was implemented earlier and more vigorously in China's large cities, so the rise in abortions was more notable and abortion incidence was much higher in urban areas than at the national level. In Shanghai, abortions exceeded births every year in the late 1970s and early 1980s (Tien, 1987). In Xi'an city, Shaanxi province, the likelihood of a woman with a child to abort for next pregnancy increased from 39 per cent in 1977 to 88 per cent in 1981, with 96 per cent of women in 1981 with two or more children chosing to abort than next pregnancy. Thus the number of abortions exceeded the number of births in Xi'an city by 1981 (Feng and others, 1983). Despite the role of the family planning programme, the incidence of abortion varied substantially across China. There is evidence that both the population policy and socio-economic changes were affecting the likelihood of women having an abortion (Tien, 1987; Li and others, 1990).

Throughout the 1980s, China's abortion rate stayed at a moderately high level, fluctuating over time with the implementation of more decentralized policies. In the early 1990s, the Government of China tightened ideological and social control as a result of political turbulence in the late 1980s, which subsequently strengthened the implementation of the family planning programme had resulted in increased abortion levels in the early 1990s, similar to that of the early 1980s. In the period since the mid-1990s of China's family planning programme has reoriented its focus to quality of care and has experienced a dramatic fall in abortions. As a consequence of transitions in the family planning programme and the rapid and more divergent regional development in the 1990s, patterns of reproductive behaviour including abortion in China become more diversified, and one of the noticeable trends is the rising adolescent or non-marital abortion.

In an international perspective, China had a rate of abortion that is about the world average in the mid 1990s (AGI, 1999). China's abortion rate is comparable to the rate of the United States of America and is slightly higher than the rate of Australia and Sweden, while that of Cuba, Romania, Russia and Viet Nam is approximately

three times higher. By contrast, the rate in the Belgium, Netherlands and Spain is about three times lower. Comparing to the Republic of Korea and Japan, two neighbouring countries that resemble China's cultural context and rapid fertility decline, the abortion transition experienced in China is much less dramatic.

Fertility and abortion patterns are the result of the combined forces and factors operating at the societal, local and individual levels. Owing to a lack of empirical data, previously published studies drawing upon total abortion numbers or localized survey data do not fully represent the abortion patterns and dynamics in China. To identify socio-economic characteristics associated with induced abortion and the reasons for choosing abortion can have important policy implications. Drawing on data from a recent national fertility survey in China, this paper examines the patterns and determinants of induced abortion in China.

Data and methods

Data used in this paper were drawn from China's 1997 National Demographic and Reproductive Health Survey. This was China's fourth national fertility survey, but for the first time in China's surveys, specific attention was given to reproductive health, including induced abortions (SFPC, 1997). The survey was conducted in two phases: the first phase, between 10-20 September 1997, applied stratified, multistage, cluster and PPS sampling methods to select the sample points. Thirty-one provinces of China are the 31 strata, while three-stage sampling was applied to each province. The sample unit in the first stage sampling is county (or county-level city and district), with the number of counties in each province chosen by the PPS method. The sample unit in the second stage sampling is township (or town and street), with the number of townships in each county determined by the PPS method. The sample unit in the third stage sampling is resident group, and only one resident group was randomly drawn from the selected townships. All the residents in the selected resident group were enumerated. Thus, 1,042 sample points from 337 counties and 31 provinces were selected, with 180,000 people enumerated. A household questionnaire containing 11 items was used asking general information regarding sex, date of birth, residence status, migration status, marital status, date of first marriage, number of children ever born, and the contraceptive method currently used.

The sample of women of reproductive age established in the first stage was then applied to be the sampling frame for the second stage of the survey. The number of women and sampling fraction were calculated for each sample point, and women were selected at equal intervals. Finally, a subsample of 15,213 women of reproductive age was chosen for the second stage survey, which collected detailed information on reproductive health.

The second stage survey was conducted in mid-November 1997 using an individual questionnaire of eight topics containing over 90 questions. The eight topics included: (a) Woman's basic information relating to her date of birth, ethnic group, education, marital status, date of first marriage, and her husband's ethnicity and education; (b) Menstruation care and health status relating to age at menarche and menstruation-related knowledge, maternal care-related knowledge and practices, and premarital medical examination; (c) Conception and childbearing, which was the most detailed part of the questionnaire, covering questions of pregnancy and childbearing history, child health, prenatal examination, induced abortion, infecundity and child adoption; (d) Contraceptive use, including contraceptive method used at first intercourse and current use, contraceptive availability, reasons for non-use, contraceptive failure and contraceptive knowledge; (e) Family planning technical services, including family planning operations and technical competence of service providers; (f) STDs and AIDS, including related knowledge and sources of knowledge; (g) Health care at menopause, relating to age at menopause and the needs for care at menopause; and (h) Others, including knowledge and information wanted, and economic assistance received, if any.

Questions about induced abortions were organized in two ways under topic (c): detailed questions on pregnancy history were asked, including time and outcome of each pregnancy, breastfeeding and child health. There were six possible choices for the outcome of each pregnancy: live-born boy, live-born girl, stillbirth, spontaneous abortion, induced abortion and currently pregnant. In addition, a series of separate questions were asked regarding the last induced abortion, including the reason, gestation period, ultrasound use, location and impact on health. This paper draws on the data gathered from those questions.

The 1997 survey was nationally representative with a sample population of 15,213 women. A post-enumeration check indicated fairly good data quality (Wang, 2001). However, detailed examination and calculation of recent fertility rates from the survey points to some under-reporting in births and abortions (Guo, 2000). Nevertheless, abortion patterns and characteristics, which in most cases are in relative terms, should still be regarded as relatively accurate.

This paper is a quantitative study involving bivariate analysis to establish the patterns and characteristics of induced abortion in China with respect to age, parity, place of residence, education, income and attitudes towards induced abortion. In addition, multivariate regression modeling of the determinants of lifetime abortion to determine the extent to which the effects of these variables are maintained after controlling for women's background characteristics was performed. The unit of analysis is the individual woman, and the abortion measure

applied was the abortion rate based on the definition from Shryock and Siegel (1973). The abortion rate was calculated as the proportion of induced abortions among the total pregnancies. In the multivariate analysis, since the dependent variable, namely lifetime abortion, is a count variable, ordered-logistic regression was determined to be the most appropriate method. The statistical software involved in the regression analysis is STATA version 7.0.

Socio-economic differentials in abortion

The 1997 survey recorded a detailed history of pregnancies and pregnancy outcomes of the sample women. The sample women who were married had an average of 2.45 pregnancies, 1.86 live-births and 0.46 abortions (1.43 abortions for women at least having had one abortion). This survey recorded 30,826 pregnancies for 12,158 married women, of which 23,330 were live-births and 5,780 induced abortions, resulting in an abortion rate of 18.75 per cent.

There are significant differences in the incidence of abortion across socio-economic and demographic subgroups of women, as shown in table 1. The relationship between age and abortion is closely related to women's sexuality, fecundability and family-building experiences. Data from a number of countries, largely Europe, show that there are two main patterns in the abortion rates according to age groups: a "U" shape, in which abortion rates are higher at the very beginning and end of the reproductive ages and lower in the middle; and a monotonic increase, in which the abortion rate is lowest at the beginning of women's reproductive career and rises monotonically with age (Bankole and others, 1999). The age pattern of abortion in China conforms to the monotonic increase pattern (table 1). Aborted pregnancies range from 7 per cent at age 15-19 to 56 per cent at age 40 and over. However, it should be noted that the 1997 survey only recorded abortions for married women. Non-marital abortions may contribute to a higher teenage abortion rate, but this is more relevant in large cities.

Women in urban areas are more likely to obtain abortions than their rural counterparts. This may reflect wider and availability of abortion services in urban areas as compared to rural areas. Other factors may include delayed marriage and childbearing and decreased family-size goals, enhanced education and job competition, and increased premarital sex often associated with the urban life style. In urban areas of China, where there are no regulations concerning the use of specific contraceptive methods, more choices of contraceptive methods are available, and the use of less-effective methods or non-use of contraception is widespread. As the table shows, the urban abortion rate is more than double the rural rate in China.

Table 1. Abortion patterns in China

Characteristics	Total pregnancies	Induced abortions	Abortion rate
Age			
15-19	1,669	122	7.31
20-24	13,981	1,702	12.17
25-29	11,190	2,648	23.66
30-34	3,032	992	32.72
35-39	580	250	43.10
40+	6,629	66	55.93
Place of residence			
Rural	24,665	3,654	14.81
Urban	5,905	2,126	36.00
Nationality			
Han	27,372	5,353	19.56
Minority	3,198	427	13.35
Education			
Illiterate	9,350	1,008	10.78
Primary	10,037	1,614	16.08
Junior high	7,673	1,885	24.57
Senior high	2,824	975	34.53
College+	686	298	43.44
Income			
<1,000 yuan	6,042	697	11.54
1,000-1,999 yuan	10,312	1,390	13.48
2,000-2,999 yuan	5,834	995	17.06
3,000+ yuan	2,477	572	23.09
Parity			
0	1,180	86	7.29
1	11,097	3,550	31.99
2	4,136	1,117	27.01
3+	2,145	568	26.48
Total	**30,570**	**5,780**	**18.91**

* Because of missing data, the sum of subcategories may be not necessarily equal the total.

There are 56 ethnic groups in China, but the majority is of Han nationality which constitutes more than 90 per cent of the population of China, with the remaining group being the ethnic minority nationality population. The variations in socio-economic development and family planning policies explain the higher abortion rate for the Han, compared to the minority nationality. A much looser birth control policy was implemented among the population of ethnic minority nationalities. Also cultural, moral and religious beliefs surrounding abortion are likely to have different impacts on nationalities regarding their abortion behaviour.

Education is by far the most consistent and important determinant of reproductive behaviour across the countries. Education has been documented to be linked to declining fertility and increasing abortion rates. The Chinese pattern is also impressive in that the rate has risen rapidly with education advancement; the highest education group has an abortion rate four times greater than the rate of the lowest education group. Although educated women have better knowledge of and access to contraceptive methods, they also have a stronger motivation to regulate the family-building process to achieve a small family size and prevent unplanned births. Data from the survey, however, showed that women's higher education is associated with higher contraceptive failure resulting in abortions, suggesting the frequent use of less effective methods and non-use of modern methods.

Income-abortion linkages are less frequently documented in abortion studies. There are studies in China which conclude that abortions are chosen more frequently by women in the commercial business sector (Xiao and Zhang, 2000; Meng and others, 2000), as these women usually have a higher income and have access to better medical facilities. However, with the exception of unmarried women, China provides abortion services free of charge to married couples covered by the family planning programme throughout the country. The relationship observed in the 1997 survey that higher income women had higher abortion rates may imply that those women were more mobile and had access to urban facilities where pain-free abortions are available.

Unlike Western countries where childless women account for the majority of abortions, in China abortions mostly occur among women with at least one livebirth. This is also the case in most of the developing countries. However in China parity one women have the highest abortion rate, and abortion rate climbes sharply from women at parity zero to those at parity one, suggesting the strong influence of the one-child policy. Abortion for childless women in China is, however, mainly the result of improper timing of pregnancies according to the family planning policy.

Since the 1997 survey only recorded the pregnancy history of married women, one does not know the likelihood of induced abortions among unmarried women. However, local studies in China indicate a substantial increase over the last decade in sexual behaviour and induced abortions among adolescents, particularly in large cities (Wu Z.C. and others, 1992; Xu, 1998 and Wang, 1999).

Socio-economic determinants of lifetime abortion

The examination of abortion patterns and characteristics has demonstrated wide-ranging differentials in the incidence of abortion across various sociodemographic and economic variables. Some of the relationships are also observed in other countries, while others are confined to the Chinese circumstances. The associations are demonstrated to be complex (Bankole and others, 1999), as the bivariate relationships could in fact reflect not only the impact of the variable under study but also the combined results of other influencing factors that are not controlled for. The question then is to what extent the effects of various sociodemographic and economic variables identified by the bivariate analysis are maintained when the differing background characteristics are controlled for. This issue is addressed in this section by a multivariate regression analysis of the determinants of lifetime abortion in China.

In the literature of Chinese fertility analysis, a wide range of regression models are applied to examine the determinants of fertility, depending on the conceptualization of the hypotheses and the nature and categorization of both the dependent and independent variables (see Birdsall and Jamison, 1983; Lin, 1986; Jiang, 1986; Poston and Gu, 1987; Peng and Huang, 1993; Sun and Jin, 1994; Hao and others, 1994 and Poston 2002). However, traditionally and most frequently, Ordinary Least Squares (OLS) regression technique is used when the dependent variable is a continuous variable. Demographic data on the number of children ever born, number of abortions and number of migrations etc. are discrete rather than continuous. They are actually "event count" or "count" data, which refer to the number of times an event occurs and is the realization of a non-negative integer-value random variable (Cameron and Trivedi, 1998:1). For the demographic count variables, its distribution is typically abnormal; it is often heavily skewed with a long right tail. Thus the assumptions of normal distribution and a constant error variance in the OLS method are rarely met in such event count variables. As Winkelmann and Zimmermann (1994) point out, if the dependent variable is discrete, the OLS model can only be an approximation of the data generation process; the authors consider the generalized count and ordered-response models as potentially better specifications for demographic data.

Using an OLS model to predict a count outcome will often result in inefficient, inconsistent and biased estimates of the regression parameters (Long, 1997: 217).

The two procedures modelling count variables, namely Poisson regression and ordered-logit models, have been used in a number of recent studies of fertility (Winkelmann and Zimmermann, 1994; Nguyen-Dinh, 1997; Yohannes, 2001 and Poston 2002). However, the equi-dispersion (equality of the mean and variance) assumption inherent in Poisson regression is rarely met in demographic count data, as this property results from the assumption in the Poisson distribution of independence among events. In demography, however, future fertility is not independent from past fertility, and particularly in China, the next birth or abortion is heavily dependent upon previous ones in the context of the strict family planning policy.

Ordered-logit, namely ordinal logistic regression, is used to estimate relationships between an ordinal dependent variable and a set of independent variables (Poston, 2001). Ordinal variables are common in social sciences including demography. Health status classified as "poor", "good" and "excellent", education categorized as "illiterate", "primary" and "secondary plus", and fertility grouped as "low", "moderate" and "high" are some typical examples. When the number of children ever born or the number of abortions are regrouped as "none", "some" and "lots", they are ordinal. Non-negative integer-values of the number of children ever born or the number of abortions is also ordinal. In the 1997 survey, women's number of abortion ranges from zero to eight, which can be viewed as an ordinal variable with nine categories. A recent fertility analysis in Viet Nam (Nguyen-Dinh, 1997) examined the socio-economic determinants of the number of children ever born using OLS, Poisson and ordered-logit models simultaneously and compared these three results. The comparison showed that the ordered-logit model was somewhat better than either the OLS or the Poisson models; however, the estimated effects of many variables were similar for the Poisson and ordered-logit models but differed substantially from the OLS results. The present analysis of lifetime abortion was similar hence the results from the ordered-logit models are reported.

The objective of the analysis is to examine the impact of the various sociodemographic and economic variables on the number of abortions, while controlling for women's background characteristics. The dependent variable is the number of induced abortions women experienced up to the survey time. The general hypothesis is that women with more "modernized" characteristics will have a larger number of induced abortions when several other independent variables are controlled for.

There are five independent variables in this analysis: place of residence, nationality, education, income and region. Two additional variables, namely age and the number of conceptions, are entered as control variables. The five independent variables are all categorical variables and are thus recoded as dummy variables. The dummy variable "Urban residence" scored 1 if the woman lived in an urban area and 0 if in a rural area; the dummy variable "Han nationality" scored 1 if the woman was a member of the Han majority nationality and 0 if not. There are 4 dummy variables for education, namely whether a woman completed "Primary school", scored 1 if yes and 0 if no; whether a woman completed "Junior middle school", scored 1 if yes and 0 if no; whether a woman completed "Senior middle school", scored 1 if yes and 0 if no; and whether a woman completed "College or more", scored 1 if yes and 0 if no. Women who had less than a primary school education, namely the illiterate or semi-illiterate, comprised the reference group. Three dummy variables are created for income, namely women with income "1000-1999 yuan", "2000-2999 yuan" and "3000 yuan or over" scored 1 and otherwise 0, respectively, income less than 1,000 is the reference group. Two dummy variables are created for the regions of residence, namely "Central China" scored 1 and otherwise 0 and "West China" scored 1 and otherwise 0. The reference category is "East China". The two control variables are the woman's age in years and number of conceptions.

Table 2 shows the results of the ordered-logit estimates of the effects of the above-specified sociodemographic and economic variables on lifetime abortions for the more than 15,000 married women. The ordered-logit model estimates the probability of a random variable falling within the ranges determined by ancillary parameters, also called cutting points. In the present analysis, the maximum number of abortions is eight and grouping is not used, hence there are eight cutting points. A disadvantage of the ordered-logit model is the difficulty in interpreting its coefficients; however, a preferred interpretation of the coefficients is in terms of odds ratios.

To sum up, the ordered-logit coefficients in table 2 provide support to the hypothesis that induced abortion is more likely to occur among the urbanized, Han nationality, more educated and higher income groups of women. Women in Central China are less likely to obtain an induced abortion than women from East China. The West China group has a positive coefficient; however, it is not statistically significant. Age is not linearly related to the number of abortions. And as expected, the number of conceptions is positively related to the number of abortions.

Exponential values of the coefficients give the odds ratios shown in the third column of data in table 2. These exponentiated coefficients may be

interpreted as follows: for each unit increase in the independent variable, the odds are multiplied by its exponentiated coefficient. Furthermore, the percentage change in the odds with one unit change in the explanatory variable can be computed, suggesting a more straightforward interpretation. So urban residence has an odds ratio of 8.2, meaning that urban women as compared to their rural counterparts are 8.2 times more likely to be in a higher number of abortions category, holding all other variables constant.

Table 2. Determinants of lifetime abortion: Ordered-logistic regression (1)

Independent variables	Coefficients (B)	Significance (P)	Odds ratio (Exp(B))	Semi-standardized odds ratio
Urban residence	2.103	0.000	8.189	2.391
Han nationality	0.752	0.000	2.121	1.244
Primary school	0.822	0.000	2.275	1.469
Junior middle school	1.332	0.000	3.790	1.829
Senior middle school	1.681	0.000	5.373	1.681
College or over	1.819	0.000	6.167	1.354
1,000-1999 yuan	0.481	0.000	1.618	1.255
2,000-2999 yuan	0.810	0.000	2.249	1.374
3,000 yuan or over	1.359	0.000	3.892	1.450
Central China	-0.354	0.000	0.702	0.846
West China	0.110	0.076	1.116	1.050
Age	0.037	0.242	1.037	1.325
Age square	-0.002	0.000	0.998	0.411
Number of conceptions	1.400	0.000	4.054	6.459

Notes: Cases = 12,013; Chi-square = 5,441.90; Degrees of freedom = 14; Significance = 0.000; Pseudo R square = 0.24.

The Han majority nationality women are more than twice as likely to experience a higher number of abortions than that of the minority nationality women. Higher the women's education, the greater their odds of being in a higher number of abortions category as compared to the reference group (illiterate women). In addition, women with college plus education are 6 times more likely than the illiterate women to experience a higher number of abortions. Regarding the effects of income, higher income women will be more likely to be in a higher number of abortions category, while women having an income of 3,000 yuan plus, for example, are nearly four times greater more likely to be in a higher number of abortions category than women of the lowest income group (under 1,000 yuan).

As east China is more developed and greater emphasis is put on family planning, it is expected that women in central and west China will have odds of less than 1. It is true for the central China group, but not the case for the west China group. In fact, the west China group has slightly higher odds than the reference group to be in a higher number of abortions category, although the effect is not statistically significant. The age coefficient is not statistically different from zero, however, the quadratic effect of age is statistically significant, though small. Finally, for every additional conception, the odds are four times greater that a woman will experience a higher number of abortions.

The relative importance of the covariates can be assessed by raising the odds of each covariate to the power of one standard deviation (Rabe-Hesketh and Everitt, 2000: 155). Such semi-standardized odds ratios are presented in the last column of table 2. Although there is a problem in the interpretation of the meaning of semi-standardized odds ratios when the covariate is a dummy variable (Long, 1997), their values nevertheless indicate the relative effects of the covariates on the odds of being in a higher number of abortions category.

The semi-standardized odds ratios indicate that the most influential covariate is the number of conception, followed by place of residence, education, income, nationality and region. Among the socio-economic characteristics of women, abortion differentials by place of residence, education, income and nationality are all important and the effects are statistically significant, meaning that their influencing patterns and directions are to a great extent determined fertility differentials and changes.

Table 3 presents an ordered-logit model extending the model presented in table 2 by including variables relating to women's reproductive knowledge and attitudes, examining the impact of the knowledge and attitudinal variables when controlling for women's background characteristics. There are seven knowledge and attitudinal variables: (a) "Training before marriage" addresses the question of whether the woman or her husband attended a training course on marriage, sex, contraception and childbearing before they got married. It is hypothesized that women or their husbands who attended this training should have a better knowledge of contraception and be more aware of the health consequences of induced abortion, which could be favourable to avoiding induced abortions. (b) "Abortion does harm to health" addresses the question to what extent an induced abortion affects women's health, with the hypothesis being that women who are aware of the health risk should be less likely to experience induced abortions. (c) "Agree with premarital sex" addresses the question whether the woman agrees with having premarital sex when the partners have decided to marry. It is

hypothesized that those who agreed with this view should be more likely to have had premarital sex, possibly unprotected, and is more likely to have experienced induced abortions. (d) "Contraception at first sex" addresses the question whether the woman used contraception when she first had sex, and it is hypothesized that those who did would be less likely to experience induced abortions. (e) "Experience of contraceptive failure" addresses the question of whether the woman has experienced contraceptive failure which led to conception. The hypothesis is that women having experienced contraceptive failure are more likely to terminate their pregnancy with induced abortion. (f) "Post-partum contraception" addresses the question of whether contraception should be used between the birth of a child and the next menstruation. It is hypothesized that women who think it necessary are more likely to experience induced abortion as a result of no contraception or contraceptive failure. (g) "Provide services to unmarried" addresses the question whether contraceptive knowledge and methods should be provided to unmarried young people, and it is hypothesized that those who think it is necessary are more likely to experience induced abortions as a result of having unprotected sex or contraceptive failure.

The results in table 3 show that there are no significant impacts of training before marriage and contraception at first sex on the subsequent experience of induced abortion, while all other knowledge and attitudinal variables have a statistically significant impact on the number of induced abortions women experienced. Women who are aware of the health consequences of induced abortion have odds that are twice less likely than those who are not aware of such health consequences of induced abortion to be in a higher number of abortions category. Women agreeing with premarital sex are 1.4 times more likely to be in a higher number of abortions category. Women who have experienced with contraceptive failure are eight times more likely to have experienced a higher number of abortions than those without the experience. Women who think it is necessary to use the post-partum contraception are 1:3 times more likely to be in a higher number of abortions category than those who think it is not necessary. Finally women who think it is necessary to provide family planning services to the unmarried are 1.1 times more likely than those who think it is not necessary to be in a higher number of abortions category.

As indicated by the semi-standardized odds ratios in the last column in table 3, among the five significant knowledge and attitudinal variables, contraceptive failure experience and the awareness of the health consequences of induced abortions are the most influential, followed by the attitude towards premarital sex and post-partum contraception, and finally the attitude towards family planning services for the unmarried. Those results suggest important implications for reducing induced abortion by meeting the unmet needs through providing better reproductive education and services.

Table 3. Determinants of lifetime abortion: Ordered-logistic regression (2)

Independent variables	Coefficients (B)	Significance (P)	Odds ratio (Exp(B))	Semi-standardized odds ratio
Urban residence	1.967	0.000	7.146	2.345
Han nationality	0.583	0.000	1.792	1.181
Primary school	0.657	0.000	1.929	1.359
Junior middle school	1.095	0.000	2.990	1.676
Senior middle school	1.271	0.000	3.563	1.533
College or over	1.357	0.000	3.885	1.284
1,000-1,999 yuan	0.370	0.000	1.448	1.189
2,000-2,999 yuan	0.756	0.000	2.131	1.341
3,000 yuan or over	1.150	0.000	3.158	1.373
Central China	-0.406	0.000	0.666	0.827
West China	0.078	0.332	1.081	1.035
Age	-0.002	0.963	0.998	0.986
Age square	-0.001	0.055	0.999	0.551
Number of conceptions	1.383	0.000	3.986	6.224
Training before marriage	0.032	0.744	1.032	1.010
Abortion does harm to health	-0.648	0.000	0.523	0.777
Agree with pre-marital sex	0.366	0.000	1.441	1.138
Contraception at first sex	-0.202	0.066	0.817	0.951
Experience of contraceptive failure	2.095	0.000	8.123	2.540
Post-partum contraception	0.234	0.000	1.264	1.123
Provide services to unmarried	0.081	0.021	1.085	1.070

Notes: Cases = 7,338; Chi-square = 5,156.80; Degrees of freedom = 21, Significance = 0.000; Pseudo R square = 0.35.

Conclusion

In China, induced abortion occurs in virtually all sub-groups of women. The extent to which women chose induced abortion is, in all likelihood, determined by both their background characteristics and the nation's parity-specific fertility policy. When practical contradictions persist between the country's demographic goals and a couple's reproductive aspirations, many resorts to induced abortion as well as effective contraceptive methods. However, this does not negate the circumstances in which a women's enhanced socio-economic status results in an appreciation for alternatives to frequent childbearing, and thus increasing their willingness to undergo induced abortions especially in the last decade during which China has experienced substantial socio-economic transition.

As the 1997 survey data clearly show, there are significant differences in incidence of abortions across the socio-economic strata of women. Higher abortion rates are associated with higher education, higher income, urban residence, Han nationality, and pregnancies after first birth. However, two of the relationships have been observed peculiar to the Chinese context. Age pattern of abortion is an inverted U shape, and abortion rates descend significantly after parity 1. These characteristics are demonstrably associated with China's one-child family planning policy (in terms of both numbers and timing) and its regulated contraceptive use, as well as moral constraints on sexuality among unmarried people.

The observed effects of the socio-economic variables on the incidence of abortion are maintained when addressed in the multivariate analysis with controls. Controlling for age and number of conceptions, place of residence has the largest impact. Urban women as compared to their rural counterparts are eight times more likely to experience a higher number of abortions. Education has the second largest effect, as women with a college plus education are six times more likely to experience a higher number of abortions than illiterate women. Women having a higher income and of Han nationality also exhibit a significantly greater risk than those with a lower income and of minority nationality in undergoing more abortions. The significantly independent effects of these variables are in conformity with those proposed in the hypothesis.

When controlling for women's background characteristics, women's knowledge and attitudes towards induced abortion also have significant and independent impacts on their abortion experiences. Among the hypothesized knowledge and attitudinal variables, contraceptive failure experience and the awareness of the health consequences of induced abortions are the most influential, followed by the attitude towards premarital sex and post-partum contraception, and finally the attitude towards family planning services for the unmarried. Those results have important policy implications, suggesting more family planning programme efforts to address the unmet needs for and to ensure widespread use of effective contraceptive methods and to provide better reproductive education and services.

Finally it is important to emphasize that the regression models did not incorporate the factor of family planning policy, so that the effects of the socio-economic variables can be isolated from the policy impact. The apparent significance of individual characteristics (such as urban residence, higher education and higher income) of women may at the same time be an indication of the effectiveness of the family planning policy. In China, the Government can usually exert greater control over urban, higher educated or higher income people

through household registration and work unit to which their life and welfare are tightly related. Consequently they have greater obedience to the State policy. However, as many studies suggest, the powerful government policy has been unable to erase fertility differentials, women's socio-economic status playing an important and independent role on their decision-making.

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Indicators of Women's Empowerment in India

Of the three direct measures of autonomy, involvement in decision-making, freedom of movement and access to money, women, particularly in Uttar Pradesh, have the least autonomy in terms of freedom of movement, which turns out to be an important indicator of empowerment.

By T.K. Roy and S. Niranjan*

Women's empowerment, or autonomy, is a multifaceted concept. In a patriarchical society, as exists in large parts of India, men are placed in a more advantageous position than women. The family lineage and living arrangements are centred on men, and inheritance and succession practices tend to neglect women as well. The state of male supremacy is reflected in the child rearing and caring practices. The celebrations for the birth of a male child, and the differential treatment meted out to boys bears ample evidence of this. Access to nutrition, child care and education all favour boys over girls. From a very early age, a girl is

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socialized to give priority to the needs of the male members in the family. The cumulative effect of these practices is a tilt in the power relations in favour of males. Women's empowerment is essentially an effort to rectify this imbalance and attain gender equity.

Based on a few macrolevel indicators like expectation of life at birth, education and income, the UNDP (2000) has developed a gender-related development index. According to this index, the gender inequity in 1998 is substantially high in India and ranks a poor 108th out of the 143 countries for which the index value is available. In India, a gender gap in literacy still persists, though it has narrowed over the years. For example, at the dawn of independence, according to the 1951 census, only nine per cent of females were literate, compared to 27 per cent of males. Female literacy improved faster than males and after 50 years, the level of literacy for females and males is 54 and 75 per cent, respectively. The differentials are particularly wide in the states of Bihar and Uttar Pradesh.

A similar pattern can be observed in the case of increased life expectancy. Unlike most countries, the longevity of males is higher than that of females in India and has been so for a long time. In recent years, owing to improvements in the female life expectancy, female life expectancy has exceeded male life expectancy marginally. Notwithstanding, female child mortality continues to be much higher compared to males, particularly in the north of the country.

Marriage practices also have an immense influence on women's position in family. In fact, a difference in marriage customs between north and south India has been identified as a factor responsible for the differential level of women's status (Dyson and Moore, 1983). In southern India marriages often occur between relatives. In such consanguineous marriages, brides do not go into a completely unknown family. Marriages in the south are generally endogamous, and brides maintain their link with the natal family. In contrast, marriages in the north are exogamous and a bride goes into a completely unknown family, causing the link with her natal family to weaken.

There are studies which have highlighted the role of gender in understanding demographic diversity within the country. They suggest that women's status is an important variable responsible for the lower level of fertility in the south, compared to the north. Bardhan (1974) suggested that widespread rice cultivation in the south, which is female labour intensive, contributes positively towards the economic value of a woman and is possibly a contributing factor for lower fertility in the south than in the north of India. Dyson and Moore (1983) and later Malhotra, Vanneman and Kishore (1995) further investigated the north-south dichotomy in the demographic transition and emphasized the role of gender

equality in this context. It was confirmed that patriarchy and development play a strong role in defining regional variations in fertility levels in India. Aspects of patriarchy are both overlapping and multidimensional in their relationship to fertility: gender discrimination and marriage systems overlap considerably, while women's economic value is relatively independent of the other two dimensions.

Studies on women's empowerment as such, are rare. There is a lack of knowledge regarding different dimensions of women's autonomy and specific strategies to enhance it. Laws and institutional rules can support the endeavour of women's empowerment, but considering the complex cultural beliefs and practices that lie at the root of the imbalance, the effectiveness of such isolated efforts remains doubtful.

In the absence of appropriate measures of empowerment, commonly found measures like education and employment are used as surrogates. While those proxy measures are important and are ideally associated with empowerment, they may not capture all aspects of the multidimensional concept of empowerment (Joshi, 1999).

At the family/household level, gender inequity manifests itself in a weaker role for women in decision-making, lesser control over resources and restrictions in physical movement. According to Jejeebhoy (1998) "…. while women's autonomy is indeed multidimensional, at least three dimensions – decision-making, mobility and access to economic resources – are closely related in all settings, irrespective of region or religion".

The recently conducted national family health survey, collected information on a variety of aspects related to the status of women and is a reliable resource to understanding different dimensions of women's autonomy in India. Using the above data, the present paper attempts to examine the following:

- Variation in the level of female autonomy in different sociocultural settings such as religion, caste, economic status and family type.
- Role of the indirect (proxy) indicators such as education, work participation, age and educational difference between spouses in understanding women's empowerment.
- Extent to which indirect indicators and direct indicators like decision-making, freedom of movement and access to money help facilitate women in gaining control over the circumstances of their lives (like self-esteem, favourable attitude towards girls' education and family planning practices).

Data and methodology

The NFHS survey undertaken in 1998-1999 covered a representative sample of more than 90,000 eligible women aged 15-49 from 26 states that existed at that time. For the present study, two states were chosen; Uttar Pradesh (including the present Uttaranchal) from the north and Tamil Nadu from the south of India. Uttar Pradesh and Tamil Nadu lie at two extremes of the demographic, social and cultural dimensions of India. The findings revealed that the total fertility rate in Uttar Pradesh was 3.99, which is much higher than 2.19 in Tamil Nadu. Similarly, the mortality rate was much lower in Tamil Nadu than in Uttar Pradesh. For example, the infant mortality rate was 87 per 1,000 live births in Uttar Pradesh compared to 48 in Tamil Nadu. Female literacy was much higher in Tamil Nadu (59 per cent) than in Uttar Pradesh (43 per cent) (IIPS and ORC Macro, 2000). Both states are typically patriarchal and patrilocal and the northern region is well known for inegalitarian gender relations (Jejeebhoy, 1998). In order to understand the suitable indicators of women's empowerment and their influence, this study examines the indicators in two different sociocultural settings. This attempt will also hopefully facilitate an understanding of the north-south divide in women's equality. In Uttar Pradesh, the survey covered a total of 8,682 households and 9,292 eligible women. The analysis in this study is based on 8,012 currently married women who are the usual residents of the households. In Tamil Nadu, the survey covered a sample of 5,281 households, 4,676 eligible women, but the present analysis is only based on 4,028 currently married women who are permanent residents.

The variables related to women's empowerment have been categorized into three groups. The first category is referred to as indirect indicators of empowerment and includes education, occupation, age difference education difference between spouses. These indicate the characteristics that have relevance in influencing a woman's access to and control over resources. The next group is direct indicators of empowerment, and consists of indicators such as involvement in decision-making, freedom of movement and access to money. These indicators tend to provide evidence of empowerment (see Kishor, 1998 for a comprehensive discussion of the indicators). However, empowerment is a multidimensional concept, which purports to measure a woman's ability to control resources, her ability to choose and control different outcomes, and above all enhance her self-esteem. Our third set of indicators relates to a few additional dimensions of empowerment that the survey captures, and was referred to as evidence of empowerment. This category is comprised of three indicators, namely, extent of self-esteem, favourable attitude towards girls' education and practice of family planning.

In the survey, each woman was asked six questions to assess her attitude towards wife beating. The questions relate to whether, according to the respondent, a husband is justified in beating his wife for each of the following reasons: if he suspects her of being unfaithful, if her natal family does not pay the promised dowry; if she shows disrespect towards her in-laws; if she goes out without telling him; if she neglects the house or children; or if she does not cook food properly. A woman's self-esteem is considered high if she does not agree with any of these reasons as justification for a husband to beat his wife, otherwise her self-esteem is considered low.

A question was asked in the survey to each woman about her attitude towards girls'/boys' education. The specific question about girls' education asked was: "In your opinion, how much education should be given to girls these days". Based on the responses, a variable was computed to determine whether a woman has a favourable attitude towards girls' education. If according to a woman, the extent of education to be given to a girl is greater than or equal to that of a boy, she is regarded as having a favourable attitude, otherwise she is not seen as having a favourable attitude.

In addition to all those indicators of empowerment, the authors have considered five background characteristics of women to understand the variation in the autonomy in different sociocultural settings such as caste, religion, place of residence, standard of living and the type of family structure.

Results

In the following section, the analysis on the relationship between the indirect and direct measures of autonomy is presented. An attempt is also made to examine how those indicators, in turn, are associated with the characteristics which provide evidence of empowerment.

Indirect vis-à-vis direct measures of autonomy

In the absence of direct data on women's autonomy, previous studies have relied on other measures – years of education, work-force participation, marital age and spousal age difference as proxies for autonomy. Table 1 presents the bivariate associations between the indirect measures or proxies and the direct measures of female autonomy. As expected, all the three indicators of autonomy suggest that, compared to Uttar Pradesh, women in Tamil Nadu have greater autonomy. A higher proportion of women in Tamil Nadu are involved in decision-making about their own health care, have greater freedom of movement and access to money than women in Uttar Pradesh.

Table 1. Percentage of usual residents and currently married women involved in decision-making about their own health care, percentage with freedom of movement and percentage with access to money by indirect indicators of female autonomy

Indirect indicators	Uttar Pradesh				Tamil Nadu			
	Percent-age involved in decisions about own health care	Percent-age with complete freedom of move-ment	Percent-age with control over economic resources[$]	Number of women	Percent-age involved in decisions about own health care	Percent-age with complete freedom of move-ment	Percent-age with control over economic resources[$]	Number of women
Education								
Illiterate	43.0	9.6	46.2	5,677	58.0	53.8	76.1	1,882
Literate up to Middle	46.0	8.7	58.7	930	60.8	51.2	79.2	932
Middle+	50.1	15.1	69.1	1,405	57.1	51.4	82.0	1,213
Occupation								
Not working	43.1	9.6	50.3	6,120	56.5	47.7	77.0	1,920
Working not for cash	49.0	12.2	51.8	1,058	63.8	57.0	78.1	406
Working for cash	49.9	14.4	61.6	833	59.3	56.7	80.4	1,699
Age difference between spouses								
Little (5 years)	43.9	10.2	50.3	5,117	60.7	53.5	79.4	1,821
Moderate (6-10 years)	45.7	11.2	54.9	2,092	56.5	52.3	79.2	1,605
Big (> 10 years)	45.4	9.7	52.1	722	56.2	49.5	74.3	598
Education difference between spouses								
No difference	45.3	11.4	48.8	2,682	56.8	55.3	79.4	968
Moderate (5 classes)	46.3	10.5	56.7	2,479	59.8	51.7	78.1	2,346
Big (more than 5 years)	42.5	9.6	50.1	2,820	55.9	50.8	78.9	708
Total	**44.6**	**10.5**	**51.7**	**8,012**	**58.4**	**52.5**	**78.6**	**4,028**

[$] access to money.

Particularly striking is the low level of freedom of movement in Uttar Pradesh. Only 11 per cent of the women in the state mentioned that they have complete freedom of movement – meaning they do not need permission to either go to the market or visit their friends or relatives.

The relationship between the indirect and direct measures of autonomy differs in the two states. The two indirect indicators, education and occupation of women show a stronger association with the three direct indicators of autonomy in Uttar Pradesh than in Tamil Nadu. In fact, in Tamil Nadu the associations are found to be insignificant. In Uttar Pradesh, as the level of education of women

improves, their autonomy also increases. A much higher proportion of women who have completed at least a middle level of education are involved in decision-making, have freedom of movement and also have access to money, as compare with women who are illiterate. In Tamil Nadu, where the patriarchy is relatively weak compared to Uttar Pradesh, education, the most commonly used proxy indicator of autonomy, fails to show a clear association with the direct measure of autonomy. Contrary to this, Jejeebhoy found that in a setting where patriarchy is strong other traditional factors can counteract and make the empowering effect of education less significant, than in a setting where patriarchy is weak (Jejeebhoy, 1998). However, it is possible that in a setting where the level of female literacy is generally low, the literate women, particularly those who are educated at least up to a middle level are a select group. Other sources of empowerment such as family background, exposure to the outside world etc. are likely to be high and add to the creation of a positive empowering environment.

Work participation also tends to have beneficial effects in improving women's autonomy. A study by Sharma (1983) states that the women's status in the family is related to whether she is engaged in a gainful economic activity or not. Improved women's autonomy is noticeable among those who work outside for cash and is evident among women in Uttar Pradesh. The other two indirect indicators, age and educational difference between spouses, show no definite relationship with the three direct indicators of autonomy.

Table 2 presents the relationship between the sociocultural setting of women and the direct measures of autonomy. In other words, it shows how female autonomy as indicated by involvement in decision-making, freedom of movement and control over resources varies according to characteristics like caste, religion, residence, standard of living and type of family. The proportions shown against each category of the characteristics have been adjusted to take into account the differences in the levels of the indirect indicators (education, occupation, age and educational difference between spouses). The differentials are found to be larger in Uttar Pradesh compared to those in Tamil Nadu.

The most noticeable difference in the level of sociocultural setting of women and the direct measures of autonomy occurs in the type of family characteristic. Interestingly, the presence of in-laws in a family lowers the level of autonomy of women. Women living in joint families with their in-laws have the lowest levels of autonomy. Specifically, in Uttar Pradesh, women staying in nuclear families have the highest level of autonomy in terms of all three indicators. Another factor that is important in this context is the place of residence. Women living in rural areas are found to have less autonomy than urban women.

Table 2. Percentage of usual residents and currently married women involved (adjusted)[$] in decision-making about their own health care, percentage with freedom of movement and percentage with access to money by background characteristics

Background characteristics	Uttar Pradesh			Tamil Nadu		
	Percentage involved in decisions about own health care	Percentage with complete freedom of movement	Percentage with control over economic resources	Percentage involved in decisions about own health care	Percentage with complete freedom of movement	Percentage with control over economic resources
Caste						
SC/ST	57.4	25.9	83.4	66.3	62.5	92.8
Others	62.8***	22.1**	85.2**	67.3	62.1	93.0
Religion						
Hindus	61.4	23.0	84.3	67.0	62.7	93.0
Non-Hindus	63.1	22.6	87.2***	67.9	58.1*	92.9
Place of residence						
Urban	65.6	27.9	89.3	70.1	66.1	93.8
Rural	60.6**	21.7**	83.4***	65.4**	60.0***	92.4*
Standard of living						
Low	62.2	22.9	80.3	65.7	61.9	91.5
Medium	62.0	21.9	85.2***	68.5	63.1	93.3***
High	59.8	26.1	89.4***	65.6	60.0	94.4***
Type of family						
Broken/Suppl. extended	62.5**	23.2***	85.7***	65.8	65.0***	92.7***
Nuclear	63.7***	28.0***	87.1***	67.1	63.6***	93.8***
Joint without in-laws	61.9**	24.4***	85.4***	69.3	58.3*	92.9***
Joint with in-laws	57.6	15.5	79.5	66.7	51.7	84.1

[$] Adjusted for usually used proxy indicators of female autonomy mentioned in table 1.

*** $p<0.001$ ** $p<0.05$ * $p<0.10$

Autonomy and evidence of empowerment

It is expected that the different dimensions of autonomy should facilitate and culminate in greater self-esteem and a positive attitude towards the girl child among women. If a woman agrees and admits that a husband is justified in beating his wife for any of the reasons asked in the survey, she is seen as not fully empowered. Table 3 provides information on such associations.

At the outset, it is apparent that a much higher proportion of women in Uttar Pradesh have high self-esteem than women in Tamil Nadu. But, women in Tamil Nadu have a more equitable attitude towards educating girl children and a higher propensity to use family planning methods, as compared to women in Uttar Pradesh. Thirty-eight per cent of the women in Uttar Pradesh subscribe to the view that a husband is not justified in beating his wife under any of the circumstances

asked in the survey. In Tamil Nadu, the percentage of such women is much lower (26 per cent). By and large, the different direct indicators of autonomy are positively related to the indicators of empowerment. Freedom of movement shows the strongest association with the empowerment indicators. In Tamil Nadu, 31 per cent of women with complete freedom of movement showed greater self-esteem, compared to only 21 per cent of women without freedom of movement.

Table 3. Percentage of permanent, who are currently married and do not agree with justifications given for a husband beating his wife (self-esteem), percentage with no unwanted pregnancy and percentage using family planning (by direct indicators of female autonomy)

Women status	Uttar Pradesh				Tamil Nadu			
	Percent-age with greater self-esteem	Percent-age favour girls' education	Percent-age using family plan-ning	Number of women	Percent-age with greater self-esteem	Percent-age favour girls' education	Percent-age using family plan-ning	Number of women
Decision-making in health care								
Respondent involved	39.1	55.6	33.1	3,528	31.5	57.6	54.2	2,343
Not involved	36.9	51.3	27.1	4,370	19.0	56.5	51.9	1,674
Freedom of movement								
Complete freedom	45.7	66.3	40.3	827	31.3	61.3	55.3	2,103
No complete freedom	37.0	51.7	28.5	7,065	20.7	52.6	51.0	1,914
Control over resources								
Yes	37.7	56.4	34.4	4,083	27.6	57.2	53.6	3,146
No	38.1	49.8	24.9	3,778	21.4	56.8	51.7	857
Total	37.9	53.2	29.8	7,897	26.3	57.0	53.3	4,018

It is surprising to find that women in Tamil Nadu tend to accept wife beating more than those in Uttar Pradesh. It may be mentioned in this context, that a greater proportion of women in Tamil Nadu have reported being beaten than in Uttar Pradesh. It may not be out of context to mention that the survey showed a much higher proportion of males in Tamil Nadu drink alcohol than those in Uttar Pradesh (IIPS and ORC Macro, 2001) and alcohol abuse have been found to be a factor leading to domestic violence.

The relationship of the indirect measures of autonomy and the sociocultural settings to the factors of evidence of empowerment was also examined in this study. The three indicators of evidence of empowerment were evaluated separately and the results are shown in tables 4 to 6. Three separate logistic regression models have been used for each of the indicators.

Table 4. Adjusted proportion of currently married women (usual residents of the household) not agreeing with reasons given in the survey to justify the husband beating his wife (self-esteem) – Results from logistic regression analysis[$]

Background characteristics	Uttar Pradesh			Tamil Nadu		
	Model-I	Model-II	Model-III	Model-I	Model-II	Model-III
Decision-making in health care						
Respondent not involved	41.6	42.5	43.1	30.1	27.0	35.0
Respondent involved	43.3	43.3	43.8	43.3***	40.0***	49.4***
Freedom of movement						
No complete freedom	41.4	42.2	42.7	32.6	29.2	37.3
Complete freedom	50.2***	48.5***	49.7***	42.4***	39.2***	48.8***
Control over economic resources						
No	42.9	45.7	46.2	35.1	32.8	41.6
Yes	41.8	40.3***	40.9***	38.3	34.7	43.7
Education						
Illiterate		38.4	39.9		30.9	41.7
Literate up to middle		43.7***	43.1		28.9	36.7**
Middle+		61.0***	58.0***		44.5***	50.9***
Occupation						
Not working		43.9	44.4		35.8	44.4
Working not for cash		38.5***	38.7***		35.7	44.9
Working for cash		41.0	42.4		32.2*	41.6
Place of residence						
Urban		50.2	49.9		38.3	46.1
Rural		41.0	41.8***		32.2***	41.7**
Age difference between spouses						
Little		42.9	43.5		36.1	45.4
Moderate		43.2	43.2		33.5	41.9*
Big		41.4	43.1		31.1*	40.3*
Education difference between spouses						
Little		41.3	42.4		34.3	43.2
Moderate (5 classes)		43.1	43.6		34.1	43.2
Big (more than 5 years)		44.2*	44.2		34.8	43.5
Caste						
SC/ST			43.8			40.9
Others			41.6			44.0
Religion						
Hindus			42.6			42.4
Non-Hindus			43.6			50.0**
Standard of living						
Low			41.5			41.3
Medium			42.2			40.7
High			50.2***			55.8***
Type of family						
Broken/Suppl. extended nuclear			43.6			43.5
Nuclear			41.7*			43.7
Joint without in-laws			44.8			42.6
Joint with in-laws			44.9			40.3

[$] controlled for age of the respondent

*** p<0.001 ** p<0.05 * p<0.10

Attitude towards wife beating

Direct indicators of autonomy, particularly whether a woman has complete freedom of movement, shows a significant association with her attitude towards wife beating in both states. For example, in Tamil Nadu, a relatively higher proportion of women with freedom of movement deplore wife beating, compared to those not having freedom of movement (table 4). Autonomy in decision-making also leads to higher self-esteem in Tamil Nadu, but not in Uttar Pradesh. Control over resources does not lead to a favourable disposition of women towards wife beating in Tamil Nadu. One surprising result is that in Uttar Pradesh a lower proportion of women with control over resources show high self-esteem compared to those with no control over resources. In this context, it may be mentioned that the proportion of women working for cash is much higher among those who say they have control over resources than those who claim to have no control over resources. The majority of women working for cash are agricultural labourers or unskilled or skilled manual workers. These women are found to have lower self-esteem, compared to women who are either home makers or working not for cash or are in professional jobs/service sector. The education level of women is found to be an important indicator showing a positive influence on empowerment. However, a moderate level of education does not help in strengthening self-esteem among women. In fact, in Tamil Nadu, a significantly lower proportion of women with a moderate level (literate but below middle) of education are found to have self-esteem compared to illiterates women. As a whole, the sociocultural differentials tend to narrow down when the direct and indirect measures of autonomy are significant.

Attitude towards girls' education

Besides indirect measures of autonomy, direct indicators such as freedom of movement and control over resources show a significant impact on the existence of a favourable attitude towards girls' education in both the cultures (table 5). In most Indian societies, girls' education is adversely affected because they are required to assist their mothers in daily household chores. The boys on the other hand, are free from such responsibilities and are sent to schools. However, the situation seems to be changing along with the changing attitudes of women and the realization of the importance of education in the modern era. Respondents with some level of education favoured a reduced gap between boys' and girls' education. Women living in urban areas have shown a more favourable attitude towards girls' education compared to women living in rural areas. The idea that girls should receive as much education as boys has not been widely accepted in rural areas, even today.

Table 5. Adjusted proportion of currently married women (usual residents of the household) who favour girls' education to be equal or more than the boys' education – Results from logistic regression analysis[$]

Background characteristics	Uttar Pradesh			Tamil Nadu		
	Model-I	Model-II	Model-III	Model-I	Model-II	Model-III
Decision-making in health care						
Respondent not involved	62.7	62.1	64.3	60.9	61.9	61.9
Respondent involved	65.1	63.7	66.3*	60.1	60.8	60.9
Freedom of movement						
No complete freedom	62.4	61.6	64.0	55.6	56.2	55.9
Complete freedom	74.1***	72.8***	74.6***	64.8***	65.7***	66.0***
Control over economic resources						
No	61.1	62.4	65.1	61.7	64.2	64.1
Yes	66.2***	63.2	65.4	60.1	60.4*	60.6*
Education						
Illiterate		57.6	61.4		54.9	55.2
Literate up to middle		65.6***	66.7**		60.4***	61.1***
Middle+		78.9***	77.6***		70.9***	70.3***
Occupation						
Not working		63.8	66.0		63.5	63.5
Working not for cash		61.1*	64.2		58.6	59.4
Working for cash		57.3**	60.3**		59.4*	59.2*
Place of residence						
Urban		73.9	74.3		66.9	67.0
Rural		59.7***	62.6***		58.1***	58.1***
Age difference between spouses						
Little		63.0	65.3		61.5	61.6
Moderate		62.2	64.5		62.3	62.2
Big		63.4	66.6		57.8	58.0
Education difference between spouses						
Little		61.1	64.1		60.3	60.2
Moderate (5 classes)		62.6	65.2		61.4	61.6
Big (more than 5 years)		64.7**	66.2		61.9	62.0
Caste						
SC/ST			63.2			63.7
Others			65.8*			60.6
Religion						
Hindus			65.2			61.2
Non-Hindus			65.4			62.6
Standard of living						
Low			62.8			61.6
Medium			62.5			59.5
High			75.9***			65.9
Type of family						
Broken/Suppl. extended nuclear			65.1			62.5
Nuclear			63.8**			60.7
Joint without in-laws			65.0			62.3
Joint with in-laws			67.5			61.9

[$] controlled for age of the respondent

*** p<0.001 ** p<0.05 * p<0.10

Table 6. Adjusted proportion of currently married women (usual residents of the household) who are currently using family planning – Results from logistic regression analysis[$]

Background characteristics	Uttar Pradesh			Tamil Nadu		
	Model-I	Model-II	Model-III	Model-I	Model-II	Model-III
Decision-making in health care						
Respondent not involved	38.9	66.7	62.3	45.8	75.6	79.8
Respondent involved	43.7***	68.3	64.0	50.8	74.4	78.9
Freedom of movement						
No complete freedom	40.0	67.2	62.7	43.4	74.1	78.6
Complete freedom	50.2***	69.0	65.4	53.6**	75.7	79.8
Control over economic resources						
No	36.0	65.9	61.7	40.7	76.3	81.0
Yes	45.9***	68.8**	64.3**	50.9	74.5	78.7
Education						
Illiterate		62.5	59.5		73.3	77.8
Literate up to middle		72.3	66.6***		77.7**	81.5**
Middle+		81.1	73.9***		75.2	79.7
Occupation						
Not working		66.7	62.4		75.6	80.0
Working not for cash		69.9	64.9		70.2**	74.1**
Working for cash		68.8	65.2		75.3	79.5
Place of residence						
Urban		76.2	72.2		78.0	81.9
Rural		64.9	60.5***		73.1***	77.7***
Age difference between spouses						
Little		66.2	61.8		74.9	79.2
Moderate		70.9	66.5***		76.2*	80.4
Big		65.6	61.3		71.3	76.1*
Education difference between spouses						
Little		63.8	61.0		75.7	80.3
Moderate (5 classes)		65.6	61.7		74.4	78.7
Big (more than 5 years)		72.1	66.2***		75.6	79.7
Caste						
SC/ST			62.8			77.8
Others			63.1			79.7
Religion						
Hindus			65.3			79.7
Non-Hindus			51.4***			75.9*
Standard of living						
Low			56.2			78.1
Medium			63.5***			79.9
High			71.8***			79.8
Type of family						
Broken/Suppl. extended nuclear			60.7			79.3***
Nuclear			65.1**			80.9***
Joint without in-laws			63.2			76.7***
Joint with in-laws			61.1			69.9

[$] controlled for age of the respondent

*** p<0.001 ** p<0.05 * p<0.10

Contraceptive use

The more education a woman has, the more likely she is to use contraceptive methods. This link between a woman's education level and contraceptive use is found to be strong. Furthermore, contraceptive use is greater among women living in urban areas than among women living in rural areas. Among the direct indicators of autonomy, women with greater control over economic resources use contraceptives more than women without control over resources. This is particularly evident in Uttar Pradesh (table 6). In short, the level of contraceptive use depends on women's autonomy, as well as the usual socioreligious characteristics.

Conclusion

There exists a regional divide in the level of women's empowerment. As expected, women in Tamil Nadu have greater autonomy in making decisions regarding their own health care, freedom of movement and access to money. However, empowerment being a multidimensional concept, the results show some interesting variations. Women in Uttar Pradesh are found to have greater self-esteem in the sense that they are more critical about wife beating. A much higher proportion of women in Uttar Pradesh deny that a husband is justified in beating his wife under any of the six circumstances on which data was collected, compared to women in Tamil Nadu. Among the indirect measures of autonomy, education in particular is important and plays a positive role in enhancing different dimensions of autonomy. There are sociocultural variations in the level of empowerment. The type of family in which a woman lives has a strong association with the three direct measures of autonomy. Women staying in families with in-laws show a far lower level of autonomy than do women who live in other types of families

Of the three direct measures of autonomy, like involvement in decision-making, freedom of movement and access to money, women, particularly in Uttar Pradesh, have the least autonomy in terms of freedom of movement, which turns out to be an important indicator of the evidence of empowerment.

Further, women with education, particularly secondary education, and working women show greater self-esteem, have a favourable attitude towards girls' education and use contraceptives across cultures. Urban women as compared to rural women are more favourable towards girls' education and towards family planning methods. This divide indicates that there are two different societies that exist in India, a rural culture and an urban culture. In rural areas, the

lifestyle is oriented more towards the community than towards the family, while in urban areas, life is more individualistic and family-oriented. The degree of such adherence to societal norms and practices in rural areas is much stronger in Uttar Pradesh than in Tamil Nadu. Among the three selected direct indicators of empowerment, complete freedom of movement determines greater self-esteem and a more favourable attitude for girls' education to a great extent in both cultures.

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Nutritional Status of Children in North-East India

Contrary to the findings in other parts of India, in the north-eastern region, female children have a nutritional edge over male children.

By G. Rama Rao, L. Ladusingh and Rajkumar Pritamjit*

Undernutrition in children is the consequence of a range of factors which are often related to insufficient food intake, poor food quality, and severe and repeated infectious diseases. The inadequacy is relative to the food and nutrients needed to maintain good health, provide for growth and allow a level of physical activity (National Nutrition Policy, Government of India, 1993). Widespread poverty resulting in chronic and persistent hunger is the biggest scourge of the developing world today. Poverty, in turn, is closely linked to the overall standard of living and whether a population can meet its basic needs, such as access to food, housing, health care and education. This intersectoral and interrelated cause of undernutrition

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operates at many levels from the community at large to the household and children within households. Undernutrition is often cited as an important factor contributing to high morbidity and mortality among children in developing countries (Sommer and Loewenstein, 1975; Chen, Chowdury and Huffman, 1980; Vella and others, 1992a, 1992b). Undernutrition during childhood can also affect growth potential and risk of morbidity and mortality in later years of life.

The National Nutrition Monitoring Bureau (NNMB) surveys of 1977 to 1996, showed very little improvement in the nutritional status of children; 45 to 50 per cent of children were classified as moderate to severely malnourished (Gopalan and Shiva, 2000). Income, food security and women's available time seem to affect the nutritional status of children of disadvantaged population. Based on a study of three states – Maharashtra, Tamil Nadu and Uttar Pradesh – using data from NFHS-I (1992-1993), Griffiths, Mathews and Hinde (2002) came to the conclusion that the undernutrition of children tended to concentrate and cluster around households in which one of the children suffers from undernutrition. The clustering percentages are 33 per cent in Uttar Pradesh and Maharashtra and 29 per cent in Tamil Nadu. In mid-1995, the Government of India launched a new centrally-sponsored scheme, the national programme of Nutritional Support to Primary Education. Under this programme, cooked mid-day meals were to be introduced in all government and government-aided primary schools within two years. The coverage of the mid-day meals programme has steadily expanded during the last two years and cooked lunches are becoming part of the daily school routine across the country. In a study of three states, Chhattisgarh, Rajasthan and Karnataka, Dreze and Goyal (2003) found that the mid-day meal scheme helps in the enhancement of child nutrition, school attendance and social equity.

Chen, Hug and D'Souza (1981), using data from the demographic surveillance system organized by the International Centre for Diarrhoeal Disease Research, Bangladesh, found girls' mortality risks to be as much as 60 per cent higher than those for boys after the neonatal period. The study also revealed that girls were fed less and suffered more from malnutrition. Infection rates were similar, but boys recovered faster than girls. Utilizing data from Demographic and Health Surveys (DHS) for Ghana, Malawi, Nigeria, Tanzania, Zambia and Zimbabwe; Madise, Matthews and Margetts (1999) studied the heterogeneity of child nutritional status in those six Sub-Saharan African countries. Their findings unfolded to reveal that the percentage of children who were undernourished in terms of being underweight ranged from 16 in Zimbabwe to 36 in Nigeria. A clustering effect at the household level was found in all six countries, ranging from 24 per cent in Tanzania and Zimbabwe to 40 per cent in Malawi. There was also a

significant, but smaller clustering effect at the community level for Malawi, Nigeria, Tanzania and Zambia.

The outcomes of those studies support the World Health Organization (1994) report that over half of the underweight children in the world are living in Asia and Africa, including children in India, Bangladesh, Sub-Saharan African countries and other countries of those two regions of the globe. It is also evident that the nutritional status of children varies across countries in the developing world and that there are wide variations within countries. Though poverty is the main reason for the prevalence of undernourished children, many of the countries in the developing world do not have enough resources to implement wide-scale poverty alleviation programmes. As such when looking for means to reduce and minimize undernutrition among children, one needs to create cost-effective intervention programmes which can be implemented at the community level to develop child-raring and child-feeding practices. For a meaningful investigation into the feasibility of developing cost-effective community-level intervention programmes which can be implemented through the existing social support system, there is an urgent need to study the determinants of undernutrition among children, by using appropriate measures of the nutritional status of children. Keeping the foregoing emphasis on strengthening community-level intervention programmes, this paper makes an attempt to identify child, parental and household background determinants which have either a favourable or unfavourable bearing on the nutritional status of children.

Anthropometric indices

There are various means of measuring the nutritional status of children and anthropometric indices, but weight-for-height, height-for-age and weight-for-age are the most effective measures of undernutrition of children in terms of growth status. Each of these indices provides somewhat different information about the nutritional status of children. The World Health Organization's (1995) interpretation of those indices is as follows:

The height-for-age index measures stunting, owing to linear growth retardation as a result of suboptimal and/or nutritional conditions, primarily reflect chronic undernutrition. The weight-for-height index by contrast measures wasting or thinness, which indicates in most cases a recent and severe process of weight loss often associated with acute starvation and/or severe disease. This index is a relative measure of body mass and body weight, primarily reflecting chronic undernutrition. Weight-for-age reflects body mass relative to chronological age. It is influenced by both the height of the child and his/her weight. This index is often

taken as a composite index integrating the first two anthropometric indices, as it reflects both chronic and acute malnutrition.

Background of study area

The study area is comprised of seven states, namely Arunachal Pradesh, Manipur, Meghalya, Mizoram, Nagaland, Sikkim and Tripura, located in the north-eastern part of India. The region has international boundaries with China, Bhutan, Myanmar and Bangladesh. This area of India is the most interior and inaccessible part of the country as a result of mountanous terrain and poor communication means. It is believed that a sizeable population of the region originated from Thailand, China and other neighbouring countries, that the region is inhabited mostly by the Mongoloid race, has different sociocultural beliefs and practices and is rich in biodiversity. Those states together constitute 5.6 per cent of the country's total land area and 1.2 per cent of India's total population (Census of India, 2001). The states of Mizoram, Nagaland and Meghalya are predominantly Christian, whereas Tripura has a predominantly Hindu population. Mixed

Table 1. State profiles and demographic characteristics

	Arunachal Pradesh	Manipur	Meghalaya	Mizoram	Nagaland	Sikkim	Tripura
Population (in millions)	1.09	2.39	2.31	0.89	1.99	0.54	3.19
Percentage to national population	0.1	0.2	0.2	0.1	0.2	0.1	0.3
0-6 years population (in millions)	2.0	3.12	4.57	1.41	2.80	7.71	4.27
Percentage to state population	18.3	13.1	19.8	15.9	14.1	14.3	13.4
Total land area (km2)	83,743	22,327	22,429	21,081	16,579	7,096	10,486
Population density	13	107	103	42	120	76	304
Sex ratio (females per 1,000 males)	901	978	975	938	909	875	950
Growth rate (%) per decade	2.6	3.0	3.0	2.9	6.4	3.3	1.6
Female literacy rate (%)	44.2	59.7	60.4	86.1	61.9	61.5	56.6
Infant mortality rate (per 1,000 live births)	44.0	23.0	58.0	21.0	23.0*	21.8	16.5
Female singulate mean age at marriage (years)	21.6	25.4	23.0	24.1	23.0	21.9	22.0
Median age at first marriage (25-49)	20.3	23.1	20.4	22.8	21.2	19.8	20.1
Median birth interval (months)	29.9	31.8	28.5	28.4	27.5	32.6	37.1
Total fertility rate (per woman)	2.52	3.04	4.57	2.89	3.77	2.75	1.87

Source: Census of India, 2001 and North Eeastern Sates, NHFS-II (1998-1999), International Institute for Population Sciences.

* Urban only

populations of Hindus, Christians, Buddhists and other local religions are found in the states of Arunachal Pradesh, Manipur and Sikkim. Figures in table 1 depict the profiles of those seven north-eastern states.

According to 2001 census figure, all of those states except Tripura have a growth rate higher than the national average. Nagaland reports the highest growth rate of 6.4 per cent, Meghalya has the highest 0-6 years population proportion to the states population with figure of 19.8 per cent, while Manipur has the lowest with 13.1 per cent. The entire region, with the exception of Arunachal Pradesh, has female literacy rates higher than the national average. Infant mortality rates (IMR), in the three-year period preceding the survey were found to be lower than the country's figure of 68 deaths per 1,000 live births in all the seven states.

NFHS-II survey reports revealed that those states have high fertility rates in comparison to other states in India with Meghalaya reporting the highest total fertility rate in the country of 4.57 and Tripura with 1.87 has the lowest fertility in India. The female singulate mean age at marriage in the region is between 20 – 26 years of age while their median birth interval ranges from 27 to 38 months.

Data source

Anthropometric measures assessing of the nutritional status of children are often not available. However, the two rounds of National Family Health Surveys (NFHS) during 1992-1993 and 1998-1999 have provided nationally representative anthropometric indices in the case of India. This has made it possible to examine the nutritional status of children in the north-eastern region of India, in relation to a range of demographic, socio-economic and household backgrounds. This present study is based on the recent data from NFHS-II and thus facilitates international comparisons. This exercise can illuminate future policy direction in the north-eastern region of India. In addition, it is possible to analyse the new data to understand the influences on the nutritional status of children under three years of age by socio-economic and demographic background factors operating at individual, household and community levels.

In NFHS-II survey, 1,419, 1,689 and 1,373 households were covered in the states of Arunachal Pradesh, Manipur and Mizoram, while the corresponding figures are 1,240; 1,133; 1,299 and 1,290 in Meghalaya, Nagaland, Sikkim and Tripura out of the target number of 1,500 households. From those completed households, over 1,000 ever married women in the reproductive age group 15-49 years were interviewed except in Meghalaya and Nagaland where only 945 and 818 ever married women were interviewed. In all the states, this survey collected the weight and height of the two youngest children below the age of 36 months

born to the interviewed women. NFHS-II also collected data on socio-economic characteristics of the household, health care and food consumption of mother and child, breastfeeding patterns as well as the morbidity of children. The data for the present study of covariates of nutritional status of children in north-eastern India is taken from NFHS-II (1998-1999) and pertains to 2,649 children of age between 1-35 months. The NFHS-II collected information on both the height and weight of each child, making it possible to compute anthropometric indices height-for-age, weight-for-age and weight-for-height.

Methods

In the present study z-scores for the three anthropometric indices height-for-age, weight-for-age, and weight-for-height are used to assess the nutritional status of children. The computation of z-scores involves comparison with an international reference population as recommended by the World Health Organization (Dibley and others, 1987a; Dibley and others, 1987b). The Nutrition Foundation of India concluded that the WHO standard is applicable to Indian children (Agarwal and others, 1991). Devations of z-scores less than – 2SD (standard deviation) from the international reference population were used to classify children as moderately low weight-for-age, low height-for-age and low weight-for-height, Deviation of Z-scores less than – 3SD put children in the severe undernutrition category. The preliminary analysis of identifying the quantum of under nutrition among children under 36 months was based on this categorization and this procedure was followed universally across regions and countries.

Additionally, it required relating the z-scores of the anthropometric indices with demographic, socio-economic and household background to identify crucial correlates of child nutrition in order to draw relevant and effective intervention programmes. To deal with this aspect of linkage, a multilevel regression analysis (Goldstein, 1995) was used. This statistical technique explains changes in the z-scores in response to unit changes or categorical shifts in the demographic, socio-economic and household characteristics of children. The tendency of children with poor families and within villages without proper sanitation, drinking water and health facilities to be similar in terms of nutritional status could be captured by the multilevel regression analysis.

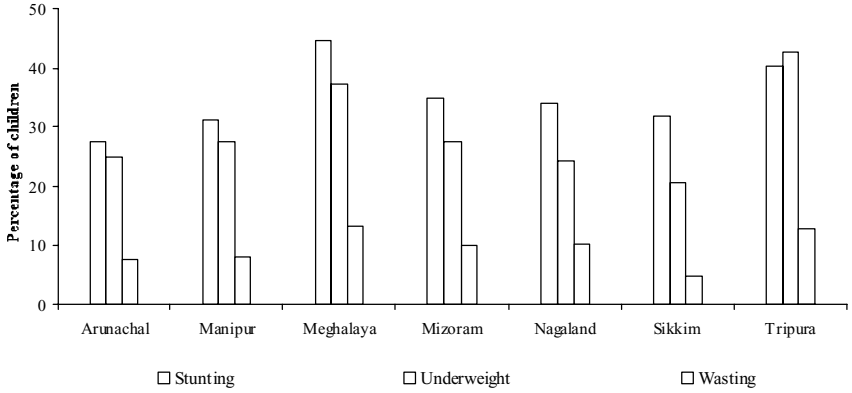
A strong case for using weight-for-age was made by Vella and others (1992a) who found, using data from Uganda that, of the three indices weight-for-age was a better predictor of children at high risk of death than height-for-age or weight-for-height, though other researchers have argued that for cross-sectional data, weight-for-height is the best indicator of current malnutrition

(McMurray, 1996). However, the proportion of children who are wasted is often too small for most studies of determinants of undernutrition. Noting the need to study more elaborately covariates of the nutritional status of children, authors restricted the study to weight-for-age z-scores and adopted a multilevel analysis incorporating the hierarchical data structure of multistage sampling designs.

Preliminary results

The analysis based on the cut-off point of z-score values for the three anthropometric indices height-for-age, weight-for-age and weight-for-height revealed that 34.5 per cent, 28.6 per cent and 9.4 per cent of the total 2,649 children included in the NFHS-II (1998-1999) survey were found to be stunted, underweight and wasted, respectively. The ranges of stunting, underweight and wasting in the north-eastern states of Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim and Tripura as shown in figure 1.

Figure 1. Percentage of children ages 1-35 months who are stunted, underweight and wasted in the seven north-eastern states of India



In these north-eastern states of India, more than a quarter of all the children aged 1-35 months were stunted and more than one fifth were underweight. Arunachal Pradesh had the lowest number at 27.6 per cent, while Meghalaya had the highest with 44.6 per cent of stunted children. Sikkim had the least with 20.5 per cent and Tripura the highest with 42.4 per cent of underweight children. Wasting among children was found to be at least at 5 per cent in Sikkim and at 14 per cent, the highest number, in Meghalaya.

Figure 2. Nutritional status of children aged 1-35 months in north-east India, 1998-1999

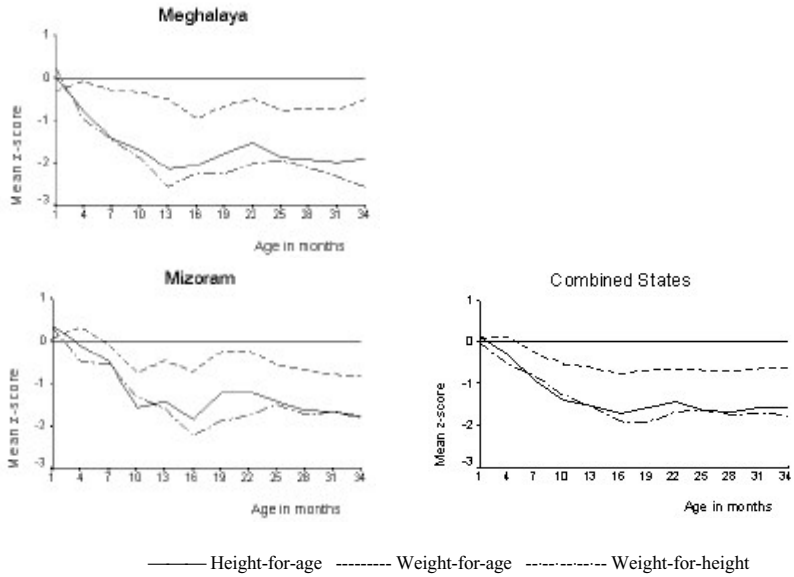


Table 2. Percentage distribution of children aged 1-35 months by background and family characteristics for seven north-eastern states in India

Variables	Percentage	Variables	Percentage
Individual characteristics			
Sex-Female	49.0	Smokes	7.5
Small size at birth	25.6	Illiterate (rc)	69.6
Home delivery	66.4	Educated up to middle school	16.3
Currently breastfeeding 12+	51.5	Educated up to high-school and above	14.1
Fed from bottle	17.8	Not working (rc)	58.7
Breastfeeding up to 6 months	20.4	Non-manual work	8.6
Illness two weeks before survey		Manual work	32.7
Diarrhoea	21.4	**Father's education**	
Fever	37.3	Illiterate (rc)	53.7
Cough	46.9	Educated up to middle school	21.0
Immunization		Educated up to high-school & above	25.3
3 DPT	43.4	**Father's occupation**	
4 Polio	45.6	Not working (rc)	2.9
BCG	62.9	Non-manual work	29.0
Measles	33.9	Manual work	68.1
Vit-A	27.6	**Household characteristics**	
Preceding birth interval		Drinks piped water	46.1
24 + months (rc)	53.1	Uses pit toilet	75.9
Below 24 months	18.2	Separate room for kitchen	63.9
First birth	28.8	Rural place of residence	78.5
Heamoglobin level- Anaemic child	45.9	3+ children below 5 years	21.3
Maternal characteristics		Any death siblings	16.9
Anaemic	26.0	5+ persons per room	10.4
BMI below 18.5 kg/m2	19.7	**Type of house**	
Read newspaper once a week	30.1	Pucca (rc)	15.1
Watches tv every week	44.4	Semi Pucca	24.7
Kachha	60.2	Kachha	60.2
Listen to radio every week	51.2	**Religion**	
Antenatal care during for pregnancy	70.6	Hindu (rc)	32.6
Received iron/folic acid during pregnancy	56.4	Muslim	4.7
Chew tobacco	34.1	Christian	47.2
Drink alcohol	11.6	Others	15.3

Source : North-eastern States, NFHS-II (1998-1999), rc – reference category.

The level of stunting, underweight and wasting by age (in months) of children is shown in figure 2. It is clear that in terms of the three anthropometric indices, the nutritional status of children deteriorated rapidly after birth and stabilized after 18 months of age in all the states and in the region as a whole. In Arunachal Pradesh, Sikkim and Tripura, the mean height-for-age z-scores for children aged one month were negative; indicating that stunting may have been present even in newborn babies in those states. However, except for Arunachal Pradesh and Tripura, the mean weight-for-age and weight-for-height z-scores for children aged one month were positive, indicating that on average, baring these two states, the children were born with adequate weight for their ages and heights. For the north-eastern region of India as a whole, children had a normal nutritional status at birth, as was evident form the fact that mean values of z-scores of all three anthropometric indices were positive and close to zero. This finding also supported the fact that only a quarter of babies were reported to be of small size at the time of birth by their mothers.

Table 2 shows the percentage distribution of 2,649 children by selected child-mother level characteristics and household characteristics included in the multilevel analysis of determinants of weight-for-age anthropometric measure. However, it is to be noted that only the background characteristics, which come under the subset of best predictors, was included in the final multilevel modeling. To assess the size of the baby, the information reported by the mothers, about whether the baby was small or large at birth was recorded in NFHS-II. The striking background of the 2,649 children included in the present study revealed that 66.4 per cent were delivered at home, 69.6 per cent of the mothers were illiterate, 78.5 per cent of them lived in rural areas, 68.1 per cent were engaged in manual work, 60.2 per cent lived in Kachha houses, 34.1 per cent chewed tobacco, 11.6 per cent drank alcohol and 7.5 per cent smoked.

Multilevel analysis results

The weight-for-age z-score was subjected to multilevel analysis for investigating the determinants of the nutritional status of children considering the selected background characteristics of children aged 1-35 months. The multilevel modeling of weight-for-age was executed in four stages in order to examine the changing nature of the explanatory potential of background characteristics. These four stages were designated as Model I based on only the child-level characteristics, Model II based on both child and parents' background level, Model III which incorporated child-woman and household background and Model IV which also took into consideration the districts of the respective states.

Table 3. Parameter estimates for multilevel models of weight-for-age z-scores for children aged 1-35 months

Variables	Model I	Model II	Model III	Model IV
Individual characteristics				
Age	-0.023**	-0.024**	-0.023**	-0.023**
Sex - female	0.153**	0.144**	0.147**	0.146**
Small size at birth	-0.464**	-0.424**	-0.420**	-0.402**
Home delivery	-0.227**	-0.079	-0.080	-0.083
Birth order	-0.012	-0.003	0.016	0.017
Fed from bottle	-0.057	-0.127*	-0.139*	-0.135*
Breastfeeding up to 6 months	0.808**	0.823*	0.846**	0.847**
Currently breastfeeding 12+	-0.252**	-0.198**	-0.188**	-0.191**
Illness two weeks before survey				
Diarrhoea	-0.012	-	-	-
Fever	-0.095	-0.084	-0.081	-0.080
Cough	-0.053	-0.039	-0.032	-0.028
Heamoglobin level-Anemic child	-0.196**	-0.145**	-0.142**	-0.138**
Preceding birth interval				
24+ months (rc)				
Below 24 months	-0.001	-0.012	-0.012	-0.014
First birth	0.061	0.090	0.090	0.090
Maternal characteristics				
Age at birth of indexed child				
25-34 (rc)				
14-24		-0.037	-0.012	-0.013
35-49		0.004	-0.041	-0.047
BMI below 18.5		-0.291**	-0.254**	-0.239**
Watch tv		0.079	0.051	0.052
Listen to radio		0.031	0.035	0.041
Illiterate (rc)				
Educated up to middle school		0.143*	0.110	0.116
Educated up to high-school & above		0.221*	0.206*	0.216*
Not working (rc)				
Non-manual work		0.065	0.036	0.046
Manual work		-0.014	-0.023	-0.019
Father's education				
Illiterate (rc)				
Educated up to middle school		0.065	0.043	0.050
Educated up to high-school & above		0.124	0.108	0.117
Father's occupation				
Not working (rc)				
Non-manual work		0.132	0.130	0.129
Manual work		0.014	0.048	0.056
Household characteristics				
Drinks piped water			0.031	0.009
Uses pit toilet			0.033	0.020
Separate room for kitchen			0.069	0.086
3+ children below 5			-0.085	-0.091
5+ persons per room			-0.015	-0.020
Sibling deaths			-0.067	-0.062
Rural place of residence			0.035	0.012

(continued)

Table 3. *(continued)*

Variables	Model I	Model II	Model III	Model IV
Type of house				
Pucca (rc)				
Semi Pucca			-0.110	-0.089
Kachha			-0.181*	-0.139
Religion				
Hindu (rc)				
Muslim			-0.188	-0.151
Christian			0.193**	0.268**
Others			0.238**	0.237**
States				
Arunachal (rc)				
Manipur				-0.202
Meghalaya				-0.396**
Mizoram				-0.228
Nagaland				-0.120
Sikkim				0.066
Tripura				-0.210
Variances				
Individual level	1.190**	1.160**	1.163**	1.162**
Household level	-	-	0.384**	0.356**
District level	-	-	-	0.014

Significant level : * p – value < 0.05 ; ** p – value < 0.01; rc – reference category

Table 3 shows the parameter estimates for the multilevel models of weight-for-age z-scores for the above-mentioned north-eastern region of India. Separate state models were not attempted as the number of cases for the background characteristics at different levels was inadequate for the study of determinants of the nutritional status of children. However, the inclusion of these states as categorical variables in Model IV facilitated the comparative assessment of the nutritional status of children in the aforesaid seven states. The estimates of Model I revealed that female children had a significant edge ($p<0.01$) over male children in terms of nutritional status, and breastfeeding at the early six months period had a significant ($p<0.01$) positive relationship with the nutrition of children. The inverse relationship between a child's age and weight-for-age z-score was highly significant at $p<0.01$. Another important determinant of weight-for-age was the size of the baby at birth as reported by the mother. As expected, small babies had lower weight-for-age z-scores, which were highly significant at $p<0.01$. Children still being breastfed beyond the first birthday had highly significantly lower z-scores compared to those who had stopped breastfeeding. Anaemic children tended to have poor nutritional status and it was

highly significant. Morbidity-related variables, such as diarrhoea, cough and fever in the two-week period preceding the survey had a negative impact on the nutritional status of children but was not statistically significant.

Model II incorporated additional background characteristics of the parents, such as age of women at the birth of indexed child, educational level; exposure to mass media, occupation, father's education and occupation and Body Mass Index (BMI) of mother. The estimates of this model showed that weight-for-age z-score values of children born to women with BMI below 18.5 kg/m^2 (the critical value) tended to be lower and it was highly significant at $p<0.01$. Education had a significantly positive impact on the nutritional status of children. Children born to young women and women engaged in manual occupation had lower values of weight-for-age z-scores but were not significant. However, the father's education and occupation had a positive association with the nutritional status of children, but the relationship was not significant. The magnitude, direction and significance of a child's background characteristics in Model I remain unchanged in Model II even after the incorporation of the parents' background characteristics.

To turn to the household level variables influence on the nutritional status of children in terms of weight-for-age z-scores, the authors included the source of drinking water, toilet facility in use, housing conditions, crowdedness, presence of large number of children below five years of age and history of sibling deaths in Model III. Next a two-level hierarchical model was designed. The child and parents' background characteristics which were significant in Models I & II in terms of their relationships with the weight-for-age z-scores were found to be carried forward in Model III with the only change from Model II being those women educated only up to primary level or longer had a significant influence on the nutritional status of children. Children living in poor living conditions (*Kachha* house) had a lower nutritional status and was significant at $p<0.05$. Children born to Christian and other minority religion households had a higher nutritional status, which was significant at $p<0.01$, compared to children in Hindu households. Children belonging to Muslim communities in the region had a poorer nutritional status compared to those of Hindu households, but the relative difference of the two communities was not statistically significant. Children of households with history of sibling deaths, with more than three children under 5 years of age, and with congested conditions of more than five persons per room, had lower weight-for-age z-scores but were not significant.

In Model IV, the authors included the seven states of Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura through dummy

variables in order to facilitate the comparative assessment of the relative nutritional status of children in these states of north-east India. Besides the background characteristics of Model III, three-level hierarchical model was fitted using the MLWiN statistical package. The magnitude, direction and significance of influence of the child's, parents' and household characteristics considered in Model III on weight-for-age z-scores remained unaltered. In terms of this anthropometric measure in all of the other five states, except Sikkim, the nutritional status of children are poorer than that of Arunachal Pradesh but the difference was significant at $p<0.01$ only in Meghalaya, where 37 per cent of children are underweight. Sikkim was the only state in the region which had a higher nutritional status of children.

Table 3 also includes estimated three-level residual variances after adjusting for the child's, parents', household and district characteristics. For all four models, child-parent level and household level variances were significant suggesting an unobserved heterogeneity in nutritional status between children and households. The district level variances were smaller and not significant for Model IV but were significant for the three preceding models.

Clustering effect

Since children living in the same household often shared both a biological inheritance and a nurturing experience, there was a certain amount of correlation in weight-for-age z-scores of children living in the same household, thereby suggesting that undernourished children cluster within certain types of household. This clustering effect was not explained by any of the variables entered into the model. Multilevel modeling has the provision of measuring the clustering effect in terms of intra-correlation coefficient (Goldstein, 1995) between households. The findings also suggested that children living within different family structures had similar probabilities of low weight-for-age z-scores, in terms of the value of 0.24 for the intra-correlation coefficient obtained from Model IV. However the clustering of undernutrition of children within the same village was found to be too small to be significant.

Conclusion

This paper examines the nutritional status of children in the north-eastern states of Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura of the Indian Union based on a representative sample of 2,649 children aged 1-35 months. Nutritional status was assessed on the basis of three anthropometric measures, namely weight-for-height, weight-for-age and height-for-age. Studies of the nutritional status of children is lacking in the region mainly due to the unavailability of anthropometric measures. But the recent

NFHS-II (1998-1999) survey provides the much-needed data to carry out the study. The focus of this study was to identify household, parental and child's background along with behavioural characteristics, such as feeding practices in order to introduce region-specific intervention strategies.

Contrary to the findings in other parts of India mentioned above, in the north-eastern region, female children have a nutritional edge over male children, which cause daughters not to be considered liabilities in the sociocultural orientation of the region. In fact, India's only matriarchal state, Meghalaya, where the dowry system does not exist is in the north-eastern region. The level of undernutrition among children in the north-eastern region of India was much higher than the national average, however more than one third were stunted and more than a quarter were underweight. Yet, less than one tenth experienced wasted growth. With the exception of a couple of states, children at birth had normal a nutritional status which deteriorated with age and stabilized once they reached 18 months of age in the region as a whole. Babies, who were small at birth, tended to have a lower nutritional status. Female children had an edge over the male children. Children born at shorter birth intervals, as expected had lower z-scores of weight-for-age. Haemoglobin level was an important base for determining the health of children and the study confirms that the nutritional status of anaemic children was poor. Children who had suffered from diarrhoea, fever and cough in the two week preceding the survey were also likely to have a poor nutritional status. Feeding practice was also an important criterion for the nutrition of children. It was found from this analysis that children who were breastfed the prescribed optimum duration of 4-6 months were nutritionally better off than those children who were breastfed even beyond their first birthday. This could be due to the fact that children who were given supplementary food at the right age were more healthy. The main reason for the prevalence of aneamia and morbidity in the region was the ignorance of people living in the inaccessible mountainous terrain about the proper and nutritional preparation of food and general hygiene.

To minimize and control aneamia and morbidity from common disease, the mothers' associations, present in almost all villages and involved in socioreligious activities, should be approached to provide education on household hygiene, proper preparation of food and on the practice of effective child breastfeeding as well as knowledge of right time of solid food supplementation. Such Information Education and Communication (IEC) programmes working through the existing social network could be vital and cost-effective in improving the nutritional status of children in the north-eastern region of India. However, as the livelihood of the people depends on the forest and on securing basic amenities, this is not likely to happen in the near future.

The nutritional and physical health structure of the mother provides the background soil for the growth of the child. The nutritional status of children born to mother whose Body Mass Index (BMI) was below the critical value of 18.5 kg/m^2 were significantly poor. It is expected that educated mothers will be more exposed to knowledge and practices of proper childcare. This is confirmed by the present study. The father's background seems to have little impact on the nutritional status of children. Among the household characteristics, the living conditions emerge as the main factor for keeping the nutritional status of children normal. As compared to children living in Hindu households, those living in Christian households were nutritionally better off. In terms of weight-for-age z-scores, Arunachal Pradesh was better off in the nutrition of children, while Meghalaya had a significantly lower nutritional level of children. Though the social status of women in most of the north-eastern states of India is high, it is the women who work in the fields and farms and tend to household chores while the men stay home. After returning home late in the evening from agricultural work, the women must be ready again for work in the field early in the morning. This physical overexertion makes them poor sources of nutrients for children. Therefore, it is imperative to bring about a change in the occupational practices of the region. Village headmen are the caretakers of villages in the hills. They should be educated, particularly during community gathering and gospel prayer meetings, on the need for change in work orientation, considering the ill effect of current practices on the health of women.

A large amount of the variation of the nutritional status of children remains unexplained by the data collected in the NFHS-II. Obviously, there is a presence of household effect with a high intrahousehold correlation coefficient, indicating a tendency of children within the same household to have the same level of nutrition.

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Rapid Fertility Decline in the Maldives: An Assessment

Until recently, the Maldives had been considered as one of the countries in South Asia with high fertility. However, recent evidence suggests the beginning of a fertility decline.

By Ibrahim Naseem, Bhakta Gubhaju and Hussain Niyaaz*

Maldives is an archipelago of 1,190 small coral islands, of which 200 are inhabited, spread over a geographical area of 90,000 sq. km in the Indian Ocean. The islands are grouped in ring-shape clusters and stretch approximately 750 km from North to South and 120 km from East to West. These islands form 26 natural atolls, which for easy administration are grouped into 20 atolls. The nearest neighbours of Maldives are India and Sri Lanka, located about 600 and 670 km to the North and East, respectively. The islands are very small and low-lying with

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many being no more than two metres above the sea level. Malé, one of the islands, is the capital of Maldives and has been the seat of the Government from the beginning of the archipelago's known history. Archeological findings reveal that the islands were inhabited as early as 1500 BC. However, it is believed that the first settlers in those islands were Aryan immigrants who came around 500 BC. Today, Maldivians are a mixed race and throughout Maldives, Dhivehi, a language which belongs to the Indo-Iranian group of languages is spoken.

As with several other countries in the Asian and Pacific region, Maldives also has an implicit population policy aimed at reducing fertility (Ministry of Planning and National Development, 2001b). Until recently the country was considered to have high fertility rates for South Asia, although there have been signs of fertility decline since the early 1990s (Chaudhury, 1996; Ministry of Planning and National Development, 2002). The total fertility rate of the country, which stood at 6.4 during the early 1990s, declined to 5.7 children per woman in 1995. Recent data from the Population and Housing census of Maldives showed a further drop in the total fertility rate to 2.8 in 2000. While the rapid decline recorded recently has been questioned by policy makers on the grounds of poor data quality, researchers argue that the decline in fertility is genuine and can be attributed to several factors, such as the increased use of contraception, improved schooling opportunities in rural areas and the political endorsement of family planning at the highest level (Ministry of Planning and National Development, 2001b).

The primary objective of this paper is to present estimates of fertility obtained directly from the 1995 and 2000 censuses of Maldives. In order to assess the validity of the results from the census, fertility rates are estimated indirectly from other methods, such as the own-children method and the Rele method (data and limitations of those methods are described later). Finally, the P/F ratio method is employed to provide an adjusted estimate of fertility reported in the censuses.

Quality of age and sex data

As indirect methods of fertility estimation heavily rely on the age and sex distribution of the population enumerated in the census, it is essential that these data are first evaluated to ensure their quality. The omission of children and inaccurate reporting of age, such as digit preference and age misreporting, are some of the major limitations of the census. These errors are quite common in many developing countries and Maldives is no exception. These errors may therefore result in a biased estimate of fertility. Various demographic techniques have been developed to

quantify the degree of errors in the age and sex distribution reported in the census (United Nations, 1955). For the purpose of this paper, the Myers' index for digit preference and the United Nations joint score for the accuracy of age and sex reporting have been used to provide an overall assessment of data quality. The Myers' index indicates the extent of age heaping of the population to a particular digit, while the United Nations joint score shows the accuracy of age and sex reporting. The United Nations joint score is a summary index of age ratio score by sex and sex ratio score (see United Nations, 1955 for estimation procedure). The results of these indices, derived from the 1995 and 2000 censuses, are presented in table 1. On the whole, age reporting in the Maldivian censuses was found to be of very high quality, as revealed by the low values of Myers' index (a value of less than 20 shows that age and sex reporting is highly accurate).

Table 1. Myers' index and United Nations joint score, Maldives, 1995 and 2000 censuses

Index	1995 census			2000 census		
	Male	Female	Both sexes	Male	Female	Both sexes
Myers' index	14.8	13.2	14.0	4.4	3.1	3.6
United Nations joint score			15.1			12.6

Source: Ibrahim Naseem (undated). Fertility levels and trends in the Maldives, unpublished manuscript, Australian National University, Canberra.

It can also be seen from this table that there has been a marked improvement in the quality of age reporting in the 2000 census as compared with the 1995 census. This is largely attributed to the fact that the 2000 census made extra efforts to validate age by using respondents' identification cards or birth certificates, wherever possible. Nonetheless, in both the censuses, error due to "age heaping" was somewhat higher for males than for females (Myers' index for males was 4.4 compared with 3.1 for females in the 2000 census). It is also worth noting that digits ending with 0 and 5 were more preferable than other digits and that the preference for digits ending with 0 and 5 was higher for males than for females (figures 1 and 2). This could be due to the fact that men were often not available at the time of the census and therefore, female respondents had to report on behalf of men in the census. It is highly likely that the female respondents may not have correctly reported the age of males during the census.

Figure 1. Myers' index by sex, Maldives 1995

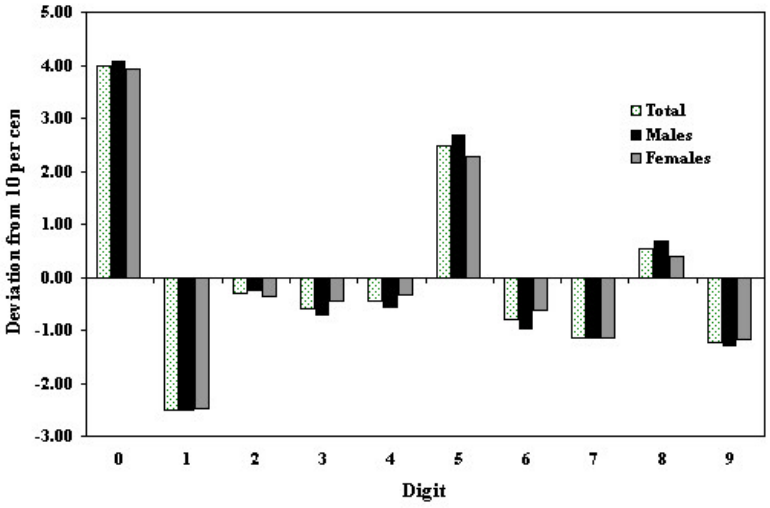
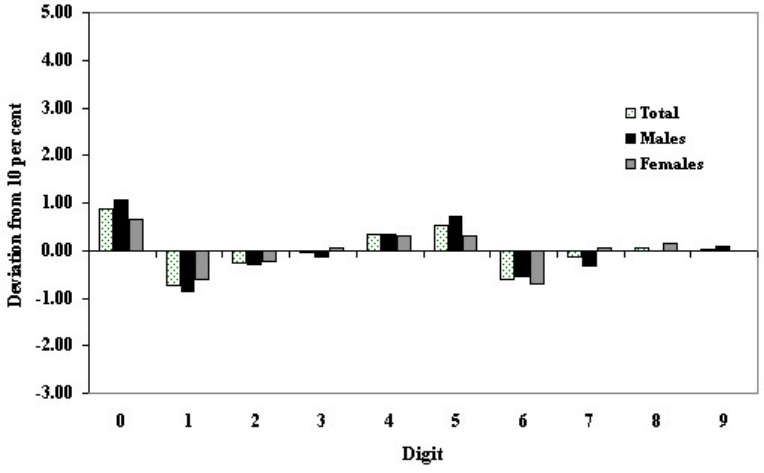


Figure 2. Myers' index by sex, Maldives, 2000



While the Myers' index indicates the extent of preference for certain digits in a single-year age distribution, the accuracy of the five-year age data can be assessed from the United Nations joint score. It can be seen from table 1 that the value of the United Nations joint score dropped from 15.1 to 12.6 between the 1995 and 2000 censuses. Note that a value under 20 indicates that the age and sex reporting is highly reliable. Hence, judging from the low values of the Myers's index and United Nations joint score, it can be concluded that the age and sex data reported in the Maldives censuses, the 2000 census in particular, are of fairly good quality. Hence, it can be assumed that the fertility estimates obtained from indirect methods are unlikely to provide biased results.

Quality of fertility data

The Population and Housing Censuses of Maldives have been routinely collecting data on both current and retrospective fertility since 1985. Those data were collected from women aged 12 years and above in both the 1995 and 2000 censuses. Data on current fertility were obtained by asking, "Did you deliver any live-birth during one year prior to the census?", while the data on retrospective fertility were collected by asking, "How many live-born children have you ever had?" Both censuses administered similar questions to obtain information on current and retrospective fertility. The quality of data on current and retrospective fertility reported in the censuses is, however, not beyond question. The most common problem associated with the collection of data on current fertility is the error resulting from the misplacement and omission of events. In particular, events that occurred close to the beginning or the end of the reference period are likely to be underreported, while data on retrospective fertility are usually underreported owing to recall lapse. Children which were born alive and died soon after birth are more likely to go unreported, with the recall-lapse error rising with the increase in age of women (Kinfu, 1994; Chaudhury, 1996). It is, therefore, important to check the quality of data with regard to the reporting of children ever born to a woman with the age of the woman. A simple method to check the consistency of data is to examine the sex ratio of children ever born by the age of women.

A comparison of the sex ratios of children ever born with the age of the women respondents in the 1995 and 2000 censuses is presented in table 2. These data reveal that there is no systematic bias in the number of children ever born reported by women, as the sex ratios fall within the expected range between 1.04 and 1.07. Furthermore, the mean children ever born show a systematic increase by age of women in both censuses in both the cross section and cohort groupings. It is

therefore reassuring to note that the reported data on children ever born are of reasonably good quality. Hence, indirect estimates of fertility derived from such data may be considered as fairly reliable.

Table 2. Sex ratio of children ever born by age of women, Maldives, 1995 and 2000 censuses

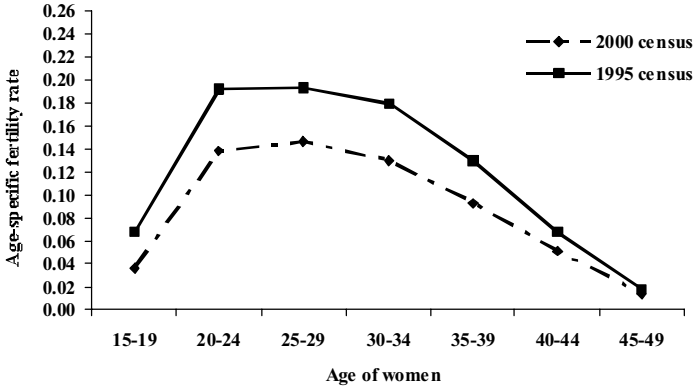
Age of women	1995 Number of children ever born			Sex ratio of children ever born	2000 Number of children ever born			Sex ratio of children ever born	Mean children ever born	
	Total	Male	Female		Total	Male	Female		1995	2000
15-19	1,903	981	922	1.06	1,125	574	551	1.04	0.151	0.068
20-24	14,813	7,618	7,195	1.06	9,516	4,891	4,625	1.06	1.337	0.800
25-29	28,196	14,482	13,714	1.06	22,116	11,441	10,675	1.07	3.003	2.150
30-34	36,594	18,650	17,944	1.04	33,641	17,220	16,421	1.05	4.701	3.629
35-39	38,814	19,872	18,942	1.05	40,265	20,837	19,428	1.07	6.144	5.116
40-44	23,405	12,071	11,334	1.07	38,440	19,749	18,691	1.06	7.099	6.271
45-49	24,250	12,485	11,765	1.06	25,078	12,927	12,151	1.06	7.543	7.198

Source: Population and housing censuses of Maldives, 1995 and 2000 censuses.

Estimation of fertility

As noted previously, data on the number of births that occurred during the 12 months prior to the census are routinely collected in the censuses of Maldives. Using these data from the 1995 and 2000 censuses, this section presents the estimates of age-specific fertility rates and total fertility rates. According to those data, the total fertility rate has been estimated at 5.7 children per woman during the period 1994-1995 and 2.8 children per woman during the period 1999-2000. It is revealed from figure 3 that while a fertility decline has occurred in every age group of women, it is much more prominent in older age groups. This is obviously an indication of the beginning of a fertility transition in Maldives, but the magnitude of the decline – almost three children per woman in the past five years – is so rapid that the quality of data on current fertility is not beyond question. There is therefore a need to provide alternative estimates in order to ascertain the validity of fertility data reported in the census.

Figure 3. Reported age-specific fertility rate Maldives, 1995 and 2000 censuses



Several techniques have been developed to indirectly estimate current fertility, using age distribution of the population and the retrospective data on fertility. For the purpose of this paper, the own-children method and Rele method are used to provide indirect estimates of fertility, while the P/F ratio method is employed to adjust reported fertility for any underreporting.

Application of own-children method.

The own-children method is an indirect technique of fertility estimation using responses to questions on the relationships of household members reported in the censuses or surveys (Cho, Retherford and Choe, 1986; Kinfu, 1994; Abbasi-Shavazi, 1997). It is basically a reverse survival technique that requires the matching of children with their mothers. This matching algorithm is carried out on the basis of information on age, relationship of each respondent to the head of the household and other members, mothers in particular. The input data required for the application of the own-children method is the single-year age distribution of the population under age 15 by the age of their own mothers; the data are then tabulated in the 1995 and 2000 censuses of Maldives. Based on this method, age-specific fertility rates are estimated by the reverse projection of enumerated children to the time of their birth and the female population to each of the years preceding the census. The advantage of this method is that it does not depend on any assumptions about fertility trends and is not sensitive to assumptions about recent changes in the level of fertility (United Nations, 1983).

Table 3. Percentage of unmatched children, Maldives, 1995 and 2000 censuses

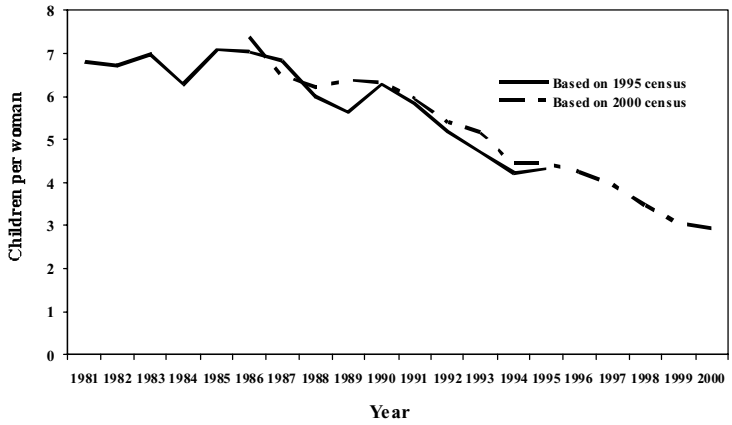
Age of children	Number of matched children		Number of unmatched children		Percentage of unmatched children	
	1995	2000	1995	2000	1995	2000
0	7,044	5,515	773	727	11.0	13.2
1	6,705	5,552	739	743	11.0	13.4
2	7,274	6,083	783	767	10.8	12.6
3	7,691	6,752	840	868	10.9	12.9
4	8,258	7,010	877	862	10.6	12.3
5	8,625	7,114	931	912	10.8	12.8
6	7,635	6,875	844	896	11.1	13.0
7	7,704	7,777	881	993	11.4	12.8
8	8,461	7,849	1,115	1,066	13.2	13.6
9	8,334	8,312	1,168	1,225	14.0	14.7
10	8,088	8,459	1,241	1,293	15.3	15.3
11	6,990	8,276	1,208	1,460	17.3	17.6
12	7,381	7,783	1,493	1,618	20.2	20.8
13	6,839	7,868	1,565	1,957	22.9	24.9
14	6,572	8,687	1,814	2,531	27.6	29.1
Total	**113,601**	**109,912**	**16,272**	**17,918**	**14.3**	**16.3**

Source: Ministry of Planning and National Development (2002).

A prerequisite of this method, however, is the examination of the proportion of matched and unmatched children enumerated in the censuses, because the higher proportion of unmatched children reported in the census may result in a biased estimate of fertility. The 1995 and 2000 censuses enumerated a total of 34,443 and 39,759 households respectively, of which 113,601 and 109,912 were children under 15 years of age. There were also 79,763 and 95,058 women aged 10 to 65 years in the 1995 and 2000 censuses, respectively. Enumerated children were linked with their mothers based on the information on age, relationship of each respondent to the head of the household and other members of the household. Proportions of matched and unmatched children for both censuses are presented in table 3.

It is apparent from this table that the percentage of unmatched children increases with the age of the children. The results, however, also show that the percentage of unmatched children is less than the 20 per cent (excepting those aged 12 to 14), which is considered the upper limit to provide a fairly reasonable estimate of fertility (Cho, Retherford and Choe, 1986). The 1995 and 2000 censuses data can, therefore, provide a fairly reliable estimate of time trends in fertility during the past 10 years.

Figure 4. Total fertility rate using own-children method, Maldives, 1981-2000



A software package, EASWESPOP: Fertility Estimation Program (East-West Center, 1987) has been applied to estimate fertility trends, the results of which are shown in figure 4 and summarized in table 4. According to figure 4, the total fertility rate has steadily declined from an average of 7 children per woman in the 1980s to 6 children in the late 1980s. A precipitous decline in fertility began taking place in the early 1990s, dropping to around 4 children around the mid-1990s and eventually declining to 3 children in the year 2000. The lack of serious fluctuations in time trends in fertility indicates the reliability of the estimates. Summary results presented in table 4 further reinforce the quality of the fertility estimates. The results reveal that these two data sets present remarkably close estimates and the total fertility rates of 4.8 and 5.0 for the period 1991-1995 provided independently based on the 1995 and 2000 censuses are almost identical, reconfirming the validity of the estimates using the own-children method.

Application of Rele method

Yet another indirect technique of fertility estimation which can be used to check the consistency of the total fertility rate is the Rele method (Rele, 1976). As with the own-children method, the Rele method uses the age distribution of the population to estimate the total fertility rate. This method is based on the reported child-woman ratio and an estimate of the expectation of life at birth. The method estimates the adjusted child-woman ratio (CWR), gross reproduction rate and total

fertility rate. The child-woman ratio is defined as the ratio of children aged 0 to 4 to women aged 15 to 49.

While a reported child-woman ratio of 615 children per 1,000 women and a life expectancy at birth of 70.6 years (Ministry of Planning and National Development, 1998) for both sexes were used to estimate fertility using the 1995 census, and a reported child-woman ratio of 423 children per 1,000 women and a life expectancy at birth of 71.4 years (Ministry of Planning and National Development, 2001a) for both sexes were used to estimate fertility using the 2000

Table 4. Estimates of age-specific fertility rate and total fertility rate based on own-children method, Maldives, 1995 and 2000 censuses

Age of women	1981-1985	1986-1990	1991-1995	1996-2000
Results from the 1995 census				
15-19	0.2069	0.1613	0.0901	-
20-24	0.3305	0.2854	0.2116	-
25-29	0.3231	0.3021	0.2245	-
30-34	0.2580	0.2594	0.2027	-
35-39	0.1507	0.1703	0.1484	-
40-44	0.0651	0.0662	0.0670	-
45-49	0.0194	0.0196	0.0195	-
TFR	**6.8**	**6.3**	**4.8**	
Rate of decline (percentage)	**-**	**7.1**	**31.2**	
Results from the 2000 census				
15-19	-	0.1473	0.1021	0.0454
20-24	-	0.2934	0.2223	0.1546
25-29	-	0.3063	0.2308	0.1680
30-34	-	0.2641	0.2022	0.1498
35-39	-	0.1910	0.1597	0.1096
40-44	-	0.0781	0.0729	0.0553
45-49	-	0.0226	0.0168	0.0165
TFR		**6.5**	**5.0**	**3.5**
Rate of decline (percentage)		**-**	**29.4**	**44.0**

Source: Estimates based on the own-children method.

census. As a result, the total fertility rate of 4.9 children per woman referring to the period 1991-1995 and the total fertility rate of 3.3 children per woman referring to the period 1996-2000 were obtained. Those rates are found to be highly consistent with the rates obtained directly from the censuses and those estimated from the own-children method, giving more confidence to the reliability of the reported fertility levels from the 1995 and 2000 censuses.

Adjustment of reported fertility using P/F ratio technique

The 1995 and 2000 censuses of Maldives collected data on current fertility, that is, the number of births that occurred 12 months prior to the census. In these censuses, retrospective data on fertility, that is, children ever born are also gathered from women in the reproductive ages. When both types of data are available, a technique can be applied to obtain a reasonable estimate of fertility by comparing the most reliable features of the two sets of data. The comparison of lifetime fertility and current fertility data can also provide a method of adjustment in cases where the data are distorted by typical errors. The adjustment procedure to correct current fertility is known as the P/F ratio technique (United Nations, 1983). Where P is the mean parity by age group of women and F is the age-specific fertility rates in the corresponding age group of women.

As mentioned previously, the current fertility level may be either distorted by a misconception of the length of the reference period or due to general omissions of births. If those errors can be assumed to be constant with respect to age, the age pattern of observed fertility can be accepted as correct although its level may be distorted. Cumulative current fertility may thus be compared with the reported lifetime fertility of women younger than 30 or 35 years in order to obtain an adjustment factor for the level of current fertility rates, which once adjusted for the level provide a better estimate of actual current fertility.

This method was originally developed by Brass (1964) under the assumption of constant fertility in the recent past. However, Arriaga (1983) later modified this method and extended it to a condition of changing fertility. If data on children ever born and age-specific fertility rates are available from two censuses taken 5 or 10 years apart, age-specific fertility rates can be estimated for the one-year period following the first census and the one-year period preceding the second census. The estimated age-specific fertility is then compared with the reported age-specific fertility rate to provide the adjustment factor. The software program MORTPAK, for Windows, (United Nations, 2003) was used to analyse the data from the 1995 and 2000 censuses of Maldives. While detailed results are given in annex 1, summary results are presented in table 5.

Table 5. Reported and adjusted age-specific fertility rate and total fertility rate, Maldives, 1995 and 2000 censuses

Age of women	Age-specific fertility rate			
	1995 census		2000 census	
	Reported	Adjusted	Reported	Adjusted
15-19	0.0602	0.0727	0.0288	0.0390
20-24	0.2168	0.2250	0.1276	0.1435
25-29	0.2339	0.2332	0.1403	0.1492
30-34	0.2194	0.2164	0.1209	0.1259
35-39	0.1955	0.1904	0.0875	0.0892
40-44	0.1253	0.1092	0.0400	0.0382
45-49	0.0837	0.0807	0.0095	0.0077
Total fertility rate	**5.7**	**5.6**	**2.8**	**3.0**

The results of the P/F ratio method reveal that the current fertility reported in the 1995 and 2000 censuses of Maldives is fairly accurate. It is evident from annex 1 that the P/F ratios based on the 2000 census are highly consistent, confirming that the current fertility reported in the census is not grossly underestimated. Using the adjustment factor based on women aged 20-24, the total fertility rate has been corrected slightly upwards to 3.0, from the reported total fertility rate of 2.8 in the 2000 census.

Discussion and conclusion

Until recently, the fertility level of Maldives was considered to be very high. The 1990 and 1995 censuses reported total fertility rates of 6.4 and 5.7, respectively. It was only in the 2000 census that the level of fertility in Maldives was reported to be as low as 2.8. While this is an indication of the beginning of a fertility transition in the islands, the magnitude of the decline — almost three children per woman in the past five years — is so rapid that the quality of data on current fertility is not beyond question.

In order to justify that the reported total fertility rates in the censuses are fairly reliable, trends in total fertility rates have been estimated by indirect techniques, results of which are summarized in table 6. As these techniques are

dependent on the age and sex distribution of the population, it is essential that data quality reported in the census is fairly accurate. An assessment of data quality, using such indicators as the Myer's index for age heaping and the United Nations joint score for age-sex accuracy, reveals that the age and sex data reported in the census are of very high quality. It was also found that the quality of data reported in the 2000 census was much higher than that of the 1995 census (Ministry of Planning and National Development, 2002). Hence, the fertility estimates derived from those data can be assumed to be fairly reliable.

One of the indirect methods used in the past several years to estimate fertility is the own-children method. The 1995 and 2000 census data provide a fairly reasonable estimate of time trends in fertility during the past 10 years. It is to be noted that the total fertility rates of 4.8 and 5.0 for the period 1991-1995 provided independently based on the 1995 and 2000 censuses are almost identical, reassuring the validity of the estimates using the own-children method.

Further evidence of the validity of the reported total fertility is provided by the Rele method, which is based on the child-women ratio and life expectancy at

Table 6. Estimates of total fertility rate for Maldives based on various methods

Method	Period				
	1986-1990	1991-1995	1994-1995	1996-2000	1999-2000
Direct estimate:					
1995 census			5.7		
2000 census					2.8
Adjusted estimate using P/F ratio method based on 1995 and 2000 censuses			5.6*		3.0
Own-children method:					
1995 census	6.3	4.8			
2000 census		5.0		3.5	
Rele method:					
1995 census		4.9			
2000 census				3.3	

Note: * Refers to the period 1995-1996.

birth. According to the Rele method, the TFR is estimated at 4.9 during the period 1991-1995 and 3.3 during the period 1996-2000. Finally, the P/F ratio technique was applied to provide an adjusted fertility for the 1995 and 2000 censuses. A comparison of several estimates, presented in table 6, confirms that the reported fertility in the censuses of Maldives is fairly accurate. Hence, based on this evidence, it can be concluded that the total fertility rate has steady declined from 6.3 during the period 1986-1990 to 5.7 during the mid-1990s and has continued at a fast rate. Apparently, the current fertility has sharply dropped to around 3.0 during the period 1999-2000.

There is, however, a need to provide some justification for the rapid fertility decline in Maldives. While the absence of a fertility survey in the Maldives prohibits the analysis of the proximate determinants of fertility, some evidence of positive socio-economic changes occurring in the islands can be put forward to support the fertility decline. For example, the reproductive health baseline survey conducted in 1999 shows a contraceptive prevalence rate of 42 per cent among currently married women aged 15-49 years (Ministry of Health, 1999). GDP per capita is estimated at US$2,082 for 2001, which is second highest in South and South-West Asia after Turkey (US$2,230). The infant mortality rate is estimated at 39 per 1,000 live births and life expectancy at birth is 66 years for males and 69 years for females. Those indicators are fairly close to Turkey, which has a total fertility rate of 2.4 (ESCAP, 2004). Furthermore, the singulate mean age at marriage for females increased from 19 to 22 years between 1990 and 2000 (Ministry of Planning and National Development, 2002). Increasing levels of affluence may also be a significant factor contributing to fertility reduction. A negative relationship between younger women's fertility and the level of household affluence was found by Niyaaz (2000:302)

A sharp reduction in the population growth rate and changing age structure during the past 15 years can also be attributed to a precipitous fall in fertility in Maldives. The annual population growth rate has declined from 3.4 per cent during the period 1985-1990 to 2.8 per cent during the period 1990-1995 and to 1.9 per cent during the period 1995-2000. Of particular importance, the proportion of child population aged 0 to 4 has been reduced from 18.3 per cent in 1985 to 15.1 per cent in 1995 to 11.5 per cent in 2000.

The fertility of a woman is known to be affected by several "direct" and "indirect" factors (Davis and Blake, 1956; Bongaarts, 1978; Bongaarts, 1993; Stover, 1998). Indirect factors are the socio-economic and environmental factors of individuals and families, such as education, employment, family type and

composition; while the direct factors are the so-called "exposure factors", "deliberate fertility control factors" and "natural factors that are known to affect fertility" (Bongaarts, 1978). Niyaaz (2000) has shown that education among Maldivian women has had a significantly negative effect on their fertility, with the relationship stronger among urban women compared to rural women.

There are four commonly used hypotheses in fertility decline: socialization, adaptation, selectivity and disruption (Goldstein and Goldstein, 1982; Hervitz, 1985), although more recent literature seem to ignore the first (Brockerhoff, 1996; Lee and Pol, 1993). In the case of Maldives, theories of social interaction (Watkins, 1991; Bongaarts and Watkins, 1996) provide further insight into factors that may be linked to the rapid fertility decline. For example, rapid growth of education and the high rates of internal mobility between rural areas and urban areas stimulate the diffusion of new ideas regarding the benefits of small family norms, thereby enhancing the speed of the fertility decline across the country. High rates of rural to urban migration may have therefore contributed to a rapid fertility decline in Maldives.

While above evidences provide some support for a rapid decline in fertility in the islands, there is, however, a strong need for a well-designed DHS-type survey. This will provide an opportunity not only to confirm the level of fertility but also to examine its proximate determinants. Unfortunately, Maldives has so far not been involved in any of the past global fertility surveys, such as the World Fertility Survey, Contraceptive Prevalence Survey and the Demographic and Health Surveys, it is strongly recommended that a national level fertility survey be carried out in the near future.

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Annex 1. Estimation of age-specific fertility rates and total fertility rate based on P/F ratio method applied to the 1995 and 2000 censuses of Maldives

Age groups	Mean children ever born (CEB)	Fertility consistent with CEB (ASFR)	Fertility pattern by age at survey date	Fertility pattern by age at birth of child	Cumulation of		Adjustment factor (P/F ratio)	Age-specific fertility rates based on adjustment factor for the age group		
					ASFR	Fertility pattern by age at birth		20-24	25-29	30-34
1995-1996										
			Recorded	**Calculated**						
15-19	0.151	0.0908	0.0602	0.0731	0.0908	0.0731	1.2422	0.0727	0.0628	0.0677
20-24	1.337	0.2069	0.2168	0.2265	0.2977	0.2996	0.9937	0.2250	0.1945	0.2097
25-29	3.003	0.1610	0.2339	0.2347	0.4587	0.5343	0.8587	0.2332	0.2015	0.2174
30-34	4.701	0.1128	0.2194	0.2178	0.5715	0.7521	0.7599	0.2164	0.1870	0.2017
35-39	6.144	0.0359	0.1955	0.1916	0.6074	0.9437	0.6436	0.1904	0.1645	0.1775
40-44	7.099	0.0087	0.1253	0.1099	0.6161	1.0535	0.5848	0.1092	0.0943	0.1018
45-49	7.543	0.0033	0.0837	0.0813	0.6193	1.1348	0.5458	0.0807	0.0698	0.0753
Total fertility rate:		3.10		5.67				5.64	4.87	5.26
1999-2000										
			Recorded	**Calculated**						
15-19	0.068	0.0460	0.0288	0.0365	0.0460	0.0365	1.2615	0.0390	0.0356	0.0373
20-24	0.800	0.1364	0.1276	0.1343	0.1824	0.1707	1.0685	0.1435	0.1310	0.1372
25-29	2.150	0.1204	0.1403	0.1396	0.3028	0.3104	0.9756	0.1492	0.1362	0.1427
30-34	3.629	0.0934	0.1209	0.1178	0.3962	0.4282	0.9252	0.1259	0.1150	0.1204
35-39	5.116	0.0639	0.0875	0.0835	0.4601	0.5117	0.8992	0.0892	0.0814	0.0853
40-44	6.271	0.0338	0.0400	0.0357	0.4940	0.5474	0.9023	0.0382	0.0349	0.0365
45-49	7.198	0.0126	0.0095	0.0072	0.5065	0.5546	0.9133	0.0077	0.0070	0.0073
Total fertility rate:		2.53		2.77				2.96	2.71	2.83

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