Women's Preferences for Children in Shifang County, Sichuan, China

Fertility preference is related to government policy in China and therefore has been a sensitive topic in Chinese fertility surveys. Direct measures of fertility preference among Chinese women, from responses to direct questions about the number of children they desire, are generally biased downward. The study described here uses a binomial probit model to estimate the probability that family-size preferences reported by women in Shifang County, Sichuan, China, are understated. It estimates both the overall percentage of understatement and the number of children "truly" desired by women of different ages and social characteristics. The number actually desired is estimated to be on average half a child greater than the number reported. Using binomial and ordered probit models, the study also estimates Shifang women's preferences for sons versus daughters. The results indicate that son preference among Shifang women is weaker than expected, although it is still strong among mothers considering only one child, particularly in rural areas. Possible reasons for the inferred decline in son preference are suggested.
by Jichuan Wang

As developing societies have experienced economic growth and social change, increased public awareness of effective techniques of birth control, and greater availability of family planning services, fertility behavior has increasingly become a matter of conscious choice. Couples' family-size preferences have accordingly become an important determinant of fertility.

For several decades most fertility surveys have included questions about respondents' desired number of children. Desired number of children is usually measured by answers to a hypothetical question: "If you could choose exactly the number of children to have in your lifetime, how many children would that be?" (International Statistical Institute 1975: Appendix I). Although empirical studies based on responses to that question have provided evidence of a strong relationship between desired number of children and actual fertility behavior (Knodel and Prachuabmoh 1973; Freedman et al. 1975; Hermalin et al. 1979), the measurement is widely recognized to be subject to deficiencies of validity, reliability, and intensity of the attitudes reported (Hauser 1967). The measurement problem is even more complicated in a country like China, where a large fraction of respondents are poorly educated or illiterate and fertility attitudes are influenced by government policy and therefore politically sensitive.

Many surveys show a desire for only one child among large numbers of young Chinese, both married and unmarried (Hong et al. 1984; Chen and Luo 1985). Comparing the results of various Chinese surveys, Whyte and Gu (1987: 489) report that for 14 out of 20 population groups they studied—including rural, urban, metropolitan, and several special groups—the mean number of children preferred was less than two.

Measuring desired family size is especially complicated in China because family size is influenced by policy and therefore a politically sensitive issue.

Hermalin and Liu (1990), however, believe this average understates true family-size preferences in China. They indirectly estimated the number of children desired by women in Shanghai, China's largest city, by using a standardization approach and data from two surveys conducted in the same region with different interviewing procedures.

In the study presented here I used an alternative method to estimate not only the desired number of children but also preference for the sex of children among women in Shifang County, Sichuan Province. Respondents were asked directly about the number and sex of children they preferred. They were also asked to compare hypothetical families of various compositions and indicate their preferences among them.

The purpose was twofold. First, I wanted to ascertain whether the
number of children that respondents “truly” desired was greater than the number they reported when asked directly about their fertility preference, and to estimate the probability that women having specific characteristics would under-report the number of children they really desired. Second, I hoped to learn whether son preference exists among Shifang women, if there has been any change in the values attached to sons and daughters, and, if so, what factors would explain the change.

■ The study area

Shifang County is located on the northern edge of the fertile Chengdu plain, about 60 kilometers northwest of Chengdu, the capital city of Sichuan Province (Figure 1).

In 1986 it had a population of 393,732, 85.3 percent rural and 14.7 urban. (Urban residents are defined by the government as those who are entitled to grain rations.)

A nationally renowned model for birth planning performance in China, Shifang County has been frequently commended by the provincial and national governments for its outstanding achievement in planning and limiting births over the past two decades. Its crude birth rate declined from 34.2 to 13.7 births per thousand population between 1971 and 1976 and in 1978 reached the extremely low level of 8.7 births per thousand. The rate remained at a low level until 1986 (Wang 1989:5).

The experience of the family planning program in Shifang County is being replicated in other areas of China. Given that China’s fertility transition is a program-induced process, understanding the reproductive attitudes of the Shifang population may provide insights about the demographic behavior of Chinese in other areas of the country.

■ The sample and study design

In July 1987 I conducted a fertility survey of women between ages 15 and 65 in Shifang County. The survey was based on a stratified multistage cluster sample of the county’s population. The county’s population was divided into three strata (urban, rural mountainous, and rural plain areas) with villages as clusters, and a cluster sample of 31 villages was drawn randomly with probability proportional to size. Then 501 households were randomly selected from the sampled villages and an effort was made to interview all women between ages 15 and 65 in the selected households.

The interviews, which were conducted in the first half of July 1987, generally took place in the respondents’ homes, or if a respondent’s residence was too far away, at a more central place, such as a village school classroom or village meeting room. The day before each interview was to take place, a village cadre visited the household and requested the household head and women between ages 15 and 65 residing in the household to stay at home or go to the designated interview site at a scheduled time.

Although an average interview took less than two hours, interviewers were able to canvass only about
two and a half households per day because they had other administrative responsibilities. A few respondents were not at home at the time of their scheduled interviews and were interviewed at their workplaces. Only those who could not be reached, fewer than 5 percent of the drawn sample, were excluded from the survey. The final sample consisted of 664 women.

In conducting the survey I was assisted by 14 teachers from the Sichuan Family Planning Cadre College and eight students of the college who were former local family planning committee personnel or leaders in other counties of Sichuan Province. Two family planning personnel of the Shifang County Family Planning Committee also provided assistance and took part in the sampling work.

Our work was made more efficient through the efforts of the local cadres, who led us to the respondents’ homes and interview sites at the scheduled times. The involvement of the local authorities, however, introduced a note of formality to the survey. To minimize the potentially inhibiting effect of their participation, we requested that village cadres be absent during the actual interviews.

One of the major objectives of the survey was to measure women’s preferred family composition. Respondents were asked directly about how many children of each sex they desired in the following questions: “How many children would you prefer to have altogether if there were no family planning program?” and “How many sons would you prefer to have among them?”

In addition, the respondents were shown pictures illustrating pairs of hypothetical families and asked to indicate which family type they preferred in each picture. The illustrations represented three types of paired comparisons: (1) comparisons between one- child families with various gender combinations; (2) comparisons between a son and a daughter in single-child families; and (3) comparisons of various gender combinations within two-child families.

For example, the left side of a picture might show a couple with a boy, and the right side a couple with two girls. The cards were presented in a consistent order and shown one by one so that respondents were forced to consider only two choices at a time. (If a respondent had no preference for either type of family portrayed on a particular card, her response was treated as a missing value. Approximately 2 percent of responses were thus coded.)

During this portion of the interview the respondents appeared to be relaxed and behaved as though the questions were part of a game. My intention was that, through the psychological process of projection, they would reveal their real fertility preferences in the course of playing the game.

To test for possible understatement of women’s desired family size and for their actual sex preferences, I compared their responses to direct and hypothetical questions about preferred family size and composition.

■ Study model for family-size preference

The reported number of children preferred, expressed mathematically, was \( C_i = f_i \) (\( i = 1, 2, \) or 3). If a respondent reported a preference for a \( j \)-child family with a specified gender combination, her selection from the paired comparisons of this specific family and families with \( j + 1 \) children of all possible gender combinations was used to determine whether she had underreported her desired family size.

For example, if in response to a direct question a respondent reported a preference for one child and also for at least one son, I used her selections from the paired comparisons of a one-son family and a two-child family of all possible gender combinations to determine whether she had underreported her desired number of children. If she had indicated a preference for any of the two-child families rather than a one-son family, I interpreted this to mean that she actually preferred, at least to some extent, to have more than one child.

For those who reported that they had no preference regarding the sex of their children (about one-third of the respondents stated no prefer-
ence), I examined their choices among the pairs of hypothetical family compositions with \( j \) and \( j + 1 \) children of all possible gender combinations. If a respondent preferred any hypothetical family with \( j + 1 \) children to a family with \( j \) children, I suspected that she had, at least to some extent, understated her preferred family size.

Because the number of children in the illustrated hypothetical families did not exceed three, it was not possible to determine whether respondents who expressed a preference for three or more children (almost no respondents reported a preference for more than three children in my survey) underreported their true preference. Respondents expressing a preference for three children were treated as the baseline group and assumed not to have understated their preferred family size.

A binomial probit model was used to analyze the preference for number of children (see Hanushek and Jackson 1977:198; Kmenta 1986:553–554). I defined the dependent variable as \( Y_i = 1 \) if a respondent understated her desired family size, \( Y_i = 0 \) if not. The independent variables were three factors known to be associated with fertility preference: women’s urban–rural residence, their educational attainment, and their age.

On the assumption that in any population, regardless of the normative family-size preference, at least some women will prefer a small family (of one or two children), my research hypothesis was that such women were more likely to be “modern”—that is, younger, more urban, and better educated—than women who preferred to have larger families. Therefore I expected to find smaller proportions of younger, more urban, and better-educated women understating their actual desired family size than of women who were older, rural, and less educated, when they reported desiring a small family size.

Although the Chinese government strongly encourages couples to limit their family size to one child, evidence from the Shifang County survey indicates that most women, especially rural women, would prefer two children if the one-child policy were not a consideration.
I expected to find that younger, more urban, and better educated women who expressed a desire for only one or two children were less likely than other women to underestimate their actual desired family size.

Whereas residence was treated as a dichotomous variable (rural versus urban), I divided women's educational attainment into three levels (no school, primary school, and middle school or higher) and age also into three cohorts (15–24, 25–34, and 35 and above). The reported number of children preferred, $C_{Ri}$ was included in the model as a covariate.

## Study model for gender preference

To analyze respondents' preferences for children of a particular sex, I employed both a binomial probit model and an ordered probit model (see McKelvey and Zavoina 1975; Maddala 1983:46–49). The binomial model was used to determine whether a woman would prefer a son or a daughter if she wanted to have only one child, and the ordered probit model was used to examine sex preference among respondents preferring a two-child family.

For respondents preferring a single-child family, the dependent variable was defined as $Y_{i} = 1$ if a son was preferred, $Y_{i} = 0$ if preference was for a daughter. In the case of a two-child family, I measured the dependent variable, son preference, by means of ordinal categories ranging from the weakest to the strongest preference for a son. Thus the values 0, 1, 2, and 3 for $Y_{ij}$ represented strong daughter preference, weak daughter preference, weak son preference, and strong son preference, respectively. The ordinal category of strong daughter preference was normalized to zero.

These ordinal measures of $Y_{ij}$ were based on respondents' choices among the pairs of hypothetical families with two children. Three combinations of gender were possible: (A) two sons and no daughter; (B) one son and one daughter, and (C) two daughters and no son.

I coded a respondent's gender preference as 3 (strong son preference) if she preferred two sons and no daughter to one son and one daughter. The preference can be expressed mathematically as $A > B$. Similarly, I coded her preference as 2 (weak son preference) if she preferred one son and one daughter to two sons and no daughter but also preferred two sons and no daughter to two daughters and no sons ($A < B$, but $A > C$); as 1 (weak daughter preference) if she preferred one son and one daughter to no son and two daughters but also preferred two daughters and no son to two sons and no daughter ($C < B$, but $C > A$); and as 0 (strong daughter preference) if she preferred two daughters and no son to one son and one daughter ($C > B$).

I theorized the existence of an unmeasured "true" son preference, $Y_{i}^{*}$, for each individual. On the scale of true son preference I demarcated three thresholds: $\mu(0)$, $\mu(1)$, and $\mu(2)$, the first threshold being normalized to zero. Thus each respondent could be located in one of four ordinal categories on the scale. If $Y_{i} < \mu(0)$, then $Y_{ij} = 0$; if $\mu(0) < Y_{i} < \mu(1)$, then $Y_{ij} = 1$; if $\mu(1) < Y_{i} < \mu(2)$, then $Y_{ij} = 2$; if $\mu(2) < Y_{i}$, then $Y_{ij} = 3$. As I was interested in the effect of respondents' age and social characteristics on their "true" son preference, my analysis focused on the probabilities of their being located in the ordinal categories of son preference. The estimated $Y_{i}^{*}$ values and the three thresholds are not displayed here.

Given the traditional value attached to sons in Chinese society, I expected son preference to vary only modestly among respondents regardless of age and social background.

All independent variables considered in the model for studying respondents' family-size preference, except $C_{Ri}$, were included in this model as well. Given the pervasive and traditional value attached to sons in Chinese society, I hypothesized that son preference would vary only modestly with respondents' scores on the modernization indices (see Coombs and Sun 1978).

## Results

### Desired number of children.
Table 1 shows the probabilities of respondents' underreporting their actual preferred family size, by age group and social characteristics. Rural women were more likely than urban women to underreport their desired number of children when the stated preference was for one or two, which is what one would expect if the proportion of women really preferring one or two children is larger in urban areas than in
rural areas. But given that urban women tend to be generally more sophisticated than rural women, it is possible that urban respondents were more careful to match their choices of paired comparisons during the second part of the interview with the number of children they had reported when asked directly about their preferred family size. As a result, the estimated probability of underreporting by urban women shown in Table 1 might be biased downward. Unfortunately it is not possible to estimate this possible bias with the data from the study.

Among rural respondents who stated that they preferred to have one child, the probability that this preferred number was understated was 84 percent. A somewhat smaller majority (60 percent) of urban women expressing a preference for one child also probably understated their family-size preference. The probability of underreporting was significantly different for rural and urban women at the 1 percent level.

Among respondents stating two children as their desired number, only 24 percent of rural women and 6 percent of urban women probably understated their actual preference. The probability of underreporting was also significantly different for rural and urban women at the 1 percent level.

As hypothesized, women with little or no formal education were more likely to understate their family-size preference than were women with more education if they expressed a preference for one or two children. It is also possible that the better-educated respondents understated their preference more than the estimated probability for them indicates because they may have been more careful than less educated women to match their paired-family selections with their reported desired number of children.

Among the three age groups, women of ages 25–34 had estimated probabilities of underreporting their true family-size preferences only marginally different from those of the other age groups, net of residence and educational attainment. For women of that age group expressing a desire for one child, the probability was slightly lower than in the other two age groups (.79 versus .80), whereas for those

Table 1. Estimated probability of preferring more than the reported desired number of children, by background characteristics of women: Shifang, Sichuan Province, China, 1987

<table>
<thead>
<tr>
<th>Reported no. of children desired and background characteristic</th>
<th>Probability</th>
<th>Stand. error</th>
<th>No. of women</th>
</tr>
</thead>
<tbody>
<tr>
<td>One child ( (C_i = 1) )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>.80</td>
<td>.0982</td>
<td>213</td>
</tr>
<tr>
<td>[Urban]</td>
<td>.84**</td>
<td>.0379</td>
<td>178</td>
</tr>
<tr>
<td>No school</td>
<td>.60</td>
<td>.0572</td>
<td>35</td>
</tr>
<tr>
<td>Primary school</td>
<td>.86**</td>
<td>.0539</td>
<td>61</td>
</tr>
<tr>
<td>[Middle school + ]</td>
<td>.80*</td>
<td>.0781</td>
<td>105</td>
</tr>
<tr>
<td>Ages 15–24</td>
<td>.70</td>
<td>.1109</td>
<td>47</td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>.80</td>
<td>.0747</td>
<td>78</td>
</tr>
<tr>
<td>Ages 35 +</td>
<td>.79*</td>
<td>.1238</td>
<td>46</td>
</tr>
<tr>
<td>[Ages 35 + ]</td>
<td>.80</td>
<td>.1021</td>
<td>89</td>
</tr>
<tr>
<td>Two children ( (C_i = 2) )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>.24**</td>
<td>.0533</td>
<td>409</td>
</tr>
<tr>
<td>[Urban]</td>
<td>.24**</td>
<td>.0533</td>
<td>391</td>
</tr>
<tr>
<td>No school</td>
<td>.06</td>
<td>.0207</td>
<td>18</td>
</tr>
<tr>
<td>Primary school</td>
<td>.28**</td>
<td>.0502</td>
<td>158</td>
</tr>
<tr>
<td>[Middle school + ]</td>
<td>.22*</td>
<td>.0429</td>
<td>182</td>
</tr>
<tr>
<td>Ages 15–24</td>
<td>.16</td>
<td>.0444</td>
<td>69</td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>.19</td>
<td>.0421</td>
<td>88</td>
</tr>
<tr>
<td>Ages 35 +</td>
<td>.27*</td>
<td>.0604</td>
<td>143</td>
</tr>
<tr>
<td>[Ages 35 + ]</td>
<td>.22</td>
<td>.0579</td>
<td>178</td>
</tr>
</tbody>
</table>

Note: Characteristics in brackets are omitted categories in the model.

** Difference from omitted category is statistically significant at the 1 percent level.
* Difference from omitted category is statistically significant at the 5 percent level.

Four-fifths of the respondents who expressed a desire for one child understated their family-size preference, but only about one-fourth of those reporting a desire for two children did so.

reporting a desire for two children it was slightly higher (.27 versus .19 and .22). These findings indicate that in all three age groups, under-reporting family-size preference was common—in fact, it was the rule rather than the exception among
women expressing a preference for one child.

The data presented in Table 1 thus indicate that four-fifths of the respondents who expressed a desire for one child understated their family-size preference, but only about one-fourth of those reporting a desire for two children did so. On the assumption that underreported family-size preferences were deflated by at most one child, the number of children "actually" desired, \( C^*_k \), by women with characteristic \( k \) can be estimated from \( N_{ck} \) and \( P_{ck} \):

\[
C^*_k = \sum_{c_k=1}^3 \left( N_{ck} \cdot C_k + N_{ck} \cdot P_{ck} \right) / N_k
\]

where \( C_k \) is the reported number of children desired, equals 1, 2, or 3;

\( N_{ck} \) is the number of respondents with characteristic \( K \) who preferred \( C_k \);

\( P_{ck} \) is the estimated probability, based on paired comparison data, that the same respondents preferred more than \( C_k \);

and \( P_{ck} \) is assumed to be zero, meaning that no underreporting occurred if a respondent chose three children as her desired family size.

The estimated values of the "truly" desired number of children, \( C^*_k \), and the corresponding weighted average values of the reported desired number of children, \( C_k \), are shown in Table 2. For the total sample and for each subgroup, the estimated number of children "truly" desired exceeds the reported number desired. For the sample as a whole the mean number "truly" desired is 2.13, or about half a child more than the mean reported number (1.73). Not surprisingly, rural women, those with no formal education, and older women desired and reported desiring more children than the comparison groups.
The proportions stating a preference for one child were greater among urban, more educated, and younger women. As a majority of respondents underreported their actual family-size preference when they stated that they desired only one child, the large proportion stating a preference for one child contributes a disproportionate weight to overall underreporting. As a result, the relative difference between $C_h^*$ and $C_b$, or the percentage of underreporting, was greater among those same women than among the comparison groups, regardless of preferred family size (last column of Table 2). Thus more modern (i.e., urban, younger, and more educated) women appear to be more sensitive to the government's one-child policy and more likely to hide their real attitudes toward family size in the face-to-face interviews.

Urban, younger, and more educated women appear to be more likely to hide their real attitudes toward family size than other women when asked directly about their family-size preference.

According to the results presented in Table 2, the mean number of children "truly" desired by Shifang women was slightly more than two. Although that is a very low number for a rural Chinese community, obviously a real gap exists between the government's one-child goal and the individual preferences of the women sampled.

It is reasonable to infer that the fertility level induced by the family planning program in Shifang County was even lower than couples' preferred fertility. In 1981 the total fertility rate in Shifang was only 1.16. It was probably even lower in 1984, when the crude birth rate reached a historically low level of 8.2 births per thousand population (Shifang County Family Planning Commission 1980–86). The difference between couples' fertility preferences and their actual fertility can be considered a sacrifice they make to society on behalf of the one-child program. How great that difference is depends upon not only the fertility level preferred by couples but also the ability of the government to compel conformity to its goal.

**Sex preference.** Among the Shifang women sampled, 55 percent stated a preference for a son rather than a daughter in a one-child family (Table 3). This finding implies that, for most women considering a one-child family, a son had more utility than a daughter.

### Table 2. Estimated average number of children desired, by background characteristics of women: Shifang, Sichuan Province, China, 1987

<table>
<thead>
<tr>
<th>Background characteristic</th>
<th>Number and percentage of women desiring specified number of children</th>
<th>$C_h^*$ (Estimated av. no. of children truly desired)</th>
<th>$C_b$ (Weighted av. reported no. of children desired)</th>
<th>$C_h^* - C_b$ (% of under-reporting)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 child No. %</td>
<td>2 children No. %</td>
<td>3 children No. %</td>
<td>1-3 children No. %</td>
</tr>
<tr>
<td>All women</td>
<td>213 33</td>
<td>408 62</td>
<td>33 5</td>
<td>654 100</td>
</tr>
<tr>
<td>Rural</td>
<td>178 30</td>
<td>391 65</td>
<td>32 5</td>
<td>601 100</td>
</tr>
<tr>
<td>[Urban]</td>
<td>35 65</td>
<td>18 33</td>
<td>1 2</td>
<td>54 100</td>
</tr>
<tr>
<td>No school</td>
<td>61 26</td>
<td>158 66</td>
<td>20 8</td>
<td>239 100</td>
</tr>
<tr>
<td>Primary school</td>
<td>105 35</td>
<td>182 61</td>
<td>11 4</td>
<td>298 100</td>
</tr>
<tr>
<td>[Middle school +]</td>
<td>47 40</td>
<td>69 59</td>
<td>1 1</td>
<td>117 100</td>
</tr>
<tr>
<td>Ages 15–24</td>
<td>78 46</td>
<td>88 52</td>
<td>4 2</td>
<td>170 100</td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>46 24</td>
<td>143 73</td>
<td>6 3</td>
<td>195 100</td>
</tr>
<tr>
<td>[Ages 35 +]</td>
<td>89 31</td>
<td>178 61</td>
<td>23 8</td>
<td>290 100</td>
</tr>
</tbody>
</table>

$d.f. = 5$

*Note: Characteristics in brackets are omitted categories in the model.*
Fifty-seven percent of rural women preferred to have a son if having only one child, in contrast with only 31 percent of urban women, and this difference was statistically significant. Inversely, 69 percent of urban women and only 43 percent of rural women preferred a daughter.

In China boys are generally considered to cause parents more worry than daughters because of their greater propensity to engage in aggressive, risk-taking behavior. Under the restriction of the one-child policy, this liability of boys may dampen son preference, but evidently it does not outweigh the positive value of sons in a rural setting.

As expected, a majority (62 percent) of women with no formal education preferred to have a son rather than a daughter if having only one child. Women with a primary education also expressed a slight preference for a son, whereas a majority of women with more education preferred to have a daughter. Differences in the probability of preferring a son versus preferring a daughter among women with different educational levels are statistically significant.

The youngest age group (15–24) was the only group in which a majority of women preferred a daughter if having only one child. Majorities of the other two age groups expressed a preference for a son.

Results of the ordered probit model are shown in Table 4. The model has only one coefficient for each dummy variable, which represents a deviation from the mean of "true" son preference among women with a certain characteristic different from that of the corresponding baseline group. A significant positive (or negative) coefficient means greater (or less) son preference.

Table 3. Estimated probabilities of preferring one son versus one daughter, by background characteristics of women: Shifang, Sichuan Province, China, 1987

<table>
<thead>
<tr>
<th>Background characteristic</th>
<th>Probability of preferring 1 son</th>
<th>Probability of preferring 1 daughter</th>
<th>Stand. error</th>
<th>No. of women</th>
</tr>
</thead>
<tbody>
<tr>
<td>All women</td>
<td>.55</td>
<td>.45</td>
<td>.1066</td>
<td>649</td>
</tr>
<tr>
<td>Rural</td>
<td>.57**</td>
<td>.43**</td>
<td>.0812</td>
<td>597</td>
</tr>
<tr>
<td>[Urban]</td>
<td>.31</td>
<td>.69</td>
<td>.0552</td>
<td>52</td>
</tr>
<tr>
<td>No school</td>
<td>.62**</td>
<td>.38**</td>
<td>.0641</td>
<td>236</td>
</tr>
<tr>
<td>Primary school</td>
<td>.53*</td>
<td>.47*</td>
<td>.0891</td>
<td>296</td>
</tr>
<tr>
<td>[Middle school + ]</td>
<td>.43</td>
<td>.57</td>
<td>.1083</td>
<td>116</td>
</tr>
<tr>
<td>Ages 15–24</td>
<td>.43**</td>
<td>.57**</td>
<td>.0570</td>
<td>169</td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>.61</td>
<td>.39</td>
<td>.0938</td>
<td>195</td>
</tr>
<tr>
<td>[Ages 35 + ]</td>
<td>.56</td>
<td>.44</td>
<td>.0854</td>
<td>284</td>
</tr>
</tbody>
</table>

Note: Characteristics in brackets are omitted categories in the model.

** Difference from omitted category is statistically significant at the 1 percent level.

* Difference from omitted category is statistically significant at the 5 percent level.

The coefficient column of Table 4 shows that only rural–urban residence and age had statistically significant effects on son and daughter preference. As expected, rural women had a stronger preference for sons than did urban women. Women in the prime childbearing age group expressed a stronger preference for sons than did women in the other two age groups.

The estimated probabilities of respondents’ ordinal categories being 0, 1, 2, and 3, by age and social characteristic, are also shown in Table 4. If sex preference were evenly distributed between daughter preference categories and son preference categories, it would imply that preferences for sons and daughters were balanced overall among the sample.

It is possible to estimate the value of the unobserved "actual" son preference as $\hat{Y}_i = \hat{\beta}'X_i$, where $\beta$ represents the corresponding coefficients estimated from the ordered probit model. On the assumption that individual preferences are normally distributed around the mean preference, the distributions of the estimated sex-preference values can be illustrated on a scale that is divided into four categories by the three estimated thresholds of $\mu(0)$, $\mu(1)$, and $\mu(2)$. A mean preference around $\mu(1)$ on the preference scale would indicate a balanced preference for sons and daughters among respondents (Wang 1990).

The sample as a whole exhibited an almost sex-balanced preference for children when respondents considered a two-child family. Respondents were almost evenly divided between categories 1 and 2, representing moderate daughter and son preference (44 and 41 percent,
Table 4. Estimated probabilities of daughter and son preference in a two-child family, by strength of preference and background characteristics of women, based on ordered probit model: Shifang, Sichuan Province, China, 1987

<table>
<thead>
<tr>
<th>Background characteristic</th>
<th>Coefficient</th>
<th>Strong daughter preference (ordinal cat. 0)</th>
<th>Weak daughter preference (ordinal cat. 1)</th>
<th>Weak son preference (ordinal cat. 2)</th>
<th>Strong son preference (ordinal cat. 3)</th>
<th>No. of women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Prob. S.E.</td>
<td>Prob. S.E.</td>
<td>Prob. S.E.</td>
<td>Prob. S.E.</td>
<td></td>
</tr>
<tr>
<td>All women</td>
<td></td>
<td>.11 .0184</td>
<td>.44 .0461</td>
<td>.41 .0690</td>
<td>.04 .0184</td>
<td>648</td>
</tr>
<tr>
<td>Rural</td>
<td>.39**</td>
<td>.10 .0335</td>
<td>.43 .0446</td>
<td>.42 .0602</td>
<td>.05 .0177</td>
<td>596</td>
</tr>
<tr>
<td>[Urban]</td>
<td>—</td>
<td>.19 .0469</td>
<td>.49 .0140</td>
<td>.30 .0541</td>
<td>.02 .0064</td>
<td>52</td>
</tr>
<tr>
<td>No school</td>
<td>.23</td>
<td>.08 .0259</td>
<td>.41 .0419</td>
<td>.46 .0491</td>
<td>.05 .0182</td>
<td>236</td>
</tr>
<tr>
<td>Primary school</td>
<td>.03</td>
<td>.12 .0390</td>
<td>.45 .0414</td>
<td>.40 .0639</td>
<td>.03 .0156</td>
<td>295</td>
</tr>
<tr>
<td>[Middle school +]</td>
<td>—</td>
<td>.14 .0483</td>
<td>.47 .0365</td>
<td>.36 .0687</td>
<td>.03 .0139</td>
<td>116</td>
</tr>
<tr>
<td>Ages 15–24</td>
<td>-.06</td>
<td>.15 .0248</td>
<td>.48 .0184</td>
<td>.35 .0289</td>
<td>.02 .0037</td>
<td>170</td>
</tr>
<tr>
<td>Ages 25–34</td>
<td>.35**</td>
<td>.07 .0257</td>
<td>.39 .0392</td>
<td>.48 .0482</td>
<td>.06 .0167</td>
<td>194</td>
</tr>
<tr>
<td>[Ages 35+]</td>
<td>—</td>
<td>.11 .0360</td>
<td>.45 .0259</td>
<td>.40 .0516</td>
<td>.04 .0096</td>
<td>284</td>
</tr>
<tr>
<td>- 2 log (LR)</td>
<td></td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Urban, middle school +, and ages 35+ are reference categories and therefore have no coefficients. Each dummy variable has only one parameter, estimated from the ordered probit model. An estimated parameter presents the deviation of mean son preference among women with a specified background characteristic from that of the corresponding reference category.

S.E.—standard error.

** Significant at the 1 percent level.

respectively), whereas only 11 percent of respondents expressed strong daughter preference.

**Surprisingly, the majority of urban, younger, and more educated women reported preferring a daughter if having only one child, although a son was still preferred by rural, older, and less educated respondents. When considering having two children, most respondents expressed a preference for children of both sexes.**

Categories 0 and 1 accounted for a majority of urban respondents, indicating a tendency to prefer daughters among them. Rural women, on the other hand, exhibited a more sex-balanced preference, the distribution of son and daughter preference for this group being almost even, and the mean of preference distribution was close to the value of \( \mu(1) \) (Wang 1990: Figure 2a).

Women with no schooling tended to exhibit a nearly equal preference for sons and daughters, whereas educated women were more likely to prefer daughters, the strength of their preference increasing with the level of education.

As in their responses to direct questions about their gender preferences for children, women of the prime childbearing ages (25–34) exhibited a preference for sons, which was not evident among either younger or older women when considering hypothetical two-child families, although even among this group only small minorities expressed a strong preference for either sons or daughters. Daughter preference was greatest among the youngest age group, 63 percent of whom expressed either strong or moderate preference for girls.

The binomial and ordered probit models used to test son preference suggest that Shifang women generally favor having a single son rather than a single daughter; when considering a two-child family, they prefer to have a child of each sex and even have a slight preference for daughters. These findings are at odds with the traditional Chinese
preference for sons and findings of persistent son preference in China reported in many recent studies (e.g., Coombs and Sun 1978; Feeney et al. 1985; Palmore et al. 1985; Arnold and Liu 1986).

Several possible explanations for the evident decline in son preference among Shifang women suggest themselves.

One is that the financial exchange that takes place between the families of betrothed couples no longer seems to favor the groom’s family. Many people in Shifang County told me of the increasing cost of providing for a son’s marriage. The groom’s family is supposed to hold three feasts for the betrothed’s relatives during the year between the couple’s engagement and their marriage—during the Spring Festival, in mid-May, and in mid-August of the Chinese calendar. Moreover, the wedding, the expenses of which are the groom’s family’s responsibility, lasts three days, and each day they must hold an expensive feast.

The increased financial cost of rearing and marrying sons in rural areas, the improvement of women’s status in Chinese society, and the success of family planning educational efforts are possible explanations for the apparent decline in son preference among Shifang women.

The cost of these festivities often exceeds 3,000 yuan (about U.S. $810 in 1986), an amount approximately six times the annual per capita income in rural China in 1986. In contrast, the traditional dowry, paid by the bride’s family to the groom’s, has become less important. Consequently, the direction of wealth flow no longer favors the groom’s family.

Another possible explanation is that changes in rural family residential arrangements have made sons more costly to their parents. Whereas in the past married sons continued to live with their parents after marriage, today it is becoming more common for them to establish their own households in the same compound as the parents’. The groom’s parents are obliged to build a house for the newly married couple if the bride is considered to marry into the groom’s family. For families with two sons, two houses have to be built.

The greater difficulty of raising sons, already mentioned, may be another reason for the apparent increase in daughter preference, especially in urban areas, given the government’s one-child policy.

A final possible explanation is that the perceived value of daughters to their parents has increased with the improvement of women's status in Chinese society. My survey revealed a nearly universal involvement of women in nondomestic work in Shifang County. Fewer than 3 percent of respondents reported that they were “not working.” Although a majority of women were still engaged in agricultural occupations, substantial fractions of younger women—one-fourth of those between ages 15 and 19 and one-fifth between ages 20 and 24—had full- or part-time employment in nonagricultural sectors of the economy, mostly in occupations related to township industry.

With job opportunities for women expanding and their marriages being delayed, daughters, like sons, can earn income and contribute to the economic well-being of their parents until reaching their early or mid-20s. The improvement of women’s status within the family means that married daughters are better able than in the past to help their parents, both physically and economically. Some Shifang respondents even told me that daughters are more dependable than sons, not simply because they are more filial and accustomed to providing domestic service and physical care to their parents, but also because after marriage they are more likely than sons to give money to their parents. In short, the perceived values of sons and daughters are changing, although some degree of son preference persists among Shifang women.

**Conclusion**

Like Hermelin and Liu (1990), my study found clear evidence of underreporting of desired family size by Chinese women when they were asked a direct question in face-to-face interviews. In answer to the question “How many children would you prefer to have altogether if there were no family planning program?” respondents were likely to give the interviewer a socially acceptable answer and to hide their true preferences. For each reported number of children desired, rural, uneducated, and older women were more likely to understate their desired family size than were urban, more educated, and younger women. But overall, larger percentages (continued on page 27)
Untilting Age Distributions: A Transformation for Graphical Analysis

This article presents a new approach to the plotting of age distribution data. "Untilting" is a way of transforming data that vary systematically from very high to very low values so as to show local variation more clearly. The article derives an untilting transformation from the formal structure of age distributions. The transformation turns out to be closely related to two familiar demographic techniques, reverse-survival estimation of births and birth rates, and comparison of observed with stable age distributions. The ideas are illustrated by application to age distributions from the 1979 and 1989 censuses of Vietnam.

by Griffith Feeney

The past several decades have seen the development of increasingly sophisticated techniques for estimating levels and trends of fertility and mortality. Valuable as these developments are in particular applications, they do not eliminate the need for understanding the quality and characteristics of the data to which they are applied. This understanding must usually be acquired through a careful scrutiny of the data, using relatively elementary tools. There is a danger that naive enthusiasm for elaborate formalism will result in the neglect of simpler and more traditional, but essential, preliminaries.

Age distributions are perhaps the most fundamental of all demographic data. Accurate age distributions contain a great deal of population history, and an appreciation of the errors present in age data is fundamental to the study of many populations, both historical and contemporary.

The first step in analyzing an age distribution is to plot it and scrutinize the result against whatever background is provided by context. When numbers of persons decline very rapidly with increasing age, however, changes from one age group to the next tend to be obscured by the overall downward sweep of the plotted points. We can hope to improve a plot that is sharply tilted in this way by "untilting," that is, by transforming the plotted values so as to make the smaller ones roughly equal in magnitude to the larger ones. The vertical axis may then be rescaled to display fluctuations more clearly.

These ideas are not new in the demographic literature, going back at least to Carrier and Farrag (1959), but they seem to have been largely lost in recent years. The authoritative United Nations Manual X (UN, DIESA, 1983) does not discuss them, for example, nor does its predecessor, Manual IV (UN, DESA, 1967). The weighty Shryock and Seigel (1973) cites the Carrier-Farrag paper in the chapter on age composition, but the text is silent. Interestingly enough, the graphical procedure of plotting against oblique axes used by Carrier and Farrag is identical to the general approach to untilting described by Tukey (1977:154-156).

This article presents a new approach to the plotting of age distribution data based on an untilting transformation derived from the formal structure of age distributions. Plotting is regarded here not merely as a means for displaying known results, but also as an important tool for data analysis. This view has been developed over the past several decades by a number of writers, including Tukey (1977), Tufte (1983), Wainer (1984), and Cleveland (1985). The untilting procedure turns out to be closely related to two familiar demographic techniques, reverse-survival estimation of fertility and comparison of observed with stable age distributions.
The problem illustrated
Figure 1 plots the age distribution of the total population of Vietnam at the census taken on 1 October 1979. The shape is characteristic of rapidly growing populations, with large numbers of persons in the younger age groups and small numbers in the older age groups. The downward sweep of the plotted points with increasing age is so strong that departures of particular age groups from the general trend are difficult to make out.

Because this pattern is typical of developing countries, conventional plots of their age distributions tend to look very much the same. Discrimination being a prime purpose of plotting, the plots are unsuccessful. The naive conclusion is that we may as well have bothered. The correct conclusion is that we need more effective plotting techniques.

Several comments on Figure 1 are in order. First, we are concerned here with plots as tools for data analysis. Although the population pyramid so popular in demographic methods texts and elsewhere may have its uses, data analysis is not one of them. We want to make plots quickly and with a minimum of effort, and the histogram format of the population pyramid is hopelessly inefficient in this respect.

Equally important, comparisons of plots are best made by overlaying plots drawn on separate pieces of tracing paper. If we want to compare the male and female age distributions, in particular, we want them on separate pages, not side by side. Such is the rationale for the general format of Figure 1.

Two other details are worth noting. We follow the usual convention of plotting the number in a given age interval above the mid-point of the interval. Following Cleveland (1985:31), we put axes and scales on all four sides of the plot and use two scales for each axis when it is useful to do so. Thus the lower horizontal scale in Figure 1 shows age, whereas the upper scale shows year of birth. The vertical scale on the left is number of persons, while the scale on the right is proportion of total population.

The untitling transformation defined
Age distributions may exhibit proportionately small numbers of persons at older ages for two reasons. First, older persons have had longer exposure to mortality; hence fewer of them will have survived. Second, older persons were born longer ago, and in a growing population there will be fewer persons born in the past than more recently. These two factors completely determine the shape of the age distribution in a population close to migration, and they are usually the primary influences in the overall shape of the age distribution even in the presence of substantial migration.
The tilting effect of mortality on an age distribution may be removed by dividing the number of persons in each five-year age group by the corresponding cohort survivorship proportion, taken as usual to be $sL_x/5l_0$, from a suitably chosen life table. Taking the life table radix $l_0$ to be one, we simplify this to $sL_x/5$.

The tilting effect of population increase may be removed by multiplying the number of persons in the age group $(x, x+5)$ by $e^{rx}$, where $r$ is an approximate average annual growth rate for the 80 years prior to the date of the age distribution.

Our first unitilling transformation is defined by applying both of these operations. Thus from given numbers $sN_x$ for five-year age groups we compute

$$\frac{sN_xe^{rx}}{sL_x/5}$$

where $r$ denotes the growth rate and $sL_x$ the number of person-years lived in the interval $(x, x+5)$.

Although we should utilize whatever knowledge we have of the population to choose sensible values for $r$ and the $sL_x$, it is neither necessary nor appropriate to conduct elaborate investigations. Our purpose here is simply to unitill the plot, and a good initial guess will often accomplish this. If it does not, we simply adjust the values and try again. It should of course be remembered that the growth rate and mortality levels are likely to have been changing, so that there may be no strictly correct choice.

To unitill the Vietnamese age distribution in Figure 1, we take $r$ to be the growth rate between the censuses of 1979 and 1989, 0.0210, and apply the $sL_x$ values from the Coale-Demeny West Level 19 model life table (Coale and Demeny 1983), with female and male tables averaged, using a sex ratio at birth of 106. The resulting untitled values, calculated from formula (1), are shown in Figure 2, with the vertical scale to the left.

The untitled values for the oldest ages now have roughly the same magnitude as the values for the youngest ages. This makes variation in numbers for the older age groups, invisible in Figure 1 because of their relatively small numbers, as visible as the variation in numbers for the younger age groups. It also makes it possible to "blow up" the vertical scale, rendering all variations more readily apparent.

Figure 2 shows a smooth progression from one age group to the next through age 35, with an initial rise followed by a steep drop; a clearly defined hollow centered on the age group 35-39, corresponding to the birth cohort of 1940-44; minor irregularities between the ages of 40 and 80 and a sharp dip at the age group 80-84; and sharply increasing values for the oldest age groups.

Formula (2) gives relative numbers, removing the effect of total population size. More importantly, it shows that the untitled values, suitably scaled, approximate crude birth rates. The numerators are reverse-survived numbers of births in five-year time periods, and the denominators approximate the corresponding number of person-years lived.

The numerators will be exact if the population is closed to migration and experiences constant mortality corresponding to the given $sL_x$ values. The denominator is necessarily approximate, except in the degenerate case of a stable population, since actual annual growth rates will vary from year to year.

Because the untitled values (2) differ from the untitled values (1) only by the constant factor $5Pe^{-2.5r}$, the plots of the two series are identical except for the scale. Figure 2 shows both scales, with the scale for the formula (2) values on the right.

Table 1 presents the data, intermediate calculations, and results. The first two columns give the $sN_x$ and $sL_x$ values. Column C1 shows $sN_x/(sL_x/5)$, i.e., reverse-survived numbers of births for five-year periods prior to the census. Column C2, calculated as the values in column C1 multiplied by $e^{rx}$, gives the result of the first unitilling transformation (1). The effect, assuming the usual case of $r>0$, is to inflate the reverse-survived numbers of births in earlier periods. The operation is analogous to the discounting of income and expenditure flows in economics, but applied in reverse. Column C3, calculated as the values in column C2 divided by $5Pe^{-2.5r}$, shows the values of the second un-
Interpreting the untilted age distribution

Taken at face value, the pseudo CBRs in Figure 2 suggest that the crude birth rate in Vietnam rose sharply, from 20 per thousand in the early 1940s to 38 per thousand in the late 1960s, and fell with equal rapidity to 33 per thousand in the late 1970s. The first question to be addressed is the extent to which this pattern is robust against changes in the untilting parameters.

The effect of choosing a larger value of $r$ will be to increase the value of $e^{r^*}$ in (1) more at older ages and earlier years than at younger ages and later years. Hence, if a value of $r$ that yields an approximately level plot is increased, the effect of choosing a higher value of $r$ will be to tilt the plot upward, holding the leftmost point fixed. Similarly, choosing a lower value of $r$ will tilt the plot downward. The overall tilt of the plot reflects the choice of $r$ and must not therefore be interpreted as a characteristic of the given age distribution.

Figure 3 shows the effect of choosing growth rates of 0.016 and 0.026 as compared with the reference value of 0.021 per thousand. This is a wide range, and there is substantial variation in the levels indicated, but the pattern of rise and fall is untouched.

The effect of choosing different mortality levels is slightly different. Given an initial choice that yields an approximately level plot of the untilted values, choosing $s_x L_x$ values corresponding to higher mortality means lower values and hence larger untilted values computed from (1). While the values at older ages will tend to increase more, the values for all the age groups increase, so that the effect is both to lift the untilted values up overall and to tilt them upward. Lower mortality rates reverse this effect, lowering the overall level and tilting the plot downward.

Figure 4 shows the effect of choosing various Coale–Demeny "West" mortality schedules. Because the reference choice was a female life expectancy ($e_0$) of 65 years, a higher than expected value, we consider only lower alternatives, $e_0$ values of 60, 55, and 50 years.

Table 1. Untilting the 1979 age distribution of Vietnam: both sexes

<table>
<thead>
<tr>
<th>Age (x)</th>
<th>$s_x N_x$</th>
<th>$s_x L_x$</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>7,712</td>
<td>4,678</td>
<td>8.243</td>
<td>8.243</td>
<td>32.9</td>
<td>1975–79</td>
</tr>
<tr>
<td>5</td>
<td>7,691</td>
<td>4,600</td>
<td>8.360</td>
<td>9.285</td>
<td>37.1</td>
<td>1970–74</td>
</tr>
<tr>
<td>10</td>
<td>7,040</td>
<td>4,571</td>
<td>7.701</td>
<td>9.500</td>
<td>38.0</td>
<td>1965–69</td>
</tr>
<tr>
<td>15</td>
<td>7,519</td>
<td>4,559</td>
<td>6.629</td>
<td>9.083</td>
<td>36.3</td>
<td>1960–64</td>
</tr>
<tr>
<td>20</td>
<td>4,882</td>
<td>4,487</td>
<td>5.440</td>
<td>8.280</td>
<td>33.1</td>
<td>1955–59</td>
</tr>
<tr>
<td>30</td>
<td>2,492</td>
<td>4,360</td>
<td>2.858</td>
<td>5.366</td>
<td>21.4</td>
<td>1945–49</td>
</tr>
<tr>
<td>35</td>
<td>2,071</td>
<td>4,281</td>
<td>2.419</td>
<td>5.044</td>
<td>20.2</td>
<td>1940–44</td>
</tr>
<tr>
<td>40</td>
<td>2,004</td>
<td>4,184</td>
<td>2.395</td>
<td>5.547</td>
<td>22.2</td>
<td>1935–39</td>
</tr>
<tr>
<td>45</td>
<td>2,109</td>
<td>4,057</td>
<td>2.599</td>
<td>6.687</td>
<td>26.7</td>
<td>1930–34</td>
</tr>
<tr>
<td>50</td>
<td>1,728</td>
<td>3,883</td>
<td>2.225</td>
<td>6.359</td>
<td>25.4</td>
<td>1925–29</td>
</tr>
<tr>
<td>55</td>
<td>1,554</td>
<td>3,643</td>
<td>2.133</td>
<td>6.770</td>
<td>27.1</td>
<td>1920–24</td>
</tr>
<tr>
<td>60</td>
<td>1,204</td>
<td>3,310</td>
<td>1.819</td>
<td>6.412</td>
<td>25.6</td>
<td>1915–19</td>
</tr>
<tr>
<td>65</td>
<td>979</td>
<td>2,859</td>
<td>1.712</td>
<td>6.704</td>
<td>26.8</td>
<td>1910–14</td>
</tr>
<tr>
<td>70</td>
<td>718</td>
<td>2,275</td>
<td>1.578</td>
<td>6.863</td>
<td>27.4</td>
<td>1905–09</td>
</tr>
<tr>
<td>75</td>
<td>496</td>
<td>1,574</td>
<td>1.576</td>
<td>7.611</td>
<td>30.4</td>
<td>1900–04</td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>881</td>
<td>1.135</td>
<td>6.090</td>
<td>24.3</td>
<td>1895–99</td>
</tr>
<tr>
<td>85</td>
<td>91</td>
<td>354</td>
<td>1.285</td>
<td>7.660</td>
<td>30.6</td>
<td>1890–94</td>
</tr>
<tr>
<td>90</td>
<td>27</td>
<td>85</td>
<td>1.588</td>
<td>10.513</td>
<td>42.0</td>
<td>1885–89</td>
</tr>
<tr>
<td>95</td>
<td>9</td>
<td>9</td>
<td>5.000</td>
<td>36.761</td>
<td>146.9</td>
<td>1880–84</td>
</tr>
</tbody>
</table>

$s_x N_x$—number of persons in age interval $(x, x + 5)$, in thousands.
$s_x L_x$—life table person years lived in age interval $(x, x + 5)$.
$C1 = s_x N_x / (s_x L_x)^{1/5}$.
$C2 = C1 e^{r^*}$, $r = 0.0210$.
$C3 = C2 / 5 P e^{-2 r t}$, where $P$ denotes total population, 52,742 thousand.
Year—year in which persons aged $(x, x + 5)$ were born.
Sources: $s_x N_x$ values from Vietnam, GSO (1983:34, Table 5), $s_x L_x$ values from Coale and Demeny (1983).
This again is a broad range, and the resulting shift in magnitudes is again substantial; but the pattern stubbornly persists. It is, in short, extremely robust against changes in the untilting parameters.

Might the rise-and-fall pattern be due to errors in the age distribution? The smoothness of the changes makes this hypothesis implausible. UN Manual IV (UN, DESA, 1967:17-22) shows that, although we may encounter age distribution errors of this magnitude, the pattern is entirely different. Other relevant evidence includes the Vietnamese practice of observing an animal-year cycle and the finding that the single-year age distribution from the 1989 census shows little evidence of heaping (Vietnam, GSO, 1990). Un fortunately, the single-year age distribution for the 1979 census is unavailable. Age-distribution errors are undoubtedly present and perhaps even influential in some respects (we shall see evidence of this below), but they cannot plausibly explain the suggestion of rising and then falling crude birth rates.

We must conclude, therefore, that crude birth rates in Vietnam really did rise and fall according to the general pattern indicated. More work would be required to get a better fix on the magnitudes involved, but the simple operation of untilting the age distribution has provided a significant conclusion and a useful guide to further analysis.

Analysis of the untilted age distributions at the older ages is in general more problematic, and I shall not pursue its deeper aspects, some of which are discussed in Feeney and Hamano (1990). The essential difficulty is that the values are far more influenced by the choice of untilting parameters, as is evident in the righthand portions of Figures 3 and 4.

Two exceptions are worth noting, however. Short-term fluctuations, such as the regular up-down-up pattern seen at ages over 40 in Figures 3 and 4, are invariant under all changes in the untilting parameters and must therefore reflect either errors in the reported age distribution or changes in fertility or mortality.

The second exception occurs at the extreme old ages. The sharp rise in the pseudo CBR values for the oldest age groups has already been noted, and in fact the plot omits the pseudo CBR for the 95–99 age group, an obviously absurd 143 per thousand. To understand these observations, note first that the reverse-survived numbers of births from the oldest age groups are obtained by dividing the very small numbers in these age groups by even smaller survivorship proportions, rendering the calculation nonrobust against small errors. It might be suggested that the pseudo CBRs for the older age groups be ignored entirely for this reason.

Figure 3. The age distribution untilted, with various growth rates, 1979

Figure 4. The age distribution untilted, with various mortality levels, 1979
It turns out, however, that useful conclusions can be drawn from them. Though the values are unstable, they show a persistent empirical tendency to rise with increasing age.

I shall not go into the arguments in detail here, but this almost certainly reflects age exaggeration, which results in greatly excessive numbers in the oldest age groups. A detailed analysis of U.S. data is given in Coale (1990); see also Coale and Kisker (1986).

Having recognized this, we find that sharply increasing pseudo CBRs for the oldest age groups are a useful indicator of probable age exaggeration. The case for age exaggeration in this case is strengthened by the observation that the older cohorts experienced higher mortality than is assumed in the untilting transformation. A life table reflecting this higher mortality would result in even higher pseudo CBRs.

### Sex ratios in Vietnam

Age-specific sex ratios from the 1979 census of Vietnam are plotted in Figure 5 with solid dots from data in Table 2. Notable anomalies are the sharp decline between the 10–14 and the 20–24 age groups, the relatively low values between ages 20 and 60, the pronounced dip in the 55–59 age group, and the leveling off at the oldest ages.

The sex ratios over age 60 are much lower than those in the Coale–Demeny model tables at any relevant mortality level and may represent the “Far Eastern” pattern of mortality identified by Goldman (1980). To provide a plausible reference schedule, we examine life table sex ratios, calculated as the ratio of the male and female $J_x$ values multiplied by the sex ratio at birth, taken here as 106 male births per 100 female births.

Life tables for Taiwan over the period 1959–61 and Singapore in 1957, given in Keyfitz and Flieger (1968a:204 and 234, respectively; data in table 2) and intercensal life tables for China, 1953–64 and 1964–82, given in Coale (1984:202), provide useful references. Having plotted all these sex ratios on separate pieces of tracing paper, I placed the Vietnamese plot over the plots for Taiwan and Singapore, then added the upper and lower reference schedules shown in Figure 5 with small circles and dotted lines.

The difference between the reference schedules and the observed schedules represents “missing males” broadly understood. They may be missing because males have been underenumerated relative to females, because males have emigrated in greater numbers than females, or because males have suffered greater mortality than females. The differential mortality explanation stands out as the obvious candidate, given Vietnam’s history of war first with France and then
with the United States; but this explanation is somewhat confounded by the pattern of sex ratios in the 1989 census (data in Table 2). If war deaths were the explanation of the deficit, the deficit would move to the right 10 years between the two censuses. This is not what we observe. The sex ratios in 1989 fall sharply from the 10–14 to the 20–24 age group, just as in Figure 5, and there is no trace in 1989 of the sharp dip at ages 55–59 in Figure 5.

A full analysis of the Vietnamese sex ratios is beyond the scope of this article, but let us consider the question of the ‘disappearing dip’ at ages 55–59 in 1979. Because this dip does not appear at ages 65–69 in 1989, we may be reasonably sure that it does not reflect a real sex imbalance in the birth cohort. A real sex imbalance occasioned by death or migration in earlier years would persist, and an imbalance at these ages coming into existence during the intercensal period is most improbable.

A possible explanation is that the dip in 1979 is simply due to a typographical error in the census report, but this is quickly dismissed. Not only do the male and female numbers add properly to the total for the age group, but also some three quarters of the provincial age distributions (Vietnam, GSO, 1983:35–74) show the same dip. It is notable that most of the exceptions are southern provinces, though it is not clear how this observation may be put to use.

A speculation advanced by several members of the General Statistical Office staff was that males of ages 55–59 were overreporting their ages to avoid government-imposed work requirements on working-age men. If this were the case, we should see a dip in the numbers of males, but not of females, in this age group, and also a corresponding excess of males in the 60–64 age group.

The observed pattern is readily displayed by untitling the male and female age distributions separately. Figure 6 shows these results. Contrary to expectation, the male age distribution between ages 45 and 80 is relatively smooth. The sex ratio dip appears to be due to a surplus of females in the age group rather than to a deficit of males.

The up-down-up-down pattern for females between ages 40 and 65 is curious, for it appears to represent age-distribution errors shared neither with males nor with older age groups. Note, however, that it is only the numbers of females in the 55–59 age group that is sharply out of line with the numbers of males.

### Untitling and the stable age distribution

If the given age distribution is stable,

\[ sN_x = Be^{-rx}(L_x/5) \]  

where \( B \) denotes the number of births in the five-year period preceding the census. We see at once from (l) that the corresponding untitled values will be identical to \( B \). This suggests that the transformed values may be thought of as representing deviations from a con-

---

**Table 2. Age-specific sex ratios for Vietnam, Taiwan, and Singapore**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0–4</td>
<td>1.065</td>
<td>1.048</td>
<td>1.058</td>
<td>1.051</td>
</tr>
<tr>
<td>5–9</td>
<td>1.054</td>
<td>1.044</td>
<td>1.059</td>
<td>1.051</td>
</tr>
<tr>
<td>10–14</td>
<td>1.062</td>
<td>1.066</td>
<td>1.058</td>
<td>1.050</td>
</tr>
<tr>
<td>15–19</td>
<td>0.981</td>
<td>0.965</td>
<td>1.057</td>
<td>1.048</td>
</tr>
<tr>
<td>20–24</td>
<td>0.923</td>
<td>0.877</td>
<td>1.052</td>
<td>1.046</td>
</tr>
<tr>
<td>25–29</td>
<td>0.907</td>
<td>0.882</td>
<td>1.047</td>
<td>1.046</td>
</tr>
<tr>
<td>30–34</td>
<td>0.917</td>
<td>0.896</td>
<td>1.045</td>
<td>1.046</td>
</tr>
<tr>
<td>35–39</td>
<td>0.874</td>
<td>0.875</td>
<td>1.041</td>
<td>1.044</td>
</tr>
<tr>
<td>40–44</td>
<td>0.869</td>
<td>0.847</td>
<td>1.034</td>
<td>1.042</td>
</tr>
<tr>
<td>45–49</td>
<td>0.814</td>
<td>0.893</td>
<td>1.023</td>
<td>1.031</td>
</tr>
<tr>
<td>50–54</td>
<td>0.804</td>
<td>0.915</td>
<td>1.004</td>
<td>1.002</td>
</tr>
<tr>
<td>55–59</td>
<td>0.882</td>
<td>0.780</td>
<td>0.970</td>
<td>0.956</td>
</tr>
<tr>
<td>60–64</td>
<td>0.830</td>
<td>0.815</td>
<td>0.920</td>
<td>0.867</td>
</tr>
<tr>
<td>65–69</td>
<td>0.766</td>
<td>0.749</td>
<td>0.848</td>
<td>0.734</td>
</tr>
<tr>
<td>70–74</td>
<td>0.678</td>
<td>0.654</td>
<td>0.755</td>
<td>0.598</td>
</tr>
<tr>
<td>75–79</td>
<td>0.597</td>
<td>0.585</td>
<td>0.648</td>
<td>0.469</td>
</tr>
<tr>
<td>80–84</td>
<td>0.487</td>
<td>0.472</td>
<td>0.524</td>
<td>0.353</td>
</tr>
<tr>
<td>85+</td>
<td>0.434</td>
<td>0.443</td>
<td>0.343</td>
<td>0.217</td>
</tr>
</tbody>
</table>

*Sources:* Vietnam, 1979, calculated from Vietnam, GSO (1983:34, Table 5). Vietnam, 1989, calculated from Vietnam, GSO (1990, Appendix Table 1.2). Taiwan, 1959–61, and Singapore, 1957, calculated from the male and female \( J_x \) values in the life tables given in Keyfitz and Flieger (1968:204, 234, respectively), assuming a sex ratio at birth of 1.06 in both cases.
dition of stability.

To obtain a formal result, let us consider the deviation of the observed age distribution from a fitted stable,

\[ D_1(x) = S_N N_0 - B e^{-r x} (s L_0/5) \]  

(4)
on the one hand, and the deviations of the untilted age distribution values (1) from \( B \),

\[ D_2(x) = S N_0 e^{-r x} (s L_0/5) - B \]  

(5)
on the other. Multiplying both sides of the latter identity by \( e^{-r x} (s L_0/5) \) gives

\[ D_2(x) e^{-r x} (s L_0/5) = D_1(x), \]

(6)
whence also

\[ D_2(x) = D_1(x) e^{-r x} (s L_0/5). \]

(7)
Thus we see that the deviations \( D_2(x) \) of the untilted age distribution from the number of births \( B \) equal the deviations \( D_1(x) \) from the fitted stable age distribution transformed by the untilting procedure (1).

If we believe that the true age distribution of the population is stable and have reasonably accurate values for the growth rate \( r \) and the life table survivorship \( s L_0/5 \), the deviations from the fitted stable age distribution may be interpreted as representing errors in the reported age distribution. This is the method of UN Manual IV (UN, DESA, 1967:17–22).

Discussion and conclusion

The variation displayed in the untilted age distribution reflects four factors: the true age distribution of the population; the errors suffered by the reported distribution; the history of fertility, mortality, and population growth; and the growth rate and survivorship parameters chosen for the untilting transformation. Assigning each factor its proper role is a difficult and sometimes impossible task. This is our natural objective, however, and we aim to carry the analysis of each case as far as circumstances permit. The saving grace is that we are not aiming for definitive conclusions, but rather for various indications to inform subsequent analysis. One or two modest conclusions and a list of sensible questions for further analysis will constitute fair payment for the hour or so of work invested in untilting and plotting an age distribution.

ACKNOWLEDGMENTS

The idea for this article germinated while I held a visiting teaching appointment at the Graduate Group in Demography, University of California at Berkeley, during the winter semester of 1987. The application to Vietnam was suggested by a United Nations Population Fund (UNFPA) consulting mission to the General Statistical Office of Vietnam in Hanoi during the summer of 1990. I am grateful to Kenneth Hill and Norman Y. Luther for comments on an earlier draft.

REFERENCES


J. R. Rele, Southeast Asia Demographic Specialist, Dies

J. (Jawahar) R. Rele, 59, research associate and valued member of the East-West Population staff, was stricken with a fatal heart attack 13 November 1990 in Bombay, India, where he was visiting relatives after conducting a workshop in New Delhi.

Dr. Rele, who had been with the institute since 1985, will be remembered for his central role in the institute's cooperative work with the Indian Registrar General's Office, producing reports on such diverse topics as literacy, urbanization, and fertility. His research also focused on the indirect estimation of fertility and mortality rates. He had been working on refinements of the Rele method and on the development of new methods of estimation.

In addition to coordinating several workshops and coauthoring numerous research reports published by the Registrar General's Office, Dr. Rele had recently agreed to coauthor three more research papers on the topics of indirect evaluation of the Sample Registration System in India, on district fertility estimates for India, and on a new method of estimating life expectancy at birth.

Dr. Rele received his Ph.D. in Sociology from the University of California at Berkeley. In addition to his appointment at the East-West Population Institute, he held the position of adjunct professor of Public Health and affiliate graduate faculty in Population Studies at the University of Hawaii.

"He was our good friend and will be sorely missed by all of us here at the Population Institute," said Director Dr. Lee-Jay Cho.

Dr. Rele is survived by his wife, Shaila, and a son, Amit, who is an engineering student at the University of Hawaii.

Status of Women in Laos Is Gradually Improving, According to Lao Social Scientist

Although men still dominate top positions in the Lao government and labor force, women have made significant gains since 1975, when the Lao People's Revolutionary Party, the Pathet Lao, took control of Laos and adopted a policy of equality between the sexes. Traditionally, women had been expected to be subservient to men in domestic as well as other spheres of activity. Today, numerous women hold government posts, and five of the 79 deputies to the National Assembly are women.

These are some of the observations of Mayoury Ngaosvyvath, a Lao jurist, herself former deputy director of the Ministry of Foreign Affairs and the Ministry of Justice, and today coordinator of the State Committee for Social Sciences, established in Vientiane in 1988. For the past few weeks she has been a fellow at the East-West Population Institute, working with Research Associates Peter Xenos and Ken Brea-zeale on a study of Laos's population.

Laos, with a population of only 3.58 million in 1985, is wedged between the far more populous and militarily powerful Vietnam on the east and Thailand on the west. It is not surprising, therefore, that the Lao government's policy is pronatalist and birth rates are high.

Nevertheless, there are signs that the government's population policy may be changing in response to
concern about maternal and child health. In 1984, at the first National Congress on Women, the prime minister made mention of a need to limit births. Last year an Institute on Mothers and Children was established, and it is seeking funds from international organizations for population education. The government is considering activities to encourage birth spacing.

The Indochinese War destroyed much of Laos’s educational infrastructure. Today the country is rebuilding its social sciences and humanities institutions. The State Committee for Social Sciences, the Lao equivalent of the U.S. National Academy of Sciences, is one of the new organizations attempting to reestablish contacts with the world community of scholars. It comprises five institutes, of Art, Literature, and Linguistics; of History, Archeology, and Geography; of Economics; of Ethnology, and of Marxism–Leninism. Another new organization is the State Statistical Center, which was responsible for conducting Laos’s first census (in 1985) and is in the process of developing a program of social and demographic data collection and analysis.

---

**U.S. Census Bureau Announces Summer 1991 Workshops**

Six workshops offered by the U.S. Bureau of the Census will provide opportunities to learn some of the latest techniques for conducting statistical activities. The workshops are open to personnel of any ministries and agencies involved in planning and conducting statistical programs. They are:

**Integrated Microcomputer Processing System (IMPS), 8 July–16 August 1991 (in English).** Program fee: $4,750 (includes a copy of REALIA COBOL for participant); without copy, $3,950.

**Integrated Microcomputer Processing System (IMPS), 15 July–23 August 1991 (in French).** Program fee: $4,750 (includes a copy of REALIA COBOL for participant); without copy, $3,950.

**Automated Cartography for Censuses and Surveys, 15 July–2 August 1991.** Program fee: $2,800.

**Conducting an Economic Census: A Case Study, 5–23 August 1991.** Program fee: $2,800.

**Microcomputers for Demographic Analysis, 5–23 August 1991.** Program fee: $2,800.


The program fee for each workshop does not include international travel or living expenses. Possible sources of fellowship funds are the U.S. Agency for International Development, the United Nations and its specialized agencies, the Organization of American States, and the World Bank. The Census Bureau has no fellowship funds available for the workshops.

Deadline for nominations is 15 May 1991; early application is advised. Applicants must identify a funding organization. Application forms and information about nomination procedures are available from:

Mr. Thomas C. Walsh
Chief, International Statistical Programs Center
Bureau of the Census

---

**Carolina Population Center Sponsors Symposium**

**Population: Growing as a Field,** a symposium sponsored by the Carolina Population Center at the University of North Carolina, Chapel Hill, will take place 5–7 May 1991. The symposium is open to all who are interested, but alumni and others having a connection with the Carolina Population Center are especially encouraged to attend. For details, write to Karen Kurczewski or Don Thomas, Carolina Population Center, University of North Carolina, CB #8120, University Square, Chapel Hill, NC 27516–3997, U.S.A.

---

**Management Sciences for Health Announces 1991 Course Schedule**

Management Sciences for Health, a nonprofit public health agency that conducts health training projects worldwide, is offering eight courses in 1991 at its Boston, Massachusetts, headquarters. The courses are:

**Managing Drug Supply for Primary Health Care** (18 March–19 April). Tuition: $5,300; field trip fee, $450.

**Managing Information in Primary Health Care Supply Systems** (22 April–10 May). Tuition: $3,800; computer fee, $350.

**District-Level Management of Health Programs** (20 May–14 June). Tuition: $4,500; field trip fee, $450.

**MIS [Management Information**

Financial Management for Health Programs (22 July-16 August). Tuition: $4,500; computer fee, $400.


Gestion des Programmes de Formation en Santé et en Planning Familial (16 septembre-18 octobre). Tuition: $5,300.

Conception et Développement de Systèmes d’Information pour les Organisations de Santé et de Planning Familial (21 octobre-22 novembre). Tuition: $5,300; computer fee, $450.

For additional information, contact:

Management Sciences for Health
Management Training
165 Allandale Road
Boston, MA 02130, U.S.A.
(Telephone 617 527-9202;
Fax: 617 965-2208;
Telex: 4990154 MSH UI;
Cable: MANSHEALTH)

Conference on the Peopling of the Americas Planned for 1992

In commemoration of the 500th anniversary of Christopher Columbus’s arrival in the Americas, an international, interdisciplinary Conference on the Peopling of the Americas is planned for March-April 1992 in Veracruz, Mexico. The conference is being sponsored by the International Union for the Scientific Study of Population, the Associação Brasileira de Estudos Populacionais, the Federation of Canadian Demographers, the Population Association of America, the Programa Latinoamericano de Población, and the Sociedad Mexicana de Demografía under the auspices of the Consejo Nacional de Población, with the support of El Colegio de México, the Universidad Autónoma de México, and other Mexican institutions; it will be chaired by Mexico’s Secretario del Gobernación.

The conference will present research on the processes of population settlement and growth in the Americas from precolombian times to the present, giving equal weight to historical and contemporary research. Sessions will cover mainstream demographic topics, such as the demographic transition, fertility and mortality decline, family structure, rural-urban migration, urbanization, and also topics peculiar to the peopling of the Americas, such as slavery, the consequences of conquest and contact, the survival of the Amerindians, and population and environmental issues in the Amazon.

Invited papers will be published in the conference proceedings before the conference takes place. Contributed papers are also encouraged.

For additional information about the conference, contact:

Mr. Bruno Remiche
Executive Secretary
IUSPP
34 rue des Augustin
B-4000 Liège, Belgium
(Fax: 32 41 223847; Telephone:
041 224080; Telex: 42648 popun;
Cable: Popunion-Liège)

Reviews and Publication Notes


Pacific Asia, according to Professor Yeung, includes the continental nations from Korea through China to Indochina and Burma; and the archipelagos of Japan, the Philippines, and Indonesia. Its great cities include Seoul, Shanghai, Taipei, Hong Kong, Hanoi, Saigon, Phnom Phen, Bangkok, Rangoon, Kuala Lumpur, Singapore, Jakarta, Manila, and Tokyo. Professor Yeung’s book is about these cities (or most of them) and their experiences and problems since 1960.

Implicit in the chosen scope of his subject is the assumption that these cities have something in common that explains their individual histories and shapes their futures. Though the author is never explicit
about this assumption, the cities he chooses—out of a larger set available in that part of the world—are nearly all saltwater or estuary ports developed by colonial powers in the sixteenth through the nineteenth centuries. (Exceptions are Kuala Lumpur and Taipei, now connected by rail to harbors 30 or 40 kilometers distant; and Phnom Phen, on a navigable river but about 200 kilometers from an oceanic harbor.) Of some 31 cities of mainland China that had more than a million inhabitants in 1985, only Shanghai is mentioned in the text; but the others are inland cities, without important functions in international trade.

Professor Yeung's main interest, however, is not in economic history but in municipal administration. He has a lively appreciation of the problems of urban life when cities are growing rapidly but most urban residents are poor—an appreciation cultivated by his decade of association with the International Development Research Centre. The essays in the volume explore policies and proposals for managing urban growth, rationalizing land use and transportation systems, providing decent housing for the urban poor, encouraging informal entrepreneurship, and improving the urban food supply. The perspective is consistently comparative, but the intercity comparisons seldom lead to compelling generalizations.

The colonial powers that developed these cities were naturally most interested in their economic functions, building modern port facilities, warehouses, office buildings, railroads, electric power generators, and public water and sewer systems to serve the import–export trade and its minions. They installed municipal administrations that reflected the varying bureaucratic styles of the mother countries. Some of these administrations were reasonably effective managers of urban resources, but none was much concerned about social (or even civil) justice for the indigenous labor force. The colonials mostly lived in gated enclaves of prosperous homes and gardens; the indigenes mostly lived in crowded shanties and flimsy multiple dwellings lacking basic sanitary conveniences.

Between 1945 and 1960, the colonial powers were either forcibly dispossessed or had the good sense to pack up and go home; the sole vestige today is Hong Kong, due to be incorporated into mainland China in 1997. But from Professor Yeung's description of Pacific Asia's cities during the 1970s and 1980s, not much has changed except the scale of cities and the ethnicities of the ruling oligarchies. The cities are still based economically in international trade, the facilities relevant to that function have been modernized and expanded, municipal bureaucracies still function much like their colonial predecessors, and the interests of the urban poor still get short shrift.

The manifest exceptions to these generalizations are Hong Kong and Singapore, both city-states with strong traditions of British governing style. Both have flourished in recent decades as manufacturing centers; their populations, though necessarily crowded, have shared in the national prosperity; and their governments have been effective instruments of social betterment, particularly with respect to housing and transportation. A critical ingredient of their success has been fiscal systems that tax urban residents and urban property to provide urban infrastructure and services—an arrangement facilitated by their limited territorial responsibilities. Formosa is also a small and relatively prosperous nation, but it has been much less effective in managing urbanization: In 1975, says Yueng, the total housing stock of Taipei was owned by 5.6 percent of its inhabitants, and the exploding population of motor vehicles made the air unbearable and the noise unbearable. Seoul, the primate city of a larger nation (60,000 km²) colonized not by Europeans but by Japanese, also has found prosperity in manufactures for international trade, but "unabated urban growth has led to intolerable population and traffic congestion, serious industrial pollution, environmental deterioration, housing shortages, and inadequate public service" (p.38).

The real basket cases are Jakarta, Bangkok, and Manila. In 1982 only 30 percent of Jakarta's households had access to piped water, and the city of 6.5 million inhabitants had no waterborne sewage system. Jakarta's municipal budget was less than 10 percent of Singapore's, for a population 2.7 times as large. Manila's sewerage system was built in 1909 to serve a population of 220,000 to 440,000 and had not since been substantially improved or extended even though the metropolitan population is now over 7 million. Traffic jams in Bangkok are probably the worst in Asia, with peak-hour speeds of 12 km per hour for autos and 9 per hour for buses. Over a fourth of Manila's
and Bangkok's populations live in squatter settlements. (pp. 43-44, 151)

The subtitle of this volume might lead a potential reader to expect a coherent theoretical statement about urban processes in Pacific Asia. However, the book is actually a collection of 15 essays that Professor Yeung wrote (a few are coauthored) between 1975 and 1988 on various aspects of urbanization in Pacific Asia. They were prepared for a variety of audiences and occasions, so overlap considerably in content; and later essays borrow freely from earlier ones. (Compare Chapter 3, "Great Cities of Eastern Asia," first published in 1988, with Chapter 6, Southeast Asian Cities: Patterns of Growth and Transformation," first published in 1976.)

Formal theories of urban development are briefly reviewed in Chapter 5, "Changing Southeast Asian Cities." Professor Yeung concludes (correctly, I think) that no general theory of urbanization with wide applicability exists, and that the succession of fashionable hypotheses and paradigms (over-urbanization, pseudo-urbanization, economic dualism, dependent urbanization) has created a "conceptual smog...so dense that [much research will be needed] before the air is clear" (p. 85).

Because the volume has no large-scale structure and no index (or even a list of the tables and maps scattered through the text), it isn't useful as a reference work. Overlap and repetition among the individual essays discourages straight-through reading. However, for readers who need a competent survey of current problems and policies among the great cities of Pacific Asia, I can recommend Chapter 3, "Great Cities of Eastern Asia"; and Chapter 10, "Cities that Work: Hong Kong and Singapore." Both are up to date (1988 and 1987 publication), reasonably systematic in exposition, interesting, and informative.

—Ira S. Lowry
Housing and Development Consultant, Pacific Palisades, California


This two-volume set contains papers prepared by South Asian scholars for the South Asian Regional Conference on Population, sponsored by the Indian Association for the Study of Population, and the 21st International Population Conference of the International Union for the Scientific Study of Population (IUSSP), both of which took place in New Delhi in September 1989. Many of the authors, representing a wide variety of population-related disciplines, are published here for the first time. Although the papers are uneven in quality, they show a marked improvement in the use of tables, charts, and bibliographical citations from earlier work submitted to IUSSP conferences. The editor note that contributors "have a rich and varied background as teachers and researchers in universities and research institutions, government organizations like the Office of the Registrar General and the Department of Family Welfare, technical institutions like the Indian Institute of Technology and the Indian Council of Medical Research." (Preface)

Because the contributions cover such a wide range of population topics, the editors found it hard to assign them to specific sections. There is some overlap in topics between Volume 1 and Volume 2.

Volume 1 contains 5 sections. Section A, Wider Issues, contains papers on population and development, Indian population policies, and private and governmental programs. Section B, Stalling of the Birth Rate, includes papers analyzing the causes of the smaller than expected decline in Indian fertility despite the government's use of incentives to lower birth rates. "Fertility Behaviour in India, 1961-86: The Stalled Decline in the Crude Birth Rate" by Mahinder D. Chaudhry; "On the Myth of Lower Urban Fertility in India and the Controversy between Programme and SRS [Sample Registration System] Birth Rates" by S. Munkerji; and "Alternative Routes of Fertility and Mortality Decline—A Study of Kera and Punjab" by Moni Nar, are informative and provocative reading in this area.

Section C, Fertility and Family Planning, contains papers on contraceptive technology, communication and pill promotion, and other factors, such as socioeconomic development, affecting the use of family planning. Section D, Family Child Survival and Aging, addresses topics that are of concern to policymakers in both the economi-
cally developing and developed countries. The use of mathematical models in the analysis of fertility, mortality, and mobility and in population projections can be found in the 16 papers in Section E.

Volume 2 includes papers on a diverse array of subjects: data bases and research; macrolevel studies; nuptiality; fertility and family planning; health, nutrition, and mortality; common influences on fertility and mortality; tribal fertility and mortality; migration and urbanization; historical demography; and religion and language in relation to population issues. A list of the papers presented by Indian authors at the 1989 IUSSP Conference, arranged by session, is also included.

Population libraries with substantial holdings on South Asia will want to purchase these volumes, as will academic libraries with South Asian collections. It is unfortunate that the purchase price outside India is so high that only libraries with generous budgets will be able to acquire this contribution to current Indian population research.

—Alice D. Harris
Palm City, Florida

ALSO NOTED


This report, edited by the Population Crisis Committee’s Senior Vice President Sharon L. Camp and prepared with assistance from urban specialists throughout the world, ranks 100 metropolitan areas in 45 countries using 10 indicators: the murder rate, food expenditures, living space, access to utilities, communications, education, infant mortality, air quality, noise pollution, and traffic congestion.

Ranked as the five most livable metropolitan areas are Melbourne, Montreal, Seattle–Tacoma, and Essen–Dortmund–Duisburg. The five largest cities with the worst living conditions, according to the report, are Lagos, Kinshasa, Kanpur, Dhaka, and Recife.

The report states that rapid urbanization has become the dominant demographic trend of the late twentieth century, after population growth itself. Between 1900 and 1950 the proportion of the world’s population living in cities rose from 10 to 30 percent. By the year 2010, nearly half of the world’s population is projected to be urban. Rapid urbanization will remain the dominant demographic trend until well into the twenty-first century, when population growth is expected to moderate.

The report notes that rural-to-urban migration is responsible for less than half of the current increases in urban populations in most developing countries. High birth rates in the cities cause most of the growth.

The study’s authors used consistent criteria to define the 10 largest metropolitan areas included in their ranking. The population estimates used were as of January 1989 and prepared by urban demographer Richard L. Forstall. Each of the 10 indicators of urban livability accounted for 10 points on the study’s 100-point scale, 10 being the most favorable and 1 the least favorable. Total scores ranged from 86 to 19.

Twenty-eight cities ranked as poor with scores below 45. All were in developing countries and most had annual population growth rates of 2.5 percent or more. Besides Dhaka, Asian cities in this category included Pune, Lahore, Calcutta, Bombay, Surabaya, Karachi, Delhi–New Delhi, Bangalore, Tehran, Hyderabad, Jakarta, Ho Chi Minh City, Shenyang, Madras, Istanbul, Guangzhou, Bangkok, Manila, and Ahmadabad.

Among the 26 cities ranking as fair with scores of 45–59 were 10 in Asia: Seoul, Pusan, Shanghai, Beijing, Bandung, Harbin, Tianjin, Wuhan, Nanjing, and Chongqin.

Most cities ranking as good (scores of 74–60) and very good (100–75) were in developed or newly industrialized countries. Cities ranked as very good in Asia were Osaka–Kobe–Kyoto, Tokyo–Yokohama, Singapore, and Nagoya.

Those ranked as good were Taipei, Hong Kong, Tashkent, and Ankara.

Detailed information on the 10 indicators used in the study is available in a Statistical Appendix, available from the Department of Publications, Population Crisis Committee. The entire data set is available to research institutions in Lotus 1–2–3 on 3.5 inch or 5 inch floppy disk upon written request to the Director of Research.

A series of studies on cities in the developing world whose populations are expected to exceed eight million by the year 2000. Each report focuses on a particular city and aims to provide a better understanding of the city’s formulation, implementation, and evaluation of population policies. Topics include demographic trends, economic background, early and recent decentralization strategies, key social and economic sectors and issues, distribution of public investment, and resource generation.

Currently available reports focus on the following Asian cities (date of publication and UN sales number appear in parentheses after each title):

**Bangkok** (1987, E.90.XIII.8)
**Bombay** (1986, E.90.XIII.9)
**Calcutta** (1986, E.90.XIII.10)
**Delhi** (1986, E.90.XIII.11)
**Dbaka** (1987, E.90.XIII.12)
**Jakarta** (1989, E.90.XIII.13)
**Karachi** (1988, E.90.XIII.14)
**Madras** (1987, E.90.XIII.15)
**Metro Manila** (1987, E.90.XIII.16)
**Seoul** (1987, E.90.XIII.17)

**Pharmacists and Family Planning**


The report documents the degree of reliance on pharmacies for contraceptives in developed and developing areas, describes lessons learned about the dispensing of contraceptives through pharmacies, and recommends ways to make pharmacies more effective contraceptive dispensers and educators.

Currently about 55 million couples buy their contraceptives in pharmacies. According to the authors, almost 450 million couples need the contraceptive supplies that pharmacies sell. For millions of customers who do not visit clinics or doctors, pharmacy personnel are the only source of information about contraceptives.

---

**WOMEN’S PREFERENCES FOR CHILDREN IN SHIFANG**

(continued from page 12)

of underreporting were found among urban, educated, and younger women because larger proportions of them reported one child as their desired number. In other words, these more “modern” women appeared to be the most sensitive to the government’s one-child policy. In contrast, Hermain and Liu found that rural and uneducated women were more likely to hide their true attitudes about family size in face-to-face interviews.

The results of the Shifang study indicate that most women, especially rural women, prefer to have more than one child. Children still have important economic value for them in agricultural production and as a source of old-age support in rural areas. If couples did not prefer more than one child, there would be no need for the government’s one-child policy or its vigorous birth control programs. Most Chinese couples who are limiting their family size to one child are doing so not out of choice, but as a sacrifice of their own interest for national prosperity and the welfare of future generations.

The critical task of the family planning program is to gain the understanding and support of the people for the national policy through family planning education. One way it can do so is to formulate realistic and meaningful policies of reward-
ber of the Shifang respondents did not subscribe to the adage "The more sons, the more happiness." Raising sons has become more expensive, even in rural areas. In contrast, with the improvement of women’s status, the value of daughters has increased. As a result, women are now more likely than formerly to express a preference for daughters and for a sex-balanced family. Yet, when considering having only one child, Shifang women, especially those in rural areas, still seem to regard a son as having more utility than a daughter.

The gap revealed by this study between individual fertility preferences and the government’s one-child policy suggests that any relaxation of the policy would lead to a rise in fertility toward the preferred level. In fact, it is the fundamental reason for the increased fertility in China in recent years and is likely to continue being a source of fertility instability in the future.

ACKNOWLEDGMENTS
My sincere gratitude goes to Professor Charles Hirschman, who gave me his enthusiastic encouragement, guidance, and support throughout my research. Special thanks go to the Graduate School of Cornell University, which provided additional financial support for the study. I also wish to thank the teachers and students of the Sichuan Family Planning Management Cadre College and the Shifang County Family Planning Commission for their assistance in conducting the survey. The article has benefited from the comments of Fred Arnold and another, anonymous reviewer and from Sandra Ward’s careful editing.

The Forum acknowledges with thanks the use of two photographs by Linus Chao of the University of Hawaii, Hilo Campus, taken as part of a research project on cultural change in China sponsored by the East–West Institute of Culture and Communication.

REFERENCES


Changing Your Address?
Please send us your old address label for the Forum when you notify us of your new address. This will enable us to update the change without delay.