China is the most populous country in the world, with a population in 1999 of nearly 1.27 billion. Of even greater interest, China's elderly population (persons age 60 and older) is about 22% (or more than 128 million) of all the elderly living in the world. By 2050, China is projected to have only 14% of the world's people but will have 21% of the world's elderly. This will occur because of the rapidity with which China's age structure will shift toward the older years. In this article, the authors consider the major factor responsible for China's very large current and projected numbers of elderly, namely, the dramatic fertility transition experienced since the 1970s. The authors also discuss the very heavy dependency burden on China's producing population and show that the burden will get even heavier in the decades ahead.

The Current and Projected Distribution of the Elderly and Eldercare in the People's Republic of China

DUDLEY L. POSTON, JR.
Texas A&M University

CHENGRONG CHARLES DUAN
Renmin (People's) University of China

THE SIZE OF CHINA'S OLDER AND OLDEST OLD POPULATIONS

China is the most populous country in the world, with a population in 1999 of nearly 1.27 billion. This figure represents more than 21% of the population of the entire world (5.995 billion). In a country with a land mass[1] a little bit smaller than that of the United States (China has 9.6 million square kilometers of surface area compared with the United States's 9.8 million square kilometers) lives a population almost 4.7 times larger than the U.S. population (about 273 million in 1999).

Of even greater interest is the size of China's older and oldest old populations. We follow the practice of the Bureau of the Census (Velkoff & Lawson, 1998) and refer to the *older* population as persons age 60 and older and the *oldest old* as those age 80 and older. In 1999, there were more than 591 million older persons (see Table 1) and more than 68 million oldest old.[2] Of the world's older population, about 22% (or more than 128

TABLE 1
Total Population, Older Population, and Oldest Old Population:
World, China, and the United States, 1999 and 2010 to 2050

		World	
Year	*Total*	*Older*	*Oldest Old*
1999	5,995,544,836	591,389,484	68,259,980
2010	6,830,906,857	755,327,646	103,181,481
2020	7,561,076,957	1,018,949,740	136,919,697
2030	8,213,573,346	1,355,545,346	190,254,664
2040	8,809,366,772	1,663,858,895	284,553,277
2050	9,297,023,938	1,981,995,384	399,466,279

		China	
Year	*Total*	*Older*	*Oldest Old*
1999	1,268,985,201	128,215,415	11,069,279
2010	1,358,722,700	168,804,989	17,654,658
2020	1,422,937,380	240,217,728	24,018,400
2030	1,432,807,130	341,693,798	35,136,698
2040	1,410,644,753	395,615,825	57,409,084
2050	1,347,624,386	424,395,138	92,505,472

		United States	
Year	*Total*	*Older*	*Oldest Old*
1999	272,639,608	44,947,333	8,930,406
2010	298,026,141	55,623,834	11,227,361
2020	323,051,793	73,769,020	12,400,055
2030	347,209,212	87,874,783	18,009,972
2040	370,289,996	93,088,015	26,216,372
2050	394,240,529	99,459,187	30,200,741

million) live in China compared with 7.6% (or almost 45 million) living in
the United States. If the older population of China today was a single
country, it would be the 8th largest country in the world, outnumbered
only by the nonelderly population of China (about 1.1 billion) and the
populations of India (989 million), the United States (273 million), Indo-
nesia (207 million), Brazil (162 million), Russia (147 million), and Paki-
stan (142 million) (Population Reference Bureau, 1998). Of the 68 million
oldest old in the world, more than 16% (or about 11.1 million) live in

China compared with more than 13% (or just fewer than 9 million) living in the United States.

Until recently, the government of China has tended to focus more on matters of population control rather than population aging. Indeed, issues of population aging have been relatively unimportant in the policy arena. In the early 1970s, China seriously came to grips with the burgeoning size of its population. Established in 1971 was a nationwide fertility control program that stressed later marriages, longer intervals between children, and fewer children. However, the large numbers of children born during China's baby boom in the early 1960s caused China's leaders in the mid-to late 1970s to become increasingly worried about demographic momentum and the concomitant growth potential of this extraordinarily large cohort. They thus intensified their already strong family planning program by launching in 1979 the infamous One Child Campaign. The principal goal of this campaign was to eliminate all births of more than two per family and especially to encourage most families to have no more than one child, particularly those living in urban areas. As we show later, these two policies along with increasing levels of socioeconomic development resulted in a drastic decline in China's total fertility rate (TFR)[3] from levels greater than six children per woman in the early 1950s to less than two in the late 1990s (Poston, 1998; Poston & Gu, 1987). In 1998, China had a TFR of 1.8 (compared with 2.0 for the United States and 2.9 for the world) (Population Reference Bureau, 1998).

This transition in China in but a few decades to below replacement levels of fertility has produced and will continue to produce an unprecedented growth in China's older populations. We show later how Chinese policy leaders have only recently become cognizant of the current numbers of elderly and especially the future numbers of elderly.

It is important to recall that the relatively large numbers shown for China's older and oldest old population in 1999 are numbers that were generated during demographic regimes that were largely pronatalist. Because it was only during the 1970s that China drastically reversed this course with strict—some would even say coercive (cf. Aird, 1990)— fertility control policies, an unanticipated consequence has been extremely large older and oldest old populations projected for the decades of the next century.

Table 1 shows population projections of the total populations, the older populations, and the oldest old populations of the world, China, and the United States for the decennial years of 2010 through 2050. From Table 1, we may determine that in 1999, China had 21% of the world's people and 22% of the world's people age 60 or older. By 2050, China is projected to

have only 14% of the world's people but 21% of the world's people age 60 plus. This will occur because of the rapidity with which China's age structure will shift toward the older years. In contrast, the United States, which had 7.6% of the world's older people in 1999, is projected to have only 5% of that group in 2050. The population in the United States is aging but not as quickly as that of China.

In the next section, we consider the major factor responsible for China's very large current and projected numbers of elderly, namely, the dramatic fertility transition experienced since the 1970s. We then turn to ways the country is beginning to address these extremely large numbers of elderly. We also consider the very heavy dependency burden on China's producing population and show that the burden will get even heavier in the decades ahead. Finally, we consider some of the implications of our analysis.

POPULATION GROWTH AND AGING IN CHINA

When Mao Zedong and the Chinese Communists took over China in 1949, relatively little attention was paid to the size and growth of the population. In fact, Aird (1972) characterized the early years of the People's Republic as a period of doctrinaire Marxism. But when the initial results of the 1953 census became available in 1954, there was anxiety expressed about the size and growth trends of the country, and by the summer of 1956, a birth control campaign was underway. Zhou Enlai, in a report to the People's Congress in August 1956, demanded that "health departments disseminate propaganda and take effective measures for birth control" (Aird, 1972, p. 237). But with the introduction in 1958 of communes and the Great Leap Forward, China began to reverse its new birth control policy: "A large population was once more regarded as advantageous, and the vicious attacks on Malthusians, 'rightists' and 'bourgeois economists' who championed birth control again shifted into high gear" (Orleans, 1972, p. 40).

The Great Leap Forward, initiated in 1958, was designed to "involve a revolutionary struggle against nature to realize the great potential of agriculture by maximizing the advantages of the collective economy" (Aird, 1972, p. 278). It had a short life because in 1959, China suffered an economic crisis and famine (Ashton, Hill, Piazza, & Zeitz, 1984), resulting in the premature death of at least 30 million people. The fertility decline from the mid-1950s through the early 1960s is thought to have resulted from the "national hard times" (Chen, 1984, p. 45) and famine experienced in China during and immediately after the Great Leap Forward.
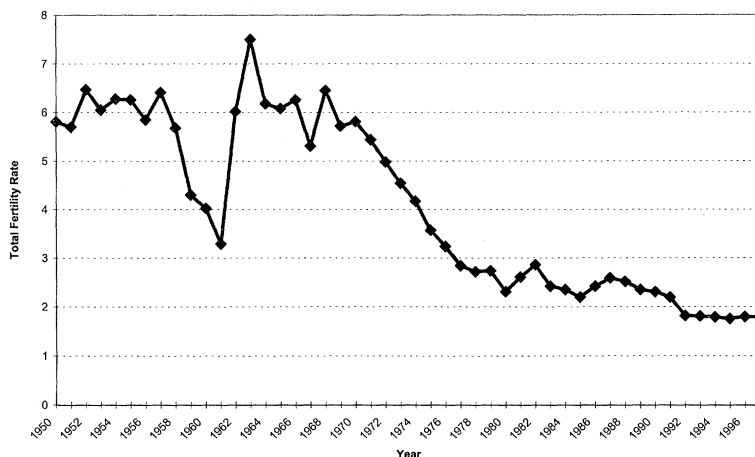
Figure 1:   Total Fertility Rates, China, 1950 to 1998

Coale (1984) wrote that in addition to "famine-induced subfecundity," the fertility decline was due also to the "disruption of normal married life" (p. 57).

During the 2 years from 1961 to 1963, the TFR increased markedly, from 3.3 to 7.5 (see Figure 1). According to Chen (1984), this occurred in conjunction with the economic recovery in China. Coale (1984) added that this increase also "resulted from the restoration of normal married life, from an abnormally large number of marriages, and from the unusually small fraction of married women who were infertile because of nursing a recently born infant" (p. 57). These years of the early to mid-1960s were the period of China's baby boom. China experienced in the early 1960s the same kinds of growth experienced in the United States after World War II. China's baby boom was of a shorter duration but of a significantly higher magnitude. China's TFR peaked at 7.5 in 1963. At the height of the U.S. baby boom in 1957, the TFR was but 3.7.

In early 1962, China resumed its second family planning program, one mainly encouraging family size limitation. This campaign lasted until 1966. With the introduction then of the Great Proletarian Cultural Revolution, birth control work was interrupted, and the focus in China on family planning programs was minimal.

The Chinese initiated in 1971 their third family planning campaign, the *wan xi shao* program. These three Chinese terms stood for the three slo-

gans of the campaign: later marriages, longer intervals between children, and fewer children. Indeed, the fertility declines in the 1970s (see Figure 1) reflect the general success of this campaign (Chen, 1984). Fertility fell from 5.4 in 1971 to 2.7 in 1979.

However, the large numbers of children born during China's baby boom in the 1960s caused Chinese leaders in the mid- to late 1970s to become very concerned about demographic momentum and the concomitant growth potential of this extraordinarily large cohort. At this time, the Chinese government was "discovering the existence and usefulness of the field of demography" (Banister, 1987, p. 183), and the leaders were cognizant of the demographic momentum built into the population's current age structure. They hence approved the "one child is best" norm and intensified their already strong family planning program by launching in 1979 the One Child Campaign. This fourth program (which is really an extension of the third) was undertaken so that, in the words of then Vice-Premier Chen Muhua, "the total population of China will be controlled at about 1.2 billion by the end of the century" (Tien, 1983).

The principal goal of the fourth campaign is to eliminate all births above two per family and to encourage most families to have no more than one child, especially those in the urban areas. The policy is not enforced stringently among the country's minority populations (Poston & Shu, 1987), and a number of exceptions are permitted among the majority Han nationality. The program involves a series of inducements that are many and varied; they touch on virtually all aspects of people's social and economic lives including their salaries, sustenance, health facilities, employment, and education (Sardon, 1985).

Between 1980 and 1982, fertility increased slightly to 2.7 and then fell back to 2.2 in 1985; by 1986, it had risen again to 2.4. The increase between 1980 and 1982 was likely due in part to the implementation of China's new Marriage Law of 1981. This law raised the legal age at first marriage to 22 years for men and 20 years for women; previously, according to the Marriage Law of 1950, the legal ages for men and women were 20 and 18 years, respectively (Gu, 1988). Ironically, this stipulation of the new Marriage Law of 1981 resulted in an unanticipated increase in the number of first marriages, with a corresponding increase in the fertility rate. This occurred because although the 1950 marriage law allowed men and women to marry at ages 20 and 18, most provincial-level marriage policies required men and women to be quite a few years older; specifically, most provinces required men to be at least 25 and women 23. With the passing of the new 1981 law, many couples used these new age-at-first-marriage stipulations as a justification for earlier marriages,

and China experienced a slight marriage boom (Coale, 1984; Poston, 1986).

By 1987, the total fertility rate increased to 2.6. This increment was due in part to a relaxation of China's one-child-per-couple policy. These days, China seems to be allowing more and more couples, particularly those in the rural areas, to have a second child. But the policies from the late 1980s into the 1990s have been implemented sometimes more stringently and sometimes less stringently, resulting in slight increases in the late 1980s and then decreases in the 1990s, leading to the current TFR of around 1.8.

It is this dramatic decline in the TFR in the 1970s and 1980s that has produced in the 1990s, and will produce in the decades of the 21st century, large numbers of elderly people. Since 1992, China's TFR has been below the replacement level of 2.1. Birth cohorts are considerably smaller these days than they were a few decades ago. This much lower fertility coupled with significant gains in longevity, both occurring in a country with a very large population base, have produced in China the largest absolute numbers of elderly ever witnessed in one country in human history.

We turn now to a discussion of the ways the country is beginning to address the extremely large current and projected numbers of elderly people.

RESEARCH AND GOVERNMENT ACTIVITIES IN CHINA WITH REGARD TO THE ELDERLY AND ELDERCARE

In China, population issues have long focused on the control of population growth. Among the few "Basic State Policies" set up by the government, population policy was the first (set up in early 1980s). Its goals are reflected in its title, namely, "To Control Population Size, and To Improve Population Quality." Little attention was given to the aging of the population.

However, with the rapid decline of fertility in China, leaders began to realize the importance for China of population aging and issues of the elderly and eldercare. Since the 1980s, the government has sponsored a considerable amount of research on population aging.

Using POPLINE, an electronic database published and maintained by the Population Information Program at Johns Hopkins University and the National Library of Medicine, we conducted in early 1999 a review of literature on population aging in China. There were about 130 publications available on the *elderly* and *aging* in China. But from 1970 to 1974, there were no publications published on this topic. There was only one published between 1975 and 1979, and it was not specifically targeted to

China's elderly; instead, it compared the Chinese population with the Australian population, and the author was not Chinese.

Since the early 1980s, research and publications on the elderly in China have increased. From 1980 to 1984, there were 8 papers on the topic and as many as 37 in the late 1980s. In the first half of the 1990s, there were 45 and an additional 11 from 1995 to 1997, the last year for which POPLINE has data.

Some of the published research has focused on the current and projected size of China's elderly population. The reasons for the increases in China's aging population have also been discussed. For instance, X. Wang (1984) mentioned three reasons: better standards of living and health care, declining birth rates, and longer life expectancy.

China's leaders and researchers have begun to debate the consequences of China's aging process and corresponding solutions. Nan (1986) wrote that the proportion of the elderly will reach one fifth of China's population by 2040, resulting in three major problems, namely, the costs of supporting this large number of elderly people, the relative decrease in the working population, and the increased problems of older people.

Zeng (1989) wrote about the future trends of China's elderly population in the rural and urban areas, under several different assumptions. Even under a high (and unlikely) fertility variant assuming rural and urban total fertility rates to remain constant at 2.7 and 1.9, respectively, the elderly (age 65 and older) will be more than 20% of China's total population by the middle of the next century. Improvements in health, he noted, may keep most of the young-old (age 65 to 74) active and some able to work. However, with mortality declines, more and more old-old people may become senile and/or bedridden. Moreover, the low sex ratio at the old-old ages means a large proportion of widows.

Government leaders are more cognizant than others of the implications of large numbers of elderly in future years in China (Wu, 1994). In China, an old-age security system was introduced in 1952 for government employees of most urban state enterprises and large collectives. Coverage now includes about 140 million persons. The rural elderly do not retire but continue to work until their health fails. China provides, depending on the location, the "Five Guarantees" of food, clothing, shelter, medical care, and a funeral for persons who are childless, disabled, or without means. A 1987 survey on the aged found that the urban elderly mainly received income from children, work, or pensions. About 50% of rural elderly income came from work. Support from children increased as the elderly aged. Given China's unbalanced urban-rural distribution, it is no surprise that 80% of the low-income elderly live in rural areas.

When Chinese leaders first confronted the aging issue, they realized immediately the conflicts between population aging and birth control. Strong birth control programs lead to proportionally more elderly in the population. There have thus been serious debates about how to realize a balance between population aging and birth control.

The debate began in the mid-1980s. Wei Wang (1987), the then minister of family planning, denied that the dependency ratio would increase due to population aging. He was very much against the view that China must relax its family planning policy to ease the difficulties brought about by rapid population aging.

The debate continues. Leaders and nonleaders are aware that Chinese citizens who adopted the one-child family norm will face the added burden of four elderly parents. Some have even urged that the one-child policy be replaced with a two-child policy. The shift to a two-child norm would result in some short-term imbalances but would eventually lead to a lighter dependency burden for succeeding generations and less fluctuations in family size and structure. A smooth and gradual transition to a two-child policy would result in a decline in population around 2030.

The government has also passed recent legislation pertaining to the elderly. The Law on the Protection of the Rights and Interests of the Elderly was enacted in 1995. Its title is its goal.

There are currently in China eight development plans in various stages of implementation that address the issue of aging. In April 1999 (when this article was first drafted), there was legislation on the books and/or in committee endeavoring to (a) speed up the passing of laws on population aging that would protect the rights of the elderly; (b) establish and improve the social security system for the elderly (support will be based on the cooperative efforts between the government, the community, family, and individual); (c) vigorously develop medical and health services for the elderly to facilitate self-care; (d) promote the health of the elderly and encourage their participation on a voluntary basis in social and economic activities; (e) create opportunities for the continued education of the elderly; (f) create recreational centers for the elderly; (g) develop social welfare programs for the financial and material support of the aged; and (h) intensify theoretical and applied scientific research on issues related to the elderly ("China's Development Plans," 1996).

Moreover, a specific "Plan of Action" was prepared by the China National Committee on Aging in 1994 containing 11 recommendations. In general, it was urged that China closely monitor population trends. Cohort studies should be conducted with census and survey data to be better able to understand the socioeconomic characteristics of the population by age

group. The plan further noted that there is a need to analyze changes in population, family status, living arrangements, and housing conditions of the elderly. The 2000 census of China, it was urged, should include questions about the elderly and home ownership. Policy makers should be aware of and should use statistical data and analysis of the elderly (National Committee on Aging, 1998).

A masterful move, in our opinion, was the government's decision in the 1990s to reestablish on a formal basis a traditional Chinese holiday, Elderly Day. In ancient China, there was a *Chong Yang* Day, on September 9 (9/9) of the lunar calendar. The sound of the Chinese character for *longevity* is the same as the sound of the Chinese character for the number nine. Thus, September 9 (the ninth day of the ninth month) has been celebrated nationally in recent years in honor of the elderly. Although not yet a public holiday, the government and the mass media sponsor all sorts of activities and celebrations for Elderly Day. The activities aim at promoting an awareness of the needs of the elderly and the need to support the elderly.

We have addressed to this point China's large absolute and relative numbers of elderly people, how China arrived at this demographic point, and some of the plans and activities now being discussed and implemented by Chinese researchers and leaders. We turn now to a consideration of the very heavy dependency burden on China's producing population; we also show that the burden will get even heavier in the decades ahead.

DEPENDENCY AND AGED
DEPENDENCY IN CHINA

A large number of elderly persons in a population is not problematic if there exists at the same time in the population a large number of producers. It is only when the ratio of elderly to producers becomes high that a host of economic, social, and related problems occur. In this section, we do not discuss these problems per se. We have already mentioned some of them in the preceding section. Instead, here we attempt only to show empirically the degree currently of China's dependency burden and how much worse it will become in the years ahead. We leave it to others to entertain the nature of the problems these dependency burdens will cause.

Figure 2 is China's 1999 population pyramid. Age and sex information for a country tell us a great deal. The large birth cohorts born in China in the mid-1960s and into the early 1970s are shown by the extensions of the male and female bars at ages 25 to 29 and 30 to 34. The better female-
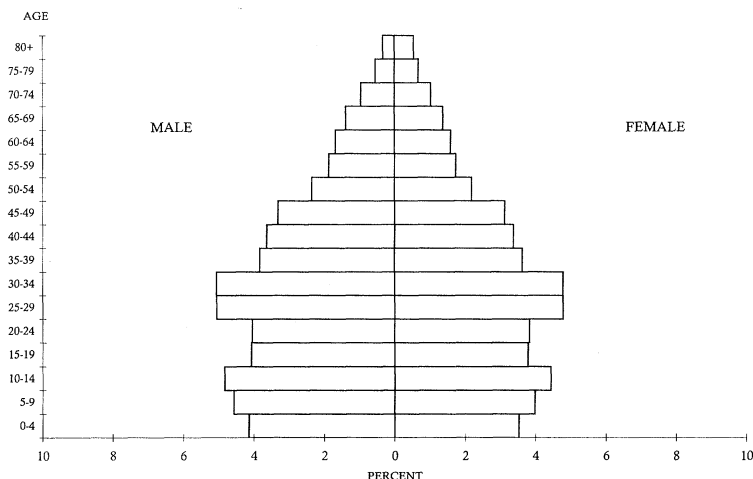
Figure 2:   China 1999, Population by Age and Sex

to-male life expectancy is reflected in the excess numbers of women at the oldest ages, and the effects of the lower fertility rates in the 1990s are seen in the indented male and female bars at age 0 to 4.

Also, in virtually every known society, about 105 males are born for every 100 females born. In China in the past 10 to 15 years, the fertility policy has led to a much higher than average number of sons being born than daughters (Hull, 1990; Poston, Gu, Liu, & McDaniel, 1997). For instance, the sex ratio at birth (SRB) for all births in China for the year of 1989 was 114; it was 121 for second births and 125 for third births. When one separates these higher order births by the sex of the previously born child(ren), the birth-order-specific sex ratios are quite a bit higher when the previous births are female (Poston et al., 1997).

Sex-selective abortion and other factors have led to abnormally high sex ratios at birth in China (Zeng et al., 1993). In Figure 2, the effects of these higher sex ratios are indicated by the higher percentages of males compared with females at ages 0 to 4, 5 to 9, and 10 to 14; the sex ratios for these age groups are 118, 115, and 109, respectively.

We turn now to a consideration of dependency. We measure the total dependency in a population by the ratio of persons age 0 to 14 and persons age 60 and older to persons age 15 to 59. The numerator consists of persons who typically are not employed, hence not serving actively as pro-

TABLE 2
Total (TDR), Youth (YDR), and Aged Dependency Ratios (ADR)
and the Percentage of the Population Older Than Age 60:
China and the United States, 1999 and 2010 to 2050

Population, Year	TDR	YDR	ADR	Percentage Older Than 60
China, 1999	55.2	39.5	15.7	10.2
China, 2020	54.3	28.2	26.1	16.9
China, 2050	85.9	27.3	58.6	31.5
United States, 1999	61.4	34.8	26.6	16.5
United States, 2020	75.3	35.2	40.1	22.9
United States, 2050	83.7	37.4	46.3	25.2

ducers of goods, material resources, and sustenance. The denominator, persons age 15 to 59, contains the productive members of the population, many of whom who are in the labor force, all of whom, in varying ways, are producing foodstuffs and related goods and services for the population; this ratio is multiplied by 100 and refers to the number of dependents in the population per 100 producers. The total dependency ratio (TDR) can be subdivided into a youth dependency ratio (YDR) (i.e., persons 0 to 14 divided by persons 15 to 59) and an aged dependency ratio (ADR) (i.e., persons 60 and older divided by persons 15 to 59).

China's 1999 pyramid does not reflect in any serious way youth or aged dependency imbalances (see Table 2). China's 1999 TDR is 55.2, meaning that in 1999, China had 55.2 dependents for every 100 producers. The TDR of 55.2 may be divided into a youth dependency ratio of 39.5 and an aged dependency ratio of 15.7.

China's YDR in 1999 is rather modest when compared with those of other countries. To illustrate, the Gaza Strip had a YDR in 1995 of 114, the highest in the world, followed by Uganda (99), Ethiopia (97), and Libya (87). Mexico had a YDR of 59.

China's ADR in 1999 is a little higher than average but not appreciably so. The ADR for the United States is more than 11 points higher (see Table 2), and Sweden's is higher still.

In 1999, one tenth of China's population is older than age 60, compared with 17% for the United States. By comparison, in the early 1990s, 10 countries, all in Europe, had more than 20% of their populations age 60 and older: Sweden had the highest percentage (23%), followed by Nor-

way, Belgium, Italy, United Kingdom, Germany, Austria, Greece, Denmark, and Switzerland.

It is in 2050 that China is projected to have made the transition to a demographically very old country (see Table 2). By the year 2050, almost 32% (nearly one third) of its population (more than 424 million people) will be 60 years of age or older. The oldest countries in the world today, the European countries mentioned earlier, are nowhere near as old as China is projected to be in 2050; recall that the oldest country today, Sweden, has 23% of its population age 60 and older.

Also in 2050, China's ADR will be larger than that of the United States. For every 100 producers in China in 2050, there will be 59 aged dependents, whereas in the United States, the number is projected to be 46.

By 2050, China will have grown to be one of the oldest populations in the world and a country with one of the heaviest aged dependency burdens of any population in the world. In the concluding section of this article, we consider some of the implications of these projections.

CONCLUSION

The current and projected levels of the elderly population in China show that by the midpoint of the 21st century, China is projected to have one of the oldest populations in the world and one of the heaviest old-age dependency burdens. Two implications worthy of consideration are the transitions in the organization of eldercare by the family and nuptiality.

Traditionally in China, the support of one's elder parents has been the responsibility of the sons. Often, the parents lived with the oldest son and either with or nearby the other sons. The eldest son and his brothers tended to be responsible for providing the parents with economic support. The sons would rely on one of their sisters or sometimes on one or more of their wives to provide their parents with emotional support. These norms have been adjusted or modified in past decades, especially since the coming of the People's Republic in 1949, and particularly among urban residents. Nevertheless, the provision of economic and emotional support to one's parents has seldom been a major burden. As one might expect in a population with modestly high levels of fertility, there have usually been many more producers in the Chinese population than aged dependents.

However, given in contemporary China the very low levels of fertility as well as highly unbalanced sex ratios at birth, the provision of eldercare could well be a problematic concern in the years of the 21st century. For one thing, as we have already noted, in the decades of the 21st century, in

China there will be many more aged dependents per producers. There are about 16 aged dependents per 100 producers today in China; in 2020, 26 aged dependents per 100 producers; and by 2050, 59 aged dependents per 100 producers. This is an astonishingly high number of old persons per 100 producing members in the population. The number of aged dependents per 100 producers in China in 2050 will be 2.7 times larger than China's current number and will likely be one of the highest of any country in the world.

When we couple this very high ADR for the year 2050 for China with the abnormally high sex ratios at birth in China, the issue of eldercare provision in the present millennium becomes even more complex. Recall that the SRB for all births for China for 1989 was 114; it was 121 for second-order births and 125 for third-order births. If these abnormally high SRBs continue into the decades of the 21st century (and there is no indication that they will not), this will mean that an enormously large number of Chinese men will find it difficult, if not impossible, to meet women to marry. As many as 10% of men seeking women to marry will likely be unsuccessful. These single men will have the responsibility for providing both the economic and the emotional support for their parents. What might one expect in such a situation? Anthropological research conducted in rural Ireland provides a possible answer.

In rural Ireland, Scheper-Hughes (1979) noted that the last-born male has the responsibility for remaining with his parents, taking over the responsibility of the family farm, and caring for the elderly parents. His older male siblings typically move to the cities, immigrate abroad, or enter the priesthood. His female siblings move away when they marry. The last-born male, sometimes referred to as the "scraping of the pot" (Scheper-Hughes, 1979, p. 163) and often called the *boy-o*, is preordained by his sex and birth order to remain unmarried, to care for the family plot, and to take care of his parents. This is an economic strategy in the society involving the selection of a male heir, one not that uncommon in other societies. The situation in rural Ireland, however, also involves a related psychological strategy in which the rural families "create a scapegoat, a vulnerable member" (Scheper-Hughes, 1979, p. 165) who is the last-born male; he knows from his earliest years that he will never marry and will forever live at home with his parents until their death. Those finding themselves in the social position of boy-o are much more likely than their older siblings, male or female, to be alcoholics and/or to be suffering from mental disease, especially schizophrenia.

According to Scheper-Hughes (1979), "the dynamics of rural Irish socialization . . . is weighted in favor of the mental health of daughters and

earlier-born sons, and against the healthy ego integration of later-born sons in large and traditional farm families" (p. 166). These last-born males never grow up; they "get stuck by default with the land and [are] saddled with a life of almost certain celibacy and self-negating service to the old people" (p. 179). The last-born son is "forever a 'boy-o,' and never a man" (p. 185).

In China in the decades of the 21st century, there will be a very large number of unmarried sons caring both economically and emotionally for their aged parents; as many as 1 in 10 sons will be in this position. If the situation in rural Ireland is relevant at all for rural China, one would expect to find much higher levels of mental illness among these Chinese boy-os than among the sons whose wives are assisting them in the care of their elder parents (see related discussions by Fry, 2000, and Climo, 2000 [this issue]).

Unlike the case these days in China where there are several married sons along with their sisters available to care for the elderly parents, the situation in the next 30 to 40 years will be different: There will be many more elderly—parents and aunts and uncles—requiring care than there are today. Moreover, many of the providers will be sons, perhaps only-born sons without wives. Alcoholism and mental illness, especially schizophrenia, could well become much more prevalent among these bachelor sons than they are today.

There are at least two kinds of extenuating circumstances that would modify this rather negative prognosis and provide an alternative to male celibacy. The immigration to China of Chinese women from Hong Kong, Singapore, and Taiwan would of course enlarge the pool of wives; there is already some marriage migration of this form underway in China, but it would need to increase in magnitude (Davin, 1998; Fan & Huang, 1998). Polyandry is another possibility (Cassidy & Lee, 1989), and there is already limited evidence of its existence among some of China's minority populations (Johnson & Zhang, 1991; Zhang, 1997).

The results of our analysis of aging in China still have other implications. Given space limitations, we will mention only a few briefly. One is that the projections of the elderly populations of the world, China, and the United States set forth earlier may well be underestimating the levels of human longevity to be experienced. Biodemographic research currently underway (Vaupel et al., 1998; see also Kannisto, Lauritsen, Thatcher, & Vaupel, 1994) suggests that rates of mortality need not necessarily accel-

erate with age. It is not at all unlikely that future generations could live even longer lives than those assumed in our population projections. If this research is correct, there may be even more elderly in the world and in China by the midpoint of the 21st century and later than is indicated earlier in our projections (see Table 2).

Is China in any position today to reduce its projected imbalance of the elderly? The answer is yes. But as noted earlier, one of the better strategies for reducing the large numbers of elderly in future years is not a popular one among doctrinaire Chinese leaders. It involves adjusting the country's so-called one-child fertility policy. Most families in China, except those living in the large cities, are allowed to have two children, particularly if the first child is a female. Relaxing this policy even more so and allowing between now and the year 2050 urban fertility rates to reach 2.0 and rural fertility rates to reach levels of 2.5 or a little higher would have a sizable impact; such a change would likely drop the aged dependency ratio and the percentage of the population age 60 and older by between 20% and 40% (for other scenarios, see Banister, 1992; Bongaarts & Greenhalgh, 1985). As Banister (1992) noted, "China's population will age under any likely scenario, but the lower the fertility level, the more severe the aging" (p. 472).

The analysis presented here of the demographic determinants in China portrays a situation that rings with irony. China solved its burgeoning fertility problem with an induced fertility transition, which was one of the most successful fertility reductions experienced by any country in the world. But it is the very success of this transition that has exacerbated the problem. Chinese fertility policies have limited the size of birth cohorts relative to their elders to a degree unprecedented in the less developed countries. And the very speed of the fertility transition has given China little time to evolve a nonfamilial old-age support system to replace the traditional family. There is a growing awareness of such problems these days in China. Although they were not foreseen at the inception of the fertility policies in the 1970s, debates about and discussions of them are now underway. It may well be that China will be forced to move to a countrywide two-plus fertility policy sometime during this new century, after the present baby-boom generation is safely beyond the childbearing years. Such a strategy will reduce significantly the magnitude of the elderly projections presented in this article and the severity of the concomitant social problems.

NOTES

1. Surface area, according to the United Nations (1992), "refers to the total surface area, comprising land area and inland waters (assumed to consist of major rivers and lakes) and excluding only polar regions and uninhabited islands" (p. 36).

2. Unless otherwise noted, all of our data on population size and age composition for 1999 and projected years are from the Census Bureau's international database, updated on December 12, 1998 (Bureau of the Census, 1998).

3. A total fertility rate (TFR) is a synthetic measure of fertility. It is a summary, cross-sectional measure of age-specific fertility rates that represents the number of children that 1,000 women would bear in their lifetimes if they followed the age-specific fertility rates of an area at one point in time. Sometimes the TFR is divided by 1,000 and thus refers to the average number of children per woman.

REFERENCES

Aird, J. S. (1972). Population policy and demographic prospects in the People's Republic of China. In *People's Republic of China: An economic assessment* (a compendium of papers submitted to the Joint Economic Committee, Congress of the United States, pp. 220-331). Washington, DC: Government Printing Office.

Aird, J. S. (1990). *Slaughter of the innocents: Coercive birth control in China*. Washington, DC: The AEI Press.

Ashton, B., Hill, K., Piazza, A., & Zeitz, R. (1984). Famine in China, 1958-61. *Population and Development Review, 10*, 613-645.

Banister, J. (1987). *China's changing population*. Stanford, CA: Stanford University Press.

Banister, J. (1992). Implications of the aging of China's population. In D. L. Poston, Jr. & D. Yaukey (Eds.), *The population of modern China* (pp. 463-490). New York: Plenum.

Bongaarts, J., & Greenhalgh, S. (1985). An alternative to the one-child policy in China. *Population and Development Review, 11*, 585-618.

Bureau of the Census. (1998). *Census Bureau international database* [Online]. Available: http://www.census.gov/cgi-bin/ipc/idbagg

Cassidy, M. L., & Lee, G. R. (1989). The study of polyandry: A critique and synthesis. *Journal of Comparative Family Studies, 20*, 1-11.

Chen, S. (1984). Fertility of women during the 42-year period from 1940 to 1981. In *Analysis on China's national one-per-thousand sampling survey* (pp. 32-58). Beijing: China Population Information Center.

China's development plans. (1996). *China Population Today, 13*(7), 18-20.

Coale, A. J. (1984). *Rapid population change in China, 1952-1982*. Washington, DC: National Academy Press.

Climo, J. J. (2000). Eldercare as "woman's work" in poor countries. *Journal of Family Issues, 21*, 692-713.

Davin, D. (1998). *Internal migration in contemporary China*. New York: Macmillan.

Fan, C. C., & Huang, Y. (1998). Waves of rural brides: Female marriage migration in China. *Annals of the Association of American Geographers, 88*, 227-251.

Fry, C. L. (2000). Culture, age, and subjective well-being: Health, functionality, and the infrastructure of eldercare in comparative perspective. *Journal of Family Issues, 21,* 751-776.

Gu, J. (1988). Marriage and the family. In *New China's population* (pp. 129-149). New York: Macmillan.

Hull, T. H. (1990). Recent trends in sex ratios at birth in China. *Population and Development Review, 16,* 63-83.

Johnson, N. E., & Zhang, K-T. (1991). Matriarchy, polyandry, and fertility amongst the Mosuos in China. *Journal of Biosocial Science, 23,* 499-505.

Kannisto, V., Lauritsen, J., Thatcher, A. R., & Vaupel, J. W. (1994). Reductions in mortality at advanced ages: Several decades of evidence from 27 countries. *Population and Development Review, 20,* 793-810.

Nan, Z. (1986). On population aging in China. *China Population Newsletter, 3*(4), 7-13.

National Committee on Aging. (1998). Plan for action. *China Population Today, 15*(4), 5-7.

Orleans, L. A. (1972). *Every fifth child: The population of China.* Stanford, CA: Stanford University Press.

Population Reference Bureau. (1998). *World population data sheet, 1998.* Washington, DC: Author.

Poston, D. L., Jr. (1986). Patterns of contraceptive use in China. *Studies in Family Planning, 17,* 217-227.

Poston, D. L., Jr. (1998, June). *Social and economic development and the fertility transitions in mainland China and Taiwan.* Paper presented at the Conference on Economic Aspects of the Demographic Transition: The Experience of Asian-Pacific Countries, Taipei, Taiwan.

Poston, D. L., Jr., & Gu, B. (1987). Socioeconomic development, family planning, and fertility in China. *Demography, 24,* 531-551.

Poston, D. L., Jr., Gu, B., Liu, P., & McDaniel, T. (1997). Son preference and the sex ratio at birth in China. *Social Biology, 44,* 55-76.

Poston, D. L., Jr., & Shu, J. (1987). The demographic and socioeconomic composition of China's ethnic minorities. *Population and Development Review, 13,* 703-722.

Sardon, J-P. (1985). Planification familiale et pratiques contraceptives en Chine [Family planning and contraceptive practice in China]. *Population, 40,* 774-779.

Scheper-Hughes, N. (1979). *Saints, scholars, and schizophrenics: Mental illness in rural Ireland.* Berkeley: University of California Press.

Tien, H. Y. (1983). China: Demographic billionaire. *Population Bulletin, 38*(2), 1-42.

United Nations. (1992). *Demographic yearbook, 1991.* New York: Author.

Vaupel, J. W., Carey, J. R., Christensen, K., Johnson, T. E., Yashin, A. I., Holm, N. V., Iachine, I. A., Kannisto, V., Khazaeli, A. A., Liedo, P., Longo, V. D., Yi, Z., Manton, K. G., & Curtsinger, J. W. (1998). Biodemographic trajectories of longevity. *Science, 280,* 855-860.

Velkoff, V. A., & Lawson, V. A. (1998). *Gender and aging caregiving* (International Brief, IB/98-3). Washington, DC: Bureau of the Census.

Wang, W. (1987). Interview. *China Population Newsletter, 3*(1), 1-3.

Wang, X. (1984). Zhongguo lao nian renkou [The elderly population of China]. *Renkou Yanjiu, 5,* 40-43.

Wu, C. (1994). The aging process and income security of the elderly under reform in China. In *The aging of Asian populations: Proceedings of the United Nations Round Table on the Aging of Asian Populations* (pp. 58-65). New York: United Nations.

Zeng, Y. (1989). Aging of the Chinese population and policy issues: Lessons from a rural-urban dynamic projection model. In *1989 International Population Conference, New Delhi* (Vol. 3, pp. 81-101). Liege, Belgium: International Union for the Scientific Study of Population.

Zeng, Y., Tu, P., Gu, B., Xu, Y., Li, B., & Li, Y. (1993). Causes and implications of the recent increase in the reported sex ratio at birth in China. *Population and Development Review, 19*, 283-302.

Zhang, T. (1997). Marriage and family patterns in Tibet. *China Population Today, 14*(3), 9-12.