DUDLEY KIRK*

RECENT DEMOGRAPHIC TRENDS AND PRESENT POPULATION PROSPECTS FOR MEXICO†

Dire predictions are common about the effects of rapid population growth on the economies and especially the food requirements in many less-developed countries (LDCs). With growing realization that birthrates have started downward in many LDCs, estimates of future population growth have been reduced but remain awesome indeed. Recent United Nations estimates project a growth of more than 1.5 billion, or some 47 percent in the LDCs, between 1980 and the year 2000 (United Nations, 1981). The economies of these countries will have to progress faster and faster merely to remain in the same place, much less to achieve gains in per capita output and consumption, notably of food.

Until recently, Mexico has been one of the most rapidly growing countries in the world. In fact, Mexico's recorded annual rate of population growth between 1965 and 1975 (about 3.5 percent) was by a substantial margin the highest of any LDC with 50 million or more inhabitants. Furthermore, up to 1970 there had been little evidence of any substantial reduction in fertility. On the basis of a 3.5 percent annual rate of growth, it has been common to project a Mexican population in 2000 of 130 to 135 million, some twice the 1980 census population of 67.4 million.

In view of reductions in the birthrate since 1975, projections made most recently are generally lower. However, all projections for 2000 and beyond foresee a much larger Mexican population than in 1980. But how much larger? Current estimates for 2000 range from a recent low forecast of 106 million by the Consejo Nacional de Población to continuing repetition of the formerly standard figure of 130 to 135 million, a massive difference for economic planning.[1]

This paper examines the evidence and makes a new evaluation of the population prospects. The basic argument is simple. A rapid reduction in birthrates

*Dean and Virginia Morrison Professor of Population Studies, Food Research Institute, Stanford University.

†Adapted from a paper given at symposium on "La Alimentación del Futuro" sponsored by the National University of Mexico, Mexico City, October 20–22, 1982. The sponsors selected the year 2000 as chief point of reference for "the future."

Food Research Institute Studies, Vol. XIX, No. 1, 1983

and fertility is now occurring and may be expected to continue; if so it will far exceed the very respectable reductions occurring in mortality. The result will be a rapid decline in the rate of natural increase (births minus deaths) and hence in the rate of population growth, making most published estimates, even the most recent ones, overestimates of realistic probabilities of Mexican population growth.

Another factor is the permanent migration of young families to the United States. By migrating, these families not only reduce population by their own departure but by the children they then have in the United States instead of in Mexico. Though precise numbers are not known, such movement is occurring and may be expected to continue.

These are assertions. Let us look at the supporting facts: first, trends in fertility and mortality; second, the balance of migration; and third, the effects of the continuation of such trends on future population size.

FERTILITY AND MORTALITY

Most observers are aware that the Mexican birthrate is high. Fewer are perhaps aware of (1) how unusually high the birth and growth rates have been for a country of Mexico's level of socioeconomic development, and (2) how precipitous the reduction in Mexican fertility has been in the last few years. Again it is generally recognized that there have been gains in reducing or postponing mortality but it is perhaps not so widely understood how dramatic these reductions have been.

Mexico in Latin American Perspective

Until the early 1970s Mexico was something of an exception in Latin America. In Latin America, reductions in birthrates have been correlated with levels of development, especially with birthrates lagged. In the early 1960s Mexico had close to the average Latin American level of socioeconomic development, but birthrates remained high and reduction of fertility, if any, was minor until the 1970s (Table 1). On the basis of more general Latin American experience, evidence in the early 1970s indicated that Mexico was on the verge of a rapid reduction in the birthrate (Oechsli and Kirk, 1975). This indeed is occurring.

As in so many of the more developed LDCs, the death rate was falling

[1]Examples include the following estimates for Mexican population in 2000:

Millions	*Source*
126-152	Secretaría de Programación y Presupuesto (Mexico, 1978). Prepared by sophisticated methods before recent fertility declines.
136	Joseph Hulse (1982).
131	Bureau of the Census (United States, 1979).
122	Amy Ong Tsui (1979). University of Chicago, Community and Family Study Center.
116	United Nations (1981).
109, 115	World Bank (1981 and 1982, Table 17).
106	Consejo nacional de poblacion [Mexican National Population Council], 1982 (personal communication).

TABLE 1—ESTIMATED REDUCTIONS IN BIRTHRATES IN MEXICO AND COMPARABLE LATIN AMERICAN COUNTRIES, 1960 TO 1980

	Percent decline in birthrate	Gross National Product per capita (*current U.S. dollars*)
Cuba	44	n.a.
Chile	41	2,150
Costa Rica	38	1,730
Colombia	34	1,180
Brazil	31	2,050
Panama	25	1,730
Venezuela	22	3,630
Mexico	18[a]	2,090

Source: World Bank, *World Development Report 1982*, Oxford University Press, New York, pp. 111, 145.

[a]Figure may be low. The officially reported provisional birthrate in Mexico for 1980 is 34 rather than the rate of 37 used by the Bank. If the officially reported figure is used, the estimated reduction would be 24 percent for the period rather than 18 percent.

dramatically in the 1970s. In this respect Mexican experience parallels that of other Latin American countries of comparable socioeconomic development. But because of later and initially slower declines in the birthrate, the difference, that is, the rate of natural increase and of population growth, has been among the highest in Latin America and in the world.

The National Family Planning Policy

The "natural" forces of modernization for reducing fertility have been greatly reinforced (some would say initiated) by the reversal of the official government position on family planning. These included (1) President Echeverria's declaration of support for family planning measures in 1973, (2) the adoption of a population control program in 1974, (3) the adoption of a coordinated National Family Planning Plan in 1977, and (4) the vigorous implementation of the plan in succeeding years (Population Reference Bureau, 1978). The increase in use of contraceptives supplied by the government and other sources has been rapid and is presumably a major factor in the reduction of the birthrate. According to the 1979 National Contraception Prevalence Study, 42 percent of women aged 15 to 44 married or living in unions were using contraceptives in that year, as compared with 33 percent as recently as 1977 (Mexico, 1980). The comparable figure in the United States in 1978 was 68 percent (Johns Hopkins, 1982).

The Reduction of Fertility

In the nation as a whole the birthrate fell from an officially reported average of 43.8 births per thousand population between 1969 and 1971 to an estimated

TABLE 2.—FERTILITY REDUCTION IN MEXICO ESTIMATED BY THREE METHODS

	Years	Earlier	Later	Decline (*percent*)	Duration (*years*)
Official birthrates[a]	1969–71 to 1980	43.8	34.0	22	10
Birthrates estimated from censuses	1965–70 to 1975–80	44.8	35.1	22	10
Total fertility from national fertility/mortality survey in 1979[b]	1971–79	6.72	4.63	31	8

Sources: Official birthrates from Mexico, *Anuario Estadístico*, 1980, and United Nations, *Population and Vital Statistics Report*, Series A, Vol. 34, No. 3, 1982; births 1965–70 and 1975–80 estimated from children aged 0 to 4 as reported in 1970 and 1980 censuses adjusted for infant and child mortality, assuming same level of underreporting at ages 0 to 4 in 1980 census as in 1970 census, and corrected for 10½-year intercensal period; total fertility from national survey from Doroteo V. Mendoza and Leopoldo Núñez, "México: Estimación de la Fecundidad por el Método de los Hijos Propios," paper presented at 2nd National Meeting on Demographic Research in Mexico, CONACYT, November 4–7, 1980.

[a]Average annual "crude" birthrate, or reported births per thousand population.

[b]Average number of live births per woman at age-specific birthrates of year concerned (number of births the average woman would have if she experienced through her reproductive life the sum of contemporary rates for each five-year age group at ages 15 to 49).

35.8 in 1978 and an official provisional figure of 34.0 for 1980. (The vagaries of Mexican vital statistics are discussed below.) If the two later figures are reasonably comparable to the earlier, the birthrate fell at an annual average of some 2.5 percent a year, or more than 22 percent in the decade (Table 2).

A second and possibly more reliable source is based on 1970 and 1980 census information for children under age five, from which births were estimated for the years 1965 to 1969 and 1975 to 1980. This procedure indicates a similar decline of about 22 percent, or again some 2.5 percent average annual decline.[2]

The third and presumably most reliable source of evidence is the successive national sample surveys conducted in 1976, 1978, 1979, and 1981 of fertility and mortality levels and especially of the extent of contraceptive use.

Unfortunately, each of these three methods of measurement has methodological faults, which are discussed in the following paragraphs.

The first approximation for estimating fertility, use of official data for birth-

[2]The intercensal period was not exactly 10 years since the 1970 census was taken on January 28 and the 1980 census on June 4. This explains the apparent difference in the five years used in estimating births. Thus the census for ages 0 to 4 in 1970 was used for estimating births in the full years from 1965 to 1969 and births for midyear 1975-midyear 1980 were estimated from 1980 census data on the population ages 0 to 4.

rates, may be questioned on several grounds. These figures are properly referred to as "crude birthrates" because they are not standardized for the age of the population, notably the proportion of the population who are women of child-bearing age. Furthermore, in LDCs such as Mexico, a very common problem is incompleteness in reporting of vital events. In Mexico, however, such concerns would not explain the apparent fall in the reported births unless the registration system had markedly deteriorated since 1970. This seems unlikely —in fact, there was a major campaign to improve birth registration in connection with the nationally designated Year of the Family in 1973. This campaign resulted in somewhat higher official registration for 1973 and 1974 in comparison with years before and after. Comparisons made between these and subsequent years would indeed exaggerate the apparent reduction in fertility. Hence measurement using these years was avoided. In normal course the completeness of birth registration should have been expected to improve rather than deteriorate. In Mexico there is no conclusive evidence either way, but it is most unlikely that the deterioration of the system could explain the extent of the reported fall in the birthrate.

Another source of marginal error in the official figures is the estimated population, the denominator in determining the birthrate. Too high an estimate of population thus artificially reduces the computed birthrate. In Mexico, this in fact occurred in the late 1970s as the basis of estimates, the last census count, receded in time. Thus following the 1980 census the population estimate for 1979 was reduced by more than 2 percent, and presumably on this basis the earlier reported birthrate of 32.8 per thousand was raised to 33.5.

Finally, an important factor in Mexico is the problem of delayed registration of births. Thus the percent of all reported births registered more than one year after occurrence was 17.7 percent in 1972 and 21.2 percent in 1978. Because of this problem and related uncertainties concerning the proper denominator (the midyear population estimate), the Mexican statistical office has not published final annual vital rates for years after 1974. Provisional annual figures have been provided to the United Nations for 1975 through 1980, but these have been changed and generally raised with the inclusion of late registrations and downward revision of the denominator (the midyear estimated population) in view of the fact that the 1980 census revealed an overestimate of no less than 4.5 million (6.7 percent) over the actual census population enumerated in 1980.

The second method of estimating fertility, based on census information for children younger than five years old in the 1970 and 1980 censuses, shows a drop of some 22 percent in the decade from 1965-70 to 1975-80. In this procedure, births in these years are estimated from the numbers of children under age five reported in the census. The principal problems in this measure arise from deficiencies in census enumeration of children and in the reporting of infant and child mortality.

In Mexico, as in many countries, the census fails to enumerate a substantial number of infants and small children. If the 1980 census did a better job than the 1970 census, the amount of fertility reduction would be understated; if the 1970 census was more complete, the amount of fertility reduction would be

overstated. In the absence of clear evidence either way, it was assumed that the percent of omissions was the same in the two censuses.

To estimate births from numbers of children under age 5 reported in the census, it is necessary to estimate deaths to this cohort in the preceding five years. In Mexico infant deaths are clearly underreported. Fortunately, the national sample surveys conducted in 1976 and 1979 provide retrospective measures of infant mortality (University of North Carolina, 1980). These indicate a reduction in infant mortality of some 25 percent in the decade of the 1970s. It was assumed that this rate of decline in infant and early child mortality also occurred between the periods 1965 to 1970 and 1975 to 1980.

It will be noted that this probably is an understatement of fertility decline in the 1970s since the averages are centered on 1967 and 1977, thus not giving full weight to the rapid reductions in fertility since 1977.

The third procedure used here for estimating fertility decline is derived from successive national sample surveys conducted in 1976, 1978, 1979, and 1981 (International Statistical Institute, 1980; Mexico, 1979, 1980, 1981; Núñez, 1982). The first survey was the Mexican part of the World Fertility Survey sponsored by the United Nations and carried out under the auspices of the International Statistical Institute (Mexico, 1979). Most relevant for present purposes is the 1979 National Fertility and Mortality Survey conducted by the government of Mexico (Mexico, 1980). This survey estimated a birthrate of 33 per thousand in 1979, close to the official vital statistics, which indicate a figure of 33.5 for that year. This survey also obtained data on age-specific fertility and total fertility.[3] The results indicate a drop from an average of a total of 6.7 children per woman in 1971 to 4.6 in 1979, or more than 30 percent in eight years. The validity of this estimate is suggested by the following data on total fertility from three independent sources (University of North Carolina, 1980). A certain amount of variance is of course to be expected in sample surveys owing to sampling problems and other administrative differences (Ordorico and Potter, 1982).

	Official vital statistics	1976 World fertility survey	1979 National fertility and mortality survey
1971	6.5	6.5	6.7
1972	6.6	6.7	6.7
1973	6.7	6.5	6.4
1974	6.6	6.0	6.1
1975	5.9	6.0	5.9
1976			5.42
1977			5.37
1978			4.82
1979			4.63

[3]Age-specific fertility refers to annual birthrates to women in the reproductive ages by five-year age groups (that is, births per 1000 women at ages 15–19, 20–24, . . . 40–44). Total fertility refers to the total average number of live births to women hypothetically passing through their reproductive life at age-specific fertility rates recorded for any given year.

As noted earlier, the official figures for 1973 and 1974 were somewhat inflated by the campaign to improve birth registration in those years. A large proportion of the higher figures apparently was due to retrospective reporting of births that had occurred in previous years. Thus in 1973 the number of births registered rose by 226,000 but the births recorded as occurring more than a year before registration rose by 260,000, implying that the number of current registrations and the current birthrate may actually have declined.

Since 1979, fertility reduction has apparently continued at the pace suggested by the above data. The provisional estimate of total fertility for 1982 is 4.1 (Potter, 1983).

The three independent methods of estimating recent fertility reduction in Mexico concur in demonstrating a reduction in the 1970s and give credibility to the evidence of especially rapid decline in the latter half of the decade. Such rapid reductions of natality are spectacular, yet they have occurred in a number of less-developed countries, notably in East Asia. They are also occurring in several countries of Latin America and the Caribbean (Table 1). As noted earlier, in the reduction of birthrates Mexico was behind Latin American countries of comparable social and economic characteristics. Now Mexico has become an urban country, with rapid progress in education, in communication and transportation, and in health care. Social and economic progress is reflected in falling infant and child mortality as well as declining death rates for adults.

The Reduction in Mortality

The officially reported death rate fell from an average of 9.5 deaths per thousand population in the years 1969 to 1971 to 6.0 reported for 1978 and for 1980. This suggests a reduction of some 37 percent in the decade. However, even more than in the case of births these so-called crude death rates are unreliable measures of mortality and mortality trends in Mexico because they are not standardized for proportions of the population in various age groups and because reporting of deaths (especially of infant deaths) is deficient. The true crude death rate is estimated as roughly seven per thousand in 1979, and infant mortality (infant deaths per thousand births) as 61 to 62 in 1979. These indicate reductions in infant mortality from an average estimate of some 72 in 1970 to 56 in 1980, or an estimated reduction of some 20 to 25 percent in the decade (University of North Carolina, 1980). Mortality at ages above one year have probably been reduced at a faster rate.

Population Growth

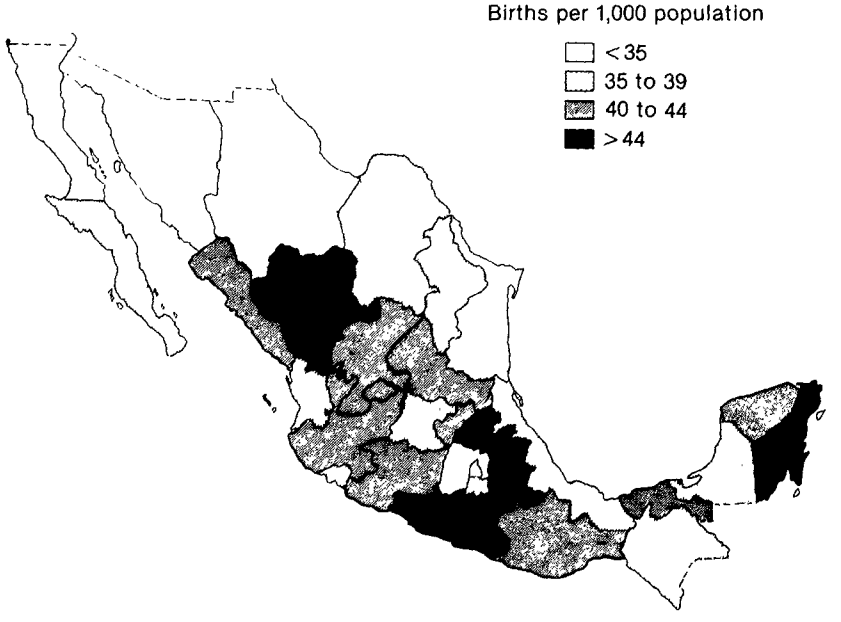
The reduction in mortality would tend to increase population growth except for even more rapid declines in fertility. The result is now clearly a rapid reduction in the rate of natural increase and consequently in the rate of population growth. Officially reported rates of natural increase (birthrate minus death rate) fell from an annual rate of 3.57 in 1970 to 2.7 percent in 1979. More recent information based on national sample surveys indicates a drop from 3.5 percent in 1970 to 2.6 in 1979 and 2.4 in 1981 (Núñez, 1982).

Differences Within Mexico

As in most countries, rural fertility in Mexico is much higher than urban fertility, rural being defined as localities with less than 2,500 inhabitants. As late as 1974 the three-year average total fertility in rural areas was 8.10 children per woman, compared with a national figure of 6.15; that is, rural fertility was close to one-third higher than the national average. Between 1974 and the 1981 national rural survey, however, the rural figure declined to 6.10 or some 25 percent in the seven-year period as compared with an estimated reduction of 28 percent in the national figure during the same period. While rural fertility remains more than a third above the national average, it is closely following the national trend in fertility reduction (Núñez, 1982).

There are great differences in estimated birthrates among Mexican states and regions, ranging from current estimates of 25 per thousand in the Distrito Federal and 26 in Baja California to more than 40 in the states of the center and south. State differences as of 1978 are presented in Map 1, generally showing lower fertility in the north (and of course in Mexico City) and higher fertility in the south (Table 3).

MAP 1—MEXICAN BIRTHRATE BY STATES, 1978



Source: Mexico, 1981, *Anuario Estadístico*. Officially reported rates for 1970; for 1978 births per 1,000 population estimated from reported births divided by corrected estimated population derived from the 1980 census.

TABLE 3—BIRTHRATES AND REDUCTION IN FERTILITY, MEXICO

	Average birth-rate, 1975–1980	Percent change from 1965–70 to 1975–80
Region 1 (Northwest)	33	−27
Region 2 (North)	33	−26
Region 3 (Northeast)	32	−26
Region 4 (North central)	39	−26
Region 5 (West)	37	−28
Region 6 (South central)	40	−14
Region 7 (Federal District and Mexico)	30	−27
Region 8[a] (South)	38	−15
Mexico	35	−24[b]

Sources: Birthrates derived from 1980 Census. See Table 2. Reduction in fertility estimated from ratios of children 0 to 4 years born to women aged 20 to 39 in 1970 and 1980 censuses, corrected for infant and child mortality and assuming same level of underreporting of children aged 0 to 4 in the two censuses.

Regions: 1—Baja California Norte, Baja California Sur, Sonora, Sinaloa, and Nayarit; 2—Coahuila, Chihuahua, Durango, and Nuevo-León; 3—Tamaulipas and Veracruz; 4—Aguascalientes, Zacatecas, and San Luis Potosí; 5—Colima, Jalisco, Michoacán, and Guanajuato; 6—Morelos, Puebla, Querétaro, Tlaxcala, and Hidalgo; 7—Distrito Federal and México; 8—Guerrero, Oaxaca, Chiapas, Tabasco, Campeche, Yucatán, and Quintana Roo.

[a]With the exception of Tabasco, Campeche, and perhaps Quintana Roo, births derived from the 1980 census are clearly defective for Region 8. True birthrates are higher than those estimated from the 1980 census, probably 40 or more.

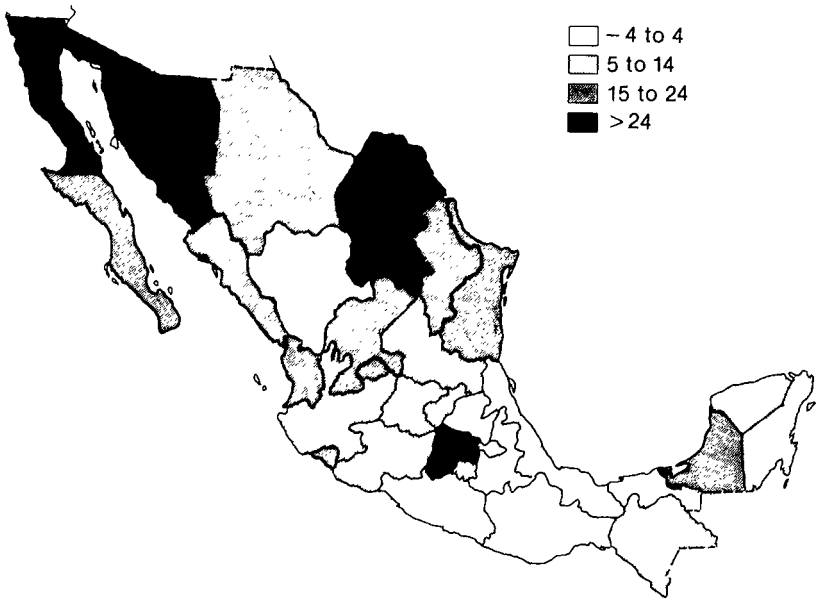
[b]Differs from Table 2 because women in the age group 20 to 39 were a larger percent of the total population in 1980 than in 1970.

These are "crude" birthrates not standardized for differences in the proportions of women at various reproductive ages and hence not strictly comparable from state to state. They also reflect unknown differences in the completeness of birth registration. But the general pattern is surely correct.

The reduction of births is nationwide. In 1980 every region had a lower birthrate than it had in 1970. The percent reduction in birthrates by states for 1970 to 1978 is shown in Map 2. This reveals a pattern of fertility decline spreading from the northern states southward, especially along the Pacific Coast. The state of Durango is an island of high fertility and little fertility reduction, formerly characteristic of all the Mesa Central. Mexico City and its immediate environs show substantial decline, but their influence is surprisingly small among states outside the metropolitan area. The most southerly states are generally the least developed and probably have the least reliable vital statistics.

Almost all states showed fertility reductions. The two exceptions, Oaxaca and Veracruz, have unreliable vital statistics. However, reductions were minor in a solid block of states in central and southern Mexico, which, aside from idiosyncracies of the vital statistics, would certainly also include Chiapas (the most southerly state) and possibly one or more of the three southeastern states

MAP 2—PERCENT CHANGE IN BIRTHRATES, 1970 TO 1978



Source: Mexico, 1981, *Anuario Estadístico*. Births per 1,000 population estimated from reported births divided by corrected estimated population derived from the 1980 census.

in the Yucatan peninsula. Mexico City and the states to the north and west are experiencing and almost certainly will continue to experience rapid fertility reduction. The major test for the future lies in the south.

The reduction of birthrates in most Mexican states is certainly a result in major part of the national family planning program, which gained momentum in the latter half of the decade and presumably will continue. It seems reasonable that the family planning program and other factors tending to reduce birthrates will increasingly take hold in the south and accelerate future reduction of fertility in this region.

Migration

Migration affects national population growth in two ways. First, since rural birthrates are higher than urban, further urbanization will contribute to lower birthrates. Second, there is a growing permanent migration to the United States.

The most direct impact on Mexican population size is temporary and permanent migration to the United States. Available data from recent Mexican national surveys give more information on temporary migration than existed formerly, but adequate information on permanent migration is lacking. Cen-

sus and vital statistics suggest a loss of one to two million in the decade of the 1970s. Thus, reported natural increase in the decade exceeded intercensal population growth by 1.6 million. If the two censuses are assumed to be of equal completeness and official vital statistics understate natural increase, as they probably do, the "missing" population would be correspondingly larger.

Mexican data assume that emigration is primarily male, but the 1980 census of the United States shows a normal sex ratio among persons of Mexican origin. A great effort was made in that census to enumerate persons of Mexican origin, both legally and illegally in the country. While the census surely did not succeed in enumerating all undocumented aliens, especially temporary ones, American statistics suggest that a growing proportion of permanent migrants from Mexico are women and children who do not get the same attention from border guards that men get. At Tijuana, for example, many millions of people cross the border each way every year. The border guards undoubtedly let through many technically illegal women and children if a man in the car has a "green" card. To enter the United States illegally apparently is much less difficult for women than for men and does not require swimming the Rio Grande or joining the large group of men that is periodically reported to cross the boundary illegally into California. There are at least four million people of Mexican descent in the state of California alone, and Los Angeles after Mexico City is the largest "Mexican" city.

In many respects, Mexican migration is following the pattern of other great migrations: first are temporary migrants, chiefly young men, followed by women and still later by families. Thus, the guest worker programs in Europe, originally intended to be temporary, have ultimately attracted large permanent populations.

There are as many and perhaps more jobs for Mexican women than for Mexican men in the United States, notably in the service occupations. Since American law precludes regular employment for children, the children of the undocumented generally go to American schools. In Texas there has been resistance to providing schooling for children of undocumented immigrants, but a recent decision of the United States Supreme Court requires states to provide schooling to all children as a right superseding the fact that they might be in the country illegally. The theory is that the children did not choose to migrate but simply were brought by their parents, and therefore they should not suffer discrimination. In California schools, at least, there are many tens of thousands of children clearly not born in the United States, children in far greater numbers than could be accounted for by legal immigration. Of course, many of the families doubtless regard themselves as temporary migrants. But especially for families, such temporary migration often becomes permanent. Usually they join relatives or friends (and people from the same community in Mexico) that preceded them in migrating to the United States.

Thus attention should be given to permanent emigration from Mexico in estimating the future population of Mexico. The loss of population to Mexico includes not only the emigrants themselves but their children born outside Mexico.

This permanent migration is of course a different question from the larger temporary labor migration, chiefly consisting of men and the chief target of American immigration authorities.

POPULATION PROJECTIONS

On the basis of the above arguments, illustrative projections were made for the Mexican population in 2000. These include projections based on four different assumptions relating to natality and three relating to migration.

Without more current and reliable information it is not feasible to compute actual reduction in mortality during the decade 1970 to 1980. In the absence of reliable data on deaths by age in Mexico, a single mortality table was used based on infant mortality levels obtained in national sample surveys and corresponding levels of age-specific mortality rates determined from West model life tables prepared by Coale and Demeny (1966). A reduction of 25 percent in infant mortality is assumed in the decade of the 1970s, projected from an estimated level of 53 deaths of children younger than one year per thousand births in 1980, decreasing to 30 deaths per year in the period from 1995 to 2000. The corresponding increase in life expectancy at birth from the Coale-Demeny model tables is from an estimated 66 years in 1979 to 71 years by the year 2000. The latter is comparable to average European and North American levels about 1970. It should be remembered that these tables have little empirical reality for Mexico; they are based almost entirely on European historical data and do not include the experience of any Latin American country, much less of Mexico itself. However, it is interesting that projections of mortality made by competent Mexican authorities with entirely different methods differ in important details but not dramatically in the overall trends. The Mexican estimates are probably superior in several aspects because they are based on empirical data, although the data are defective and require adjustments for these defects. However, they were published without the benefit of the mortality experience of the 1970s (Mexico, 1978).

The assumptions on fertility declines present results on the basis of four estimates of percent reductions in each five-year period from 1980 to 2000: no decline, 10 percent decline, 15 percent decline, and 20 percent decline. The first, zero decline, is certainly the least likely. Very recent results from national sample surveys suggest that fertility has already dropped significantly below the 1979 level assumed as standard. A reduction of 10 percent, or roughly 2 percent a year, is a much lower rate than the reduction actually experienced from 1972, when fertility reduction effectively began, to 1980. Such a reduction in the rate of fertility decline would be contrary to the general experience in less-developed countries.

An average 15 percent decline per quinquennium seems much more likely, though it indeed represents a slowing from declines estimated from national sample surveys, from 1970 to 1980 census data, and perhaps the true crude birthrates (it is quite possible that the completeness of birth reporting has improved over the period of actual fertility reduction, 1972 to 1980). Estimated

true birthrates, corrected for underregistration, show a reduction from 45.1 per thousand in 1970 to 40.7 in 1975 and 33.0 in 1980, reductions of 10 percent in the first half of the decade (effectively between 1972 and 1975) but 19 percent in the second.

The actual reduction of fertility may have been closer to 20 percent than to 15 percent per quinquennium in the last few years. Thus the total fertility rate (TFR) for 1976 obtained in the 1976 National Fertility Survey was 5.55 children per woman, which had declined to 4.63 by 1979 according to the 1979 national survey, a decline of some 17 percent in three years. A continuation of this rate of fertility reduction would lead to much lower population figures for 2000, in fact, below 100 million. However, uncertainties in the data suggest caution in using this as a basis for projections or estimates of future trends in Mexican fertility. It is indeed possible that rapid recent reductions may represent in part a catching up with more general Latin American experience in fertility and socioeconomic development (see Table 1) that might not continue at the same rate.

One argument for a slowing in the rate of fertility reduction may be dismissed. Mexicans and others have expressed doubt about a continued rapid fertility decline as it encounters resistance in rural areas.[4] Actual experience suggests otherwise. The *campesinos* indeed have much higher fertility than urban dwellers, but on the basis of the 1981 National Sample Survey it appears that fertility decline in rural areas is closely paralleling that in urban areas and that use of contraceptives is spreading rapidly in rural areas.[5] In just two years, from 1979 to 1981, contraceptive practice rose from 24.0 to 27.4 percent of rural women in the reproductive years living in unions (whether or not legally married).

Otherwise Mexico is undergoing rapid urbanization and is already a predominantly urban country. In other words, what happens in rural areas is less important in such matters than it once was.

These factors combined indicate that there will be no basic obstacle in fertility reduction created by an intractable, high-fertility rural population. Southern states, it is true, especially those with large Indian populations, will undoubtedly lag. But unless Mexico is an exception to almost universal historical experience, there will be rapid fertility decline in the next 20 years.

As noted above, migration is important in estimating future population in two ways. The first relates to the above-mentioned rural-urban migration from high-fertility to low-fertility areas. The second is net emigration to the United States. Three illustrative cases are presented here: no net emigration; 500,000 in each quinquennial period; and one million in each five-year period. Again, as noted above, actual net migration in the 1970s was probably at least two million, corresponding to the highest of the three levels used in the projections.

[4]Notably at the conference on "La Alimentación del Futuro" sponsored by the National University in Mexico City, October 20–22, 1982.

[5]Rural fertility was still very high in 1975; the total fertility rate for that year is given as 8.0. However, according to the National Survey of Fertility and Methods of Contraception in 1981, it had fallen precipitously to 6.1 in the latter year (Núñez, 1982).

It is arbitrarily assumed that one-fourth of the emigrants will be women 15 to 40 years of age, distributed in five-year age groups in the same proportion as the Mexican national female population. It is further assumed that one-fourth will be children 0 to 14 years of age. This probably cautiously understates the proportion of migrants who will be females in the reproductive ages since these actually appear to be a higher percentage now than in the net emigration of the 1970s.

The Mexican population size in 2000 is shown in Table 4 for the various combinations of assumptions. These result in an almost useless range of 97 to 125 million. However, the projections assuming constant fertility may be dismissed as already outdated and totally unrealistic barring violent social upheavals or unforeseeable catastrophic events. It may be noted that the adoption of communism has generally accelerated rather than slowed fertility reductions (for example, in Cuba and China).

While a 20 percent fertility reduction in each five-year period seems to be most in line with recent experience, this may (or may not) be in part exag-

TABLE 4—PROJECTIONS FOR THE MEXICAN POPULATION IN 2000

Fertility assumptions	Population in 2000 *(millions)*	Increase 1980–2000[a] *(millions)*	Percent increase
20% decline each 5-year period			
No emigration	103.0	34.1	49
Net emigration of 100,000/year	100.0	31.1	45
Net emigration of 200,000/year	97.0	28.1	41
15% decline each 5-year period			
No emigration	107.7	38.9	56
Net emigration of 100,000/year	104.6	35.7	52
Net emigration of 200,000/year	101.5	32.6	47
10% decline each 5-year period			
No emigration	116.2	47.3	69
Net emigration of 100,000/year	112.9	44.0	64
Net emigration of 200,000/year	109.6	40.7	59
Constant fertility[b]			
No emigration	125.1	56.2	82
Net emigration of 100,000/year	121.6	52.7	76
Net emigration of 200,000/year	118.1	49.2	71

[a]From a beginning population of 68.9 million in 1980, the census figure of 67.4 million raised 1.5 million for estimated undercount especially of children ages 0 to 4. The population was redistributed by age according to the results of the 1979 national sample survey (the census results by age reflect widespread misreporting in which respondents have favored ages ending in 0 or 5, even numbers over odd, exaggeration of older ages).

[b]As of results of 1979 sample survey, with total fertility rate of 4.8 children per woman.

gerated by data biases. But a slowing to 10 percent seems unlikely and out of step with the experience of most less-developed countries currently experiencing major fertility reductions.

The "best" estimate made by this author is for fertility reduction of 15 percent each five-year period and net emigration of 500,000 in each five-year period. This is roughly a fertility reduction of 3 percent a year with an annual net emigration of 100,000.[6] The results by major age groups are shown in Table 5.

The changing pattern of age-specific fertility assumed is shown in Chart 1, with observed changes between 1971 and 1979. The rapidity of changes in that eight-year period as compared with that projected for a 20-year period indicates that the suggested "best" projection is not extreme in its assumptions

TABLE 5—ILLUSTRATIVE PROJECTION OF MEXICAN POPULATION TO YEAR 2000 BY AGE AND SEX

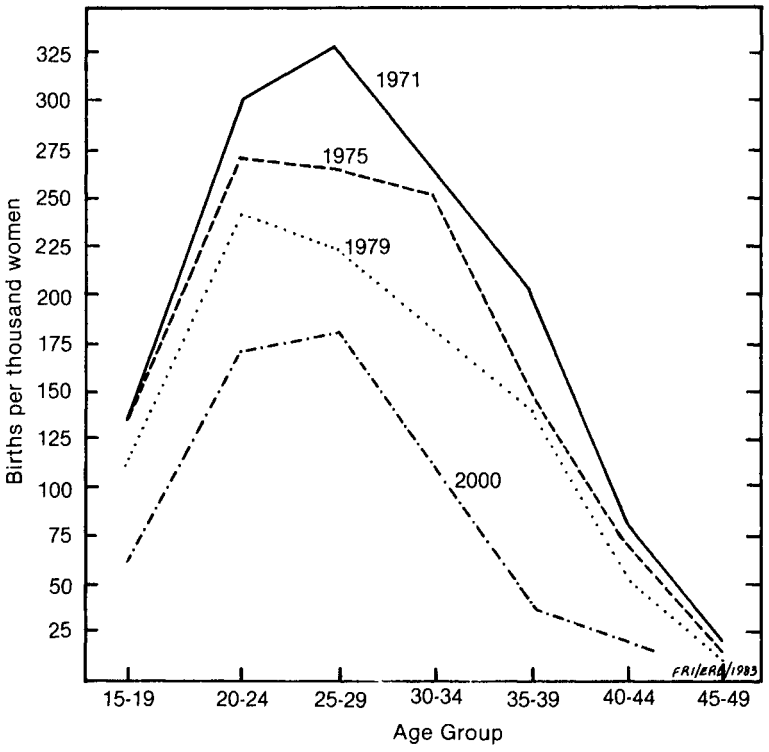
	1980	2000	Increase 1980–2000		Percent of total in age group	
	Census *(thousands)*	Projected[a] *(thousands)*	Amount *(thousands)*	Percent	1980	2000
Males						
Total	33,978[b]	51,703	17,725	52.2	49.3	49.4
0–14	15,711[b]	18,128	2,417	15.4	22.8	17.3
15–34	10,655	19,743	9,088	85.3	15.4	18.9
35–64	6,323	11,847	5,524	87.4	9.2	11.3
65+	1,289	1,985	696	54.0	1.9	1.9
Females						
Total	34,964[b]	53,244	18,280	52.3	50.7	50.8
0–14	15,453[b]	17,508	2,055	13.3	22.4	16.7
15–34	11,223	19,835	8,612	76.6	16.3	18.9
35–64	6,853	13,106	6,253	91.2	10.0	12.5
65+	1,435	2,794	1,359	94.7	2.0	2.7

[a]Assuming 15 percent reduction in fertility each five-year period; mortality schedules derived from Coale-Demeny West models from infant mortality estimated at 61 in 1979 assumed to decline to 30 in 2000, with expectation of life at birth rising from 66 to 71 in 2000; net emigration of 500,000 each five-year period (including 250,000 adult males, 125,000 adult females, and 125,000 children ages 0 to 15, the adults distributed by age by five-year age groups in the same proportions as in the Mexican census population for ages 15 to 44).

[b]Census-reported population raised to allow for pronounced underenumeration, especially at ages 0 to 4, and for natural increase from census date to midyear 1980.

[6]The assumptions are conservative in that they imply an immediate slowing of fertility reduction from currently observed rates and use a low estimate of net emigration almost certainly exceeded in the 1970s and at the present time. It may also be noted that the beginning population for projection is higher than the 1980 census figure and that projections are correspondingly higher than a take-off from the uncorrected census figure.

CHART 1—AGE-SPECIFIC FERTILITY RATES, 1971–1979 AND PROJECTION FOR 1995–2000

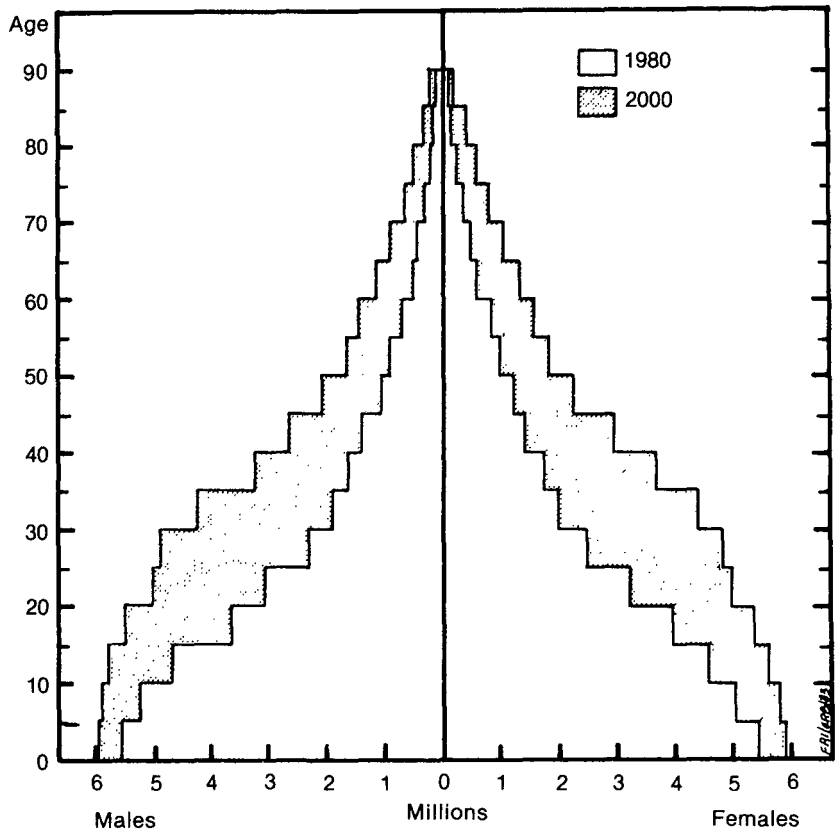


Source: Data for 1971, 1975, and 1979 from Mexico, 1981, *Fecundidad y uso de metodos anticonceptivos en México*; for 2000 from Jorge Martinez Manautou, editor, 1982, *The Demographic Revolution in Mexico 1970–1980*, Instituto Mexicano del Seguro Social, p. 291 (see text).

regarding fertility decline. In fact, the age-specific fertility rates projected for Mexico in the quinquennium 1995 to 2000 are the observed rates for the Federal District obtained from the National Contraceptive Prevalence Survey of 1979. A transition to the latter pattern is interpolated for the intervening time period.

This "best" guess produces a total population of 104.6 million in 2000. The years 1995 to 2000 would have an average crude birthrate of 26.2 and a total fertility rate of 2.8. Thus on these assumptions natality rates in Mexico in 2000 would still be quite high by current European and North American standards. In 2000 the Mexican population would still be growing through natural increase at some 1.7 percent or 1.8 million people a year. The age structure projected for 2000 is compared with the 1980 census in Chart 2. A total fertility rate of 2.8 may seem low for Mexico even in 15 to 20 years but is not really

CHART 2—AGE PYRAMIDS FOR MEXICO, 1980 CENSUS AND ESTIMATED FOR 2000



implausible since total fertility is estimated to have dropped from 6.5 to 4.1 in the decade 1972 to 1982 (Potter, forthcoming).

Only one thing is certain about population forecasts: At least in their precise estimates, they will be wrong. The above is simply one "best" estimate, which will almost certainly prove wrong in some of its assumptions. It would be as well to say that, with conservative assumptions, the Mexican population in 2000 will be 100 to 110 million. With continued success of the family planning program and with continued large net emigration, the figure could be much closer to the lower than to the higher figure.

Projections are of course only as good as the assumptions, particularly those about fertility. But with the continuing spread of contraceptive practices, especially among younger women and with the support of a strong government family planning program, it seems almost certain that there will be a continuing rapid decline in the birthrate and in births per woman.

One thing is clear: Barring radically different developments, the population of Mexico in 2000 will be much lower than the forecasts in common use, except for those prepared by the Mexican Consejo Nacional de Población (see footnote 1).

Everyone agrees that barring a holocaust there will be many more Mexicans in 2000 and beyond than there are today. But Mexico's economic problems will be very different indeed from those that would have been caused by a doubling of the 67.4 million enumerated in 1980. The difference could well be on the order of 25 to 30 million people. This difference is of tremendous importance for Mexican food requirements among many aspects of the economy. Instead of a population doubled in size by the year 2000, it seems much more likely that the population will increase by some 50 to 60 percent.

Since the reduction will be chiefly among children and young people, the most obvious early effects will be in lower food requirements; in fewer problems in upgrading education, health, and public services; and in general a lower burden of child dependency. It will not directly contribute to a solution of unemployment and underemployment in 2000 since most of the labor force of that year is already born. But in the longer run, the reduction in rate of population growth should greatly reduce this problem and probably many others.

Finally, the predicted slowing of population growth to the year 2000 in no way means that Mexico will have reached zero population growth or anywhere near that. By world standards the Mexican rate of growth would still be high in 2000. The birthrate and average size of family would still be at least 50 percent higher than the current birthrate and average family size in the United States.

CITATIONS

Ansley J. Coale and Paul Demeny, 1966. *Regional Model Life Tables and Stable Populations*, Princeton University Press, Princeton, New Jersey.

Joseph Hulse, 1982. "Food, Science and Nutrition: The Gulf Between Rich and Poor," *Science*, June 8, pp. 1291–94.

International Statistical Institute, 1980. "The Mexican Fertility Survey, 1976–77: A Summary of Findings," World Fertility Survey No. 17, The Hague, Netherlands.

John Hopkins University, Population Information Program, 1982. "Oral Contraceptives in the 1980s," *Population Reports*, Series A, No. 6 May–June.

Mexico, 1978. Secretaría de Programación y Presupuesto, *Proyecciones de la población mexicana, 1970–2000*, Evaluación y Análysis, Vol. III, No. 8.

_____ 1979. *Encuesta Mexicana de fecundidad, primer informe nacional.*

_____ 1980. Jefatura de Servicios de Planificación Familiar, *Estimaciones de fecundidad y mortalidad a nivel nacional,* Encuesta nacional de prevalencia en el uso de métodos anticonceptivos con módulo fecundidad/mortalidad.

_____ 1981. *Fecundidad y uso de métodos anticonceptivos en México.*

Leopoldo Núñez Fernández, 1982. "Niveles y Tendencias de la Fecundidad en México, 1970–1980," paper presented at Seminario Internacional de Investigación en Demográfica Médica, Mexico City, Mexico, September 27–29.

F. W. Oechsli and Dudley Kirk, 1975. "Modernization and Demographic Transition in Latin America and the Caribbean," *Economic Development and Cultural Change*, Vol. 23, No. 3.

Manuel Ordorico and Joseph Potter, 1982. "Evaluation of the Mexican Fertility Survey 1976–77," World Fertility Survey, *Scientific Reports*, London, England.

Population Reference Bureau, 1978. "Mexico's Population Policy Turnaround," *Population Bulletin*, Vol. 33, No. 5.

Joseph Potter, forthcoming. "Effects of Societal and Community Institutions on Fertility," in Ronald Lee, Paula Hollerbad, John Bongaarts, and Rodolfo Bulatao, editors, *Determinants of Fertility in Developing Countries,* Academic Press, New York.

Amy Ong Tsui et al., 1979. *Illustrative Functional Projections 1975–2000: Mexico*, University of Chicago, Community and Family Study Center, Chicago, Illinois.

United Nations, 1981. *World Population Prospects as Assessed in 1980*, Population Studies, No. 78.

United States, 1979. Bureau of the Census, *Illustrative Projections of World Populations to the 21st Century*, Current Population Reports, Series P-23, No. 79.

University of North Carolina, 1980. International Program of Laboratories for Population Statistics, *The 1979 Mexico National Fertility and Mortality Survey: A Summary of Results*, Chapel Hill, North Carolina.

World Bank, 1981. *World Development Report, 1981,* Oxford University Press, New York.

_____ 1982. *World Development Report, 1982*, Oxford University Press, New York.