FINANCIAL CRISIS, HEALTH OUTCOMES AND AGING:
MEXICO IN THE 1980s AND 1990s

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ABSTRACT

We study the impact of economic crisis on health in Mexico. There have been four wide-scale economic crises in Mexico in the past two decades, the most recent in 1995-96. We find that mortality rates for the very young and the elderly increase or decline less rapidly in crisis years as compared with non-crisis years. In late 1995-96 crisis, mortality rates were about 5 to 7 percent higher in the crisis years compared to the years just prior to the crisis. This translates into a 0.4 percent increase in mortality for the elderly and a 0.06 percent increase in mortality for the very young. We find tentative evidence that economic crises affect mortality by reducing incomes and possibly by placing a greater burden on the medical sector, but not by forcing less healthy members of the population to work or by forcing primary caregivers to go to work.

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I. Introduction

What are the consequences of economic downturns for the well-being of populations? Clearly, incomes fall, poverty increases, and standards of living decline for most. But economic downturns may have a more lasting impact on other aspects of well-being, and specifically on health.

The impact of economic and financial crisis on health is particularly important because economic crises have been both frequent and severe over the past three decades, particularly in developing countries (Glick and Rose, 1998; Corsetti, Presenti and Roubini 1998). In Mexico, the case that we study in this paper, large economic crises occurred in 1976, 1982, 1987, and 1994. Much of Latin America experienced financial crisis in the 1980s, and the mid-1990s saw a wave of crises throughout the developing world. Further, health effects in developing countries may be large because large segments of the population are vulnerable – for example, the very young, the old, or the poor. Examining how and why the health status of these groups is affected by an economic crisis is therefore an important step in developing policy to alleviate the social welfare impact of economic crisis.

In this paper, we explore how economic crisis in Mexico affected health outcomes with a special focus on the elderly population. Mexico is a particularly important developing country for the study of the impact of economic downturn on health. First, as noted above, economic crises have been repeated and severe. Second, Mexico is undergoing a prolonged and protracted epidemiological transition, accompanied by population aging (Lozano and Frenk, 1999; Frenk et al., 1989). Third, Mexico is one of the only developing countries with time series information on health, health care and economic outcomes at the national and sub-national levels.

We analyze the effects of economic crisis on mortality rates in Mexico, particularly the crisis

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of 1995. We note at the outset that mortality is only one measure of health status – and not likely to be the most responsive or easily observable indicator of the effect of economic crisis. Morbidity and other indicators of well-being may show more rapid changes. Still, we focus on mortality rates because substantially more data are available on mortality over time and by age group and region than is the case for any other measure of health status.

Our empirical analysis points to a strong conclusion: mortality rates have increased with economic crisis, particularly among the elderly and possibly among the very young. We estimate that mortality changes between 1994 and 1996 (equivalently, the mortality rate in 1996) among the population aged 60 and over were about 5-6 percentage points worse than expected based on pre-crisis trends. For children aged 0 to 4, mortality rates were approximately 7 percentage points above expected levels. This translates into about 7,000 additional deaths among children (.06 percent of the 11 million children) and 20,000 additional deaths among the elderly (.4 percent of the 5 million elderly).

The increase in mortality rates associated with economic crisis is of particular concern given long-run declining trends for mortality in Mexico and in most of the world (World Health Organization, 1999a). They are also of concern because of the growing share of the aged in developing countries, to rival the shares traditionally observed only in developed countries (World Health Organization, 1999).

We consider four theories for why the crisis in Mexico affected mortality: first, that the crisis reduced income, which reduced resources for goods that improve or maintain health, such as out-of-pocket medical spending or vital nutrition; second, that the crisis reduced public sector funds for health systems, which affected groups particularly dependent on those systems; third, that the crisis

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caused more people to work, which resulted in health reductions for affected workers; and fourth, that the crisis affected the informal care that families can provide for children and the aged. We find strongest evidence for the first two of these theories and little evidence for the latter two. Specifically, we show that as the supply of medical resources in an area fell, mortality increased, and that as more women went to work in an area, mortality rose. We count this as reflecting income changes rather than changes in the ability of women to provide home services because the effect of womens' work on mortality is found even for women without any aged family members. There is some, but a weaker correlation between the supply of public medical resources and mortality.

The paper begins, in the next two sections, by discussing the links between economic crisis and health, and the evidence from a number of developed and developing countries. The fourth section provides an overview of the nature of economic crisis in Mexico over the past 3 decades, recent demographic and epidemiological trends characterizing the health condition of the population, and the structure of the health care system in Mexico. The fifth section begins our empirical results by considering trends in national mortality rates by age and cause of death. The sixth section examines the reasons for higher mortality using cross-state evidence. The last section concludes.

II. Economic Crisis, health and vulnerability

Economic crises are among the most severe and concentrated economic downturns. While economic crisis is rare in modern-day developed countries, it has become a repeated feature of the economies of many developing countries. In Latin America, particularly in the 1980s, many countries suffered periods of dramatically high inflation, increased unemployment, currency flight, devaluation, and declining purchasing power. In some cases recovery was relatively rapid, while in

others downward spirals have left lasting effects.

One of the most disturbing aspects of economic crisis has been the effect on the poor and other vulnerable population groups. Some studies suggest that, rather than being insulated from the effects of economic crisis through limited participation, the poor are amongst the hardest hit (Levinsohn, Berry and Friedman, 1999). This may involve a shock to income, but also a shock to in social protection such as access to health services. Other work has highlighted the impact on purchasing power that has impoverished middle-income groups (Boltvinik and Hernández, 1999). Economic crisis may expose families that previously earned incomes that were low but sufficient to maintain them above a poverty line to sudden reductions in purchasing power that make it impossible to meet the needs of all members. Health, especially for particular groups such as the very young and the very old, may be one of the areas most likely to suffer from these survival strategies.

Economic crisis might affect health in four ways. The first is a reduction in family income. Average family income declines in an economic crisis, and families must adjust to this in some way. Absent the ability to borrow the entire shortfall, consumption will decline with declines in income. The consumption decline may, in turn, affect the health of different family members. Direct medical care spending is one use of funds that may be reduced – and this may be aggravated if coupled with price increases for particular products such as drugs. Other types of spending may also be cut back. For example, the quality and quantity of food consumption may fall if food is imported and import prices rise, with a resulting impact on nutrition, health status and well-being. The health of vulnerable family members such as the elderly may decline, even if other groups are able to maintain themselves in the face of short-run crises.

In addition to overall spending, the distribution of resources within the family may change as

well. Families may devote a smaller share of resources to vulnerable or dependent members (the elderly or young) when overall income is lower. Discrimination may also generate biases in the distribution of resources. A substantial literature exists showing that girls receive fewer family resources than their brothers (Sen, 1997). This may include a poorer diet and less timely access to medical care (Chen et al., 1981).

The second mechanism through which crisis may affect health is by changing public sector resources. Loss of salaried employment often involves loss of the access to social health security services and increased reliance on private health care or public services (Langer, Lozano and Bobadilla; 1991). In Mexico, for example, between 40 and 50 percent of the labor force, and their dependent family members, receive social security through their principal place of work. Only formal sector workers are covered, however; those working in the informal sector by definition have no access to social security through work. Thus, job loss, a move to the informal sector, or medium-run periods of unemployment imply loss of social security coverage for workers and families. Further, since health is a large part of public sector spending and public sector deficits usually rise in an economic downturn, efforts to cut public deficits are likely to imply reductions in public medical services (Lara et al., 1997; Wibulpolpraser, 1999). Each of these mechanisms may particularly affect the most vulnerable members of society.

Historically, the most vulnerable members in developed countries were infants and some research (discussed below) highlights the impact of economic crisis on infant mortality. Still, effective public health programs have been developed that focus on children and maternal health, attacking age-specific mortality that is particularly amenable to preventive interventions. These vertical programs may have been protected despite periods of economic downturn (Ignacio-Santos,

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Veras Godoy and Flores del Campo, 2000). In contrast, the elderly have not tended to be the focus of public health or social protection, their medical care costs are often high, and their sources of illness are not necessarily amenable to many health interventions, leaving them particularly vulnerable to economic downturn. Further, the elderly population is often more costly and difficult to protect with existing technology, particularly in poor countries. At the same time, demographic and epidemiological transitions have occurred so that populations have aged and patterns of death and disease are more concentrated among chronic and non-communicable disease. Thus, the elderly now constitute another, large population group highly exposed to the mechanisms that generate vulnerability to economic downturn yet without the social protection that may be available to other population groups such as the insured and children.

The third link between economic crisis and mortality is that additional family members may need to go to work in an economic crisis, and this could affect their health. Families often react to economic crisis, declining incomes of primary wage-earners, and declining purchasing power by sending more family members to work, particularly women and children. Evidence is available for Mexico as well as other countries (González de la Rocha, 1988; Benería, 1992; Chant, 1994; González de la Rocha, 1995; Moser, 1995; González de la Rocha, 1998; Cunningham, 2000). Depending on the nature of the work, child and youth labor force participation, can result in reduced school attendance and negative implications for health (Knaul and Parker, 1998; Duryea, 1997). Similarly, the elderly may enter the work force as well, although their health conditions might dictate otherwise. For the elderly this either means reentering the labor force, or not retiring. In Mexico, only 50 percent of the labor force is covered by pensions and more than 90 percent of these have a pension worth less than one minimum salary (approximately $US70) per month (CONAPO, 1998).

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Thus, even in times of economic recovery, many elderly leave the formal labor force with a pension and continue to work in the informal sector in order to supplement their pension income. The informal labor market accounts for up to 50 percent of employment in many Latin American countries.

A related work explanation is that the stress of work could increase mortality. Evidence from developed countries suggests that increased job stress and lack of job control adversely affect health (Bosma et al., 1997). Job stress may increase in poor economic times. Unemployment may also cause stress and therefore increase health problems (Hammerstron, Janlert and Theorell, 1988; Janlert, Asplund and Weinehall, 1992), although decreased incomes may generate reductions in risk-taking behaviour (Ruhm, 1995). Further, certain types of work may have more adverse health consequences, as suggested by the importance of the shift from manual to white-collar jobs in explaining reductions in chronic disease rates in the 20th century (Costa, 2000). Youths and elderly who go to work may suffer stress and thus have worse health outcomes, particularly if the type of work is hazardous or if work is scarce and underemployment pervasive.

The final mechanism is that economic crises may lead caregivers to enter the labor force, reducing their ability to care for those who are more dependent. Family caregivers are particularly important in countries like Mexico, where nursing home and long-term care for the elderly is not publicly provided and private medical care is only accessible to the wealthy. This explanation is particularly important in the case of women, who are frequently at home caring for children and the elderly. Women who need to work, for example during times of crisis, will have less time to provide non-market goods to children and the elderly. If children need to work, they will also have less time to care for the elderly, and vice versa. There are also potential interactions among different members

working. The entry of young family members into the labor force may generate unemployment among the elderly, for example.

III. Previous evidence on health and economic crises

The likelihood of a counter-cyclical relationship between economic recession and health outcomes, with an important moderating role for governments via the provision of health services, has been investigated in both developing and developed countries (Musgrove, 1986 and 1987). One of the most severe economic crises of the twentieth century was the Great Depression in the United States. Brenner (1973) argues for an inverse relationship between mortality and economic fluctuations, as measured by unemployment rates. The methodology and findings have been disputed, however, and several authors suggest there is little evidence for or against such a relationship (Wagstaff, 1985; Stern, 1983; Gravelle, Hutchinson and Stern, 1981; McAvinchey, 1988; Joyce and Mocan, 1993).

Indeed, research on the effects of less severe economic downturns in developed countries suggests that the relationship to mortality may have pro-cyclical components. Deaton and Paxson (1999) using data from a panel of aggregate birth cohorts spanning 1975 to 1995 find that cyclical increases in income raise mortality, which may be attributed to increased risk taking behavior. Still, the long-run effect of increased income is protective and negatively correlated with mortality. Ruhm (1996) presents a fixed effects model of the effect of unemployment on age-specific, adult mortality using longitudinal, state-level data from 1972 to 1991 for the United States. He finds a negative relationship between unemployment rates and total mortality for each age group, as well as with all specific causes except suicide. The postulated explanations are the time costs of medical care and

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healthy lifestyles, and the possible negative health effects of employment.

The evidence suggests no one specific relationship between economic crisis and health. Indeed, Murray and Chen highlight a general declining trend in age-specific mortality rates in most countries that is highly resilient to shocks (Murray and Chen, 1993).

Studies, particularly from the developing world, are hampered by data limitations, yet information exists for a number of countries. Evidence of dramatic increases in adult mortality in Russia has generated a large body of research. Age-adjusted mortality in Russia rose by more than 30 percent between 1990 and 1994, and life expectancy for men and women declined from 64 and 74 years to 58 and 71 years, respectively. More than three-quarters of the decline in life expectancy is attributable to increased mortality rates among adults aged 25 to 64. Cardiovascular disease and injuries account for approximately 65 percent of the decline. While causal factors are still being debated, economic and social instability, high rates of tobacco consumption, high and concentrated alcohol consumption, poor nutrition, depression and a deterioration in the health care system appear to be occurring simultaneously (Notzon et al., 1998; Chener et al., 1998; Walberg et al., 1998; Leon et al., 1997; The Lancet, 1999; Brainerd, 1997).

Indonesia has suffered a very recent and severe economic crisis. Family-level, panel data from before and after the crisis provides information on the impact of the crisis (Frankenberg, Beegle and Sikoki, 1998). In 1998 compared to 1997 use of public health care services declined among adults, and there was a shift to private providers, although among the poorest households financial constraints on private health care increased. Among children, the overall use of health services declined, which resulted in reductions in the proportion receiving Vitamin A, among other services. There is evidence of an improvement in health status based on self-reports over the period, yet

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weight declined for all age groups, especially among the oldest and the poor.

Thailand suffered an economic downturn in 1997 that included a decrease of per capita GDP of more than 30 percent. As part of the response to the crisis, the real public sector health budget was reduced by 17 percent. The prevalence of underweight schoolchildren and low-birth-weight newborns increased in 1997 and 1998, particularly among the poor. There is also evidence of increasing incidence of measles, malaria and diarrhea among children, although no changes in mortality rates. Both the incidence and mortality rates of dengue haemorrhagic fever also increased (Wibulpolpraser, 1999).

In Cuba the tightening of the US embargo in 1992, in the context of a severe economic decline from 1989 is reported to have had an important effect on health and health care. Total mortality increased from 6.4 to 7.2 per 1000 inhabitants between 1989 and 1994. The increase is almost entirely due to a 15 percent rise in mortality among Cubans aged 65 and over associated with influenza, pneumonia, tuberculosis, diarrhea, suicide, unintentional injuries, asthma and heart disease. Deaths from each of these causes rose by 10 percent among the older population between 1992 and 1993. The medical system largely succeeded in protecting women and children, although there is some evidence of an effect of prolonged crisis.

Most relevant for this paper is evidence from Mexico. Data show that the crises of 1982 and 1987 forced families to reduce both the quantity and quality of food consumption. This was a combined effect of reduced real salaries, increased unemployment and withdrawal of government food subsidies on basic foodstuffs. Per capita consumption of basic foodstuffs and of non-protein foods such as rice, the staple of many underprivileged groups, fell dramatically between the early and late 1980s. Rice consumption, for example, fell an annual level of 7.3 kg per capita to 3 kg (Cordera

Campos and González Tiburcio, 1991; Langer, Lozano and Bobadilla; 1991).

Trends in infant mortality in Mexico, although they have declined continuously throughout the twentieth century, show a relationship to economic downturns (Langer, Lozano and Bobadilla, 1991). Between the crises of the 1980s, the infant mortality differential between rural and urban areas, families with more and less educated mothers, and between communities with better or worse housing, all increased. For example, infant mortality was 1.65 times as high in rural as in metropolitan areas prior to 1982. Between 1982 and 1986, the difference doubled so that the rural rate was approximately 4 times the rate in larger cities. Further, during the crisis period, the decline in deaths from respiratory ailments was lower than before the crisis. Dysentery, malnutrition and anemia, all causes associated with deteriorating socio-economic conditions spawning reduced hygiene and inadequate diets, gained relative importance as causes of death among infants. Messmacher (1999) using state-level data from 1993 to 1996 on mortality, state employment rates, and social security coverage at the state level, finds that homicide rates are significantly related to economic conditions.

IV: Economic Crises, Health Conditions and the Health System in Mexico

In Mexico, economic crises have been repeated and intense with intervening periods of mild economic recovery. Over the last three decades, there have been four crises spanning the period of the late 1970s, the early 1980s, the mid to late 1980s and the mid 1990s.[1] These are characterized by sudden increases in inflation and unemployment accompanied by external imbalances and large

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1 Throughout the paper, we date crises as starting in the year in which real GDP declined the most and ending in the year in which real GDP growth returned to pre-crisis levels. Thus, the crisis periods are 1983-84, 1986-89, and 1995-96. The results are relatively insensitive to the timing of the crises, with the exceptions discussed in the text.

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devaluations. Three of these crises are evident from data on Mexico City, Guadalajara and Monterrey where open unemployment increased dramatically in 1977, 1983, and 1995 (Figure 4.1). Data on GDP growth, shown in Figure 4.2, show that in 1983 the rate of economic growth declined to -4.0 percent, in 1986 it again fell to -2.6 percent, and in 1995 it was -4.4 percent. Inflation followed a similar pattern, going from 42 percent to 110 percent from 1982 to 1983, between 1986 and 1988 from 74 percent to 153 percent, and from 7 percent to 41 percent from 1994 to 1996. Relative to 1981, the real minimum wage declined by 18 percent in 1983, by 13 percent in 1988 and by 12 percent in 1994. The purchasing power of the minimum wage has been steadily eroding, and the gap between prices and earnings has widened substantially since 1994 (Figure 4.3).

The timing and severity of economic crises tend to vary across and within states – a finding that is important for the regression results presented below. Some states suffered particularly large declines in GDP between 1993 and 1996, while others appear to have been more insulated (Figure 4.4). These differences are not clearly correlated with the extent of poverty in each state. For example, Chiapas, a poor state, suffered a less pronounced decline than did some richer states.

The impact of economic crisis on health outcomes is likely to be a reflection of demographic and epidemiologic transition. As is the case elsewhere in Latin America, Mexico is well into its epidemiological transition but the process has been characterized as 'protracted and polarized' (Frenk et al., 1989). Mexico currently faces the double burden of a backlog of 'pre-transitional', infectious disease and nutritional deficiencies in poorer parts of the country, juxtaposed with a growing burden from chronic, non-infectious illness (Frenk et al, 1989; Frenk, Lozano y Bobadilla, 1994; Frenk, Lozano and Gónzalez Block, 1994). In 1940, infections, diarrheas, and pneumonia accounted for 60 percent of deaths, while in 1992 more than 60 percent of deaths are associated with non-

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communicable diseases; 21 percent with communicable diseases, maternal mortality, perinatal mortality and malnutrition; and 15 percent with injuries (Frenk, Lozano and González Block, 1994). Further, aging is dramatically reflected in the distribution of mortality. While in 1950 13 percent of deaths occurred after age 70, in 1995 the figure was 39 percent. There are large differences in health outcomes within and between regions that reflect the high degree of inequality in both health status and the distribution of health services. Infant mortality in the southern, poorer states was approximately 92 per 1000 in the 1980s, as compared to 28 per 1000 in the wealthier, northern region (Bobadilla et al., 1993).

The health situation that has resulted from the prolonged and polarized epidemiological transition, and the increasing complexity of health care needs associated with aging, place a heavy burden on a relatively extensive, but inefficient, health system (Ham-Chande, 2000; Frenk, Lozano and González Block, 1994). The Mexican system is segmented and fragmented. The poor and uninsured have the legal right to access the public health system in which the largest institution is the Secretariat of Health. The package of services tends to be limited and does not reach large parts of the population. The insured population working in the private sector has the right to use the more extensive health network of the Mexican Social Security Institute (IMSS), while public sector workers are covered by social security through ISSSTE. In 1994 official figures suggest that 52 percent of the population was covered by social security, 38 percent through the Secretary of Health and solidarity programs in the rural areas, and 11 percent were without access to services (Poder Ejecutivo Federal, 1995; Frenk et al., 1999). It is in the poorest areas of the country where health status tends to be lowest, that health care services are scarce (Figure 4.5; Frenk et al., 1995; Frenk, 1997; Lara et al., 1997). Given the lack of quality and coverage that characterizes much of the public system, a large part of the demand for health

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care is met through out-of-pocket payments by both the insured and the uninsured population. In 1994, 23 percent of all medical consultations and hospitalizations by the insured population and 47 percent by the uninsured population occurred in the private sector (Frenk et al., 1999; Zurita, Nigenda, Ramírez, 1997; Knaul, Parker and Ramírez, 1997; Frenk, Lozano, González Block, 1994).

Economic shocks may force families to either reduce their consumption of health care, to decrease their private spending on health care, or to use the public sector, facing queues and perhaps lesser quality. They may change the composition of the care that they seek between the private and public sector. Further, economic shocks tend to generate a decline in formal sector employment and hence health insurance coverage, causing additional pressure on Secretariat of Health services, increasing demand for private medical care or reducing the consumption of health care.

V. Trends in Age-specific Mortality

We begin our empirical analysis by considering overall mortality rates in Mexico. The mortality data that we employ are based on national statistics and population estimates produced by the Mexican Secretary of Health (Secretaría de Salud), the national statistical agency (the *Instituto Nacional de Estadística, Geografía e Informática* INEGI) and the National Council on Population (*Consejo Nacional de Población, CONAPO*). We use information, by detailed age grouping, divided into major cause groupings (I (communicable, nutritional and reproductive), II (non-communicable), III (injuries) and ill-specified). We focus on the data from 1980 on, as the quality of these data has been improved by adjusting for under-registration and misclassification of causes (Frenk, Lozano and González Block, 1994, Lozano et al., 1999; Lozano, 1997). These corrections improve the quality of the time series, as under-registration, although declining over time, remains an important

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source of error in Mexican mortality data (Frenk et al., 1999). The data were first corrected for underreporting of deaths using information from Census data and from the National Family Planning Surveys. Approximately 85 percent of under-registration occurs in the rural areas, and 60 percent is attributed to deaths among children below age 5. We also compare the adjusted time series to official, published data on mortality and demographic trends from the Secretariat of Health and the National Council on Population. We analyze trends in mortality data at the level of the nation as a whole from 1980 to 1996 and across states from 1982 to 1996.

Overall mortality declined by nearly 30 percent from 1980 through 1996, which corresponds to the longer-run trend associated with the epidemiologic transition. Figure 5.1 shows mortality by cause from 1980 through 1996. The top line is overall mortality, scaled to 100 in 1980, so that the trend can be interpreted in percent changes. The first row of Table 5.1 reports annual percent changes. The remaining lines in the figure refer to Group I mortality (communicable, nutritional and reproductive), Group II communicable disease mortality, and mortality from injuries (Group III). Injuries include both intentional and non-intentional causes, among them accidents, homicides, and suicides. Each of these lines is scaled to overall mortality in 1980, so the bottom three lines add to the top one.

The decline in mortality has not been even over time, and matches the pattern of economic crises. Between 1980 and 1982, before the first crisis, mortality declined by 4.8 percent per year. Between 1982 and 1984, the years of the crisis, the mortality decline fell in half, to only 2.5 percent per year.

Mortality statistics for the second crisis are more variable. In the 1984-85 pre-crisis period, the Mexican economy was still recovering, and mortality was falling only modestly (a decline of 1.5

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percent per year). Mortality declined at a similar rate over the period of the economic crisis (1.6 percent per year from 1985 to 1989), suggesting no effect of the crisis on mortality. But annual data show this story is more mixed. Mortality declined rapidly in 1986 (5.5 percent) and then was flat through 1989. Because of the difficulty in measuring pre-crisis trends and dating the timing of the crisis exactly, we do not focus very heavily on this second economic crisis.

A sustained period of economic growth between 1989 and 1994 reduced mortality by 2 percent per year. Since then mortality rates have increased. Mortality rose by approximately 1 percent in 1995 and fell by 1 percent in 1996, for a total change of 0.3 percent per year.

Data by cause do not suggest any one explanation for the slowdown in mortality reduction in recent years. Chronic and non-communicable disease mortality – the leading cause group of death in Mexico – rose by about 3 percent between 1994 and 1996, and communicable disease mortality, which had been declining rapidly, declined much less rapidly. Death from injuries, the smallest of the rates, continued to decline. The lack of any one dominant cause of increased mortality suggests a systemic explanation more than a disease-specific explanation. Figure 5.2 shows changes in mortality rates by age and sex. In each case, we scale the series to 100 in 1980. To aid in interpretation, Table 5.1 shows annual changes in mortality rates by age and sex, for the same time periods. There is clear evidence that economic crisis is associated with increased mortality for the elderly, and possibly for the young. The figures and table suggests three age groupings of the population; infants and children (less than 15); the elderly (ages 60+); and the middle aged (in between). Changes in mortality for infants and young children match well the pattern of economic crises. Mortality decline was rapid throughout the late 1980s and early 1990s, which corresponds to good economic years (as high as 9 percent annual declines in mortality), and then slowed down in

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bad economic periods. Indeed, in some cases, such as the 1986-89 crisis and post-crisis period, mortality for infants actually increased, while in other cases, such as the 1995 crisis period, mortality rates declined but at a less rapid rate. Some of the leveling off may be the result of the fact that infant mortality had reached a low level by the mid-1990s so that additional gains were more difficult to attain. Note that child mortality fell less rapidly during the crisis years as well.

Similar patterns are true about the elderly. In this case, though, mortality actually increases during economic crises. For example, mortality for people aged 70-79 fell by about 2.5 percent per year between 1989 and 1994, but rose by about 1 percent per year between 1994 and 1996. The middle-aged population sees much steadier changes in mortality. In fact, the male population aged 15-29 and 30-44 – the groups for which medical care utilization is likely to be lowest – actually experience larger mortality declines during years of economic crisis than during years of economic growth. The female population in this age group shows on average the same decline in mortality in good and bad economic years.

Given that the Mexican Health Foundation mortality data are based on adjustments of official data, we compare mortality changes among the elderly using several sources. Figure 5.3 compares mortality rates for age groups 60-9, 70-9 and 80 and over, using three sources of data: the Mexican Health Foundation (MHF) adjusted data on mortality and population trends (MHF/MHF), Secretariat of Health estimates of mortality rates which are based on CONAPO population estimates (SSA/CON), and Mexican Health Foundation adjusted mortality estimates with CONAPO population statistics (MHF/CON). All sources show an increase in mortality rates among the all age groups in 1994 to 1996. The MFH/MHF estimates, which are the ones used in this paper, show the most moderate increase. Further mortality rates increased moderately, or declined less, in the 1980-9

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period as compared to the years of economic recovery of 1989-1994. Finally, for the years 1997-8 data are only available from official statistics (SSA/CON) but these show that mortality rates again decline.

We examine the cause of increased mortality in Figure 5.4 for infants and the elderly. The majority of the increase in mortality is in non-communicable disease mortality. For the elderly, for all age groups, the pattern shows increases in mortality or slower declines in 1994-6 and 1980-9, than in 1989-94. Further, the 1994-6 mortality changes contrast markedly with the 1980-94 time period, where chronic disease mortality was falling for all of the elderly other than the oldest old. For infants, there are also increases or reduced declines in 1994-6. While disease-specific patterns have to be analyzed with caution due to reporting error and sample size issues, increases in chronic disease mortality among the elderly is seen for such causes as cardiovascular (including heart attacks and cerebrovascular disease) and chronic respiratory and obstructive pulmonary disease. Group I (communicable) disease mortality rates increased in the 1994-96 period, particularly for the elderly. For other age groups, and in the 1980-89 period, the rates declined less than between 1989 and 1994. The pattern for injuries does not demonstrate a clear relationship to cycles in economic growth among infants or the elderly.

Mortality changes varied substantially across states and were not limited to very poor areas. Figure 5.5 shows the changes in mortality for the 1980-89, 1989-94 and 1994-96 periods for each of 5 states. Chiapas and Oaxaca are the poorest states in the country, while Nuevo Leon and Quinatana Roo are the wealthiest. Mexico City is a mixture of poor and wealthy regions and populations. In all of the areas, there are increases, or reduced declines in mortality during the periods of economic crisis. The differences across age groups thus do not reflect a clear pattern across rich and poor

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states.

The trends in mortality by age and gender summarized in Figure 5.2 can be used to generate a 'differences-in-differences' estimate of the effect of economic crisis on mortality (Table 5.2). Denoting the mortality rate as MR, the affected group as 'a', the unaffected group as 'u', and 't' as the time period which we are examining, our estimate is:

$$D = [ch(MR_{a,t}) - ch(MR_{a,t-1})] - [ch(MR_{u,t}) - ch(MR_{u,t-1})]$$

We take as our potentially affected groups infants and the elderly. We use males aged 30-44 as the group whose health is least likely to be affected in the short-term by economic crisis.[2] The time period t corresponds to years of crisis and t-1 corresponds to the preceding years of economic growth.[3]

Table 5.2 shows the differences-in-differences estimates of mortality changes. As with any complete census, the standard errors are very small; the standard error for the difference-in-difference estimate D is never above 0.1 percent. Since all of the results are statistically significant, we do not report these values.

The results show large effects of crisis on mortality. In the 1982-84 crisis, the differences-in-differences estimates of mortality changes are generally similar across groups, at roughly 6 to 9

[2] The results are qualitatively similar if we use males aged 15-29 as the unaffected group.

[3] We could alternatively estimate a regression model for mortality for different age groups and estimate the crisis impact relative to the entire time period. But the trends in mortality for different age groups appear to vary over time, so we do not follow this path.

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percent. The 1995-96 crisis witnessed increases in mortality of 5 to 7 percent.

The 1986-89 crisis had a smaller effect on mortality for most age groups, with the exception of infants. For the elderly, the excess change in mortality rates is 1 to 4 percent; for infants, the excess mortality change is 10 percent. As noted above, however, because of the short pre-crisis period we do not place particularly high weight on this experiment

These changes in mortality are quantitatively significant. In 1990, there were approximately 11 million children and 5 million elderly in Mexico. Using the estimates in the last column of Table 5.2, we calculate that the number of additional deaths was 7,000 to 8,000 children aged 0 to 4 (compared to approximately 57,000 actual deaths) and 20,000 to 21,000 elderly aged 60 and over (compared to 192,000 actual deaths). By another metric, these deaths represent 0.06 percent of the young population and 0.4 percent of the elderly population. Overall, our results provide strong evidence that economic crisis is associated with increased mortality, and that this change is quantitatively important. The increase in mortality is not attributable to just one or two causes; both communicable and chronic disease mortality rose with the economic crisis.

One might wonder whether these mortality changes are simply higher mortality among those who were 'marginal survivors' and would have died in the next year or two without the crisis. If this were the case, the crisis would simply hasten death by a few months to a year, but not impact people with high long-term expected survival. We cannot address this issue for certain without longitudinal information on the characteristics of people who die. We suspect this is not the case, however, because the increase in mortality is observed for all causes of death. Marginal survivors, in contrast, might be expected to die of particular diseases to a great extent, such as pneumonia or influenza.

VI. How Economic Crisis Affects Mortality

In this section, we analyze the reasons why economic crisis has such a large effect on mortality. Testing different explanations with time series data is difficult, since it is hard to capture all of the factors that change over time. We thus use data disaggregated to the state level to test the four explanations for the change in mortality discussed above. We examine the years 1991, 1993, 1995 and 1996 in order to be able to match available time series on employment to data on mortality and the supply of health care services.[4]

We test the four theories of economic crisis presented above. The first explanation is the income theory: mortality increases because family income falls and thus families have less to spend on goods that improve or maintain health. We test this theory in several ways. First, we examine changes in labor force participation across states. As the economy declines, fewer people with strong attachments to the labor force (for example prime-aged males and some elderly) will be able to work but more secondary workers (generally women, children and some elderly) will enter the labor force (Benería, 1992; Chant, 1994; González de la Rocha, 1988; Moser, 1995; González de la Rocha, 1995). We use as our first measure of economic crisis the reduction in labor force participation for prime-age males and the increase in participation rates for women, children, and the elderly.[5]

The employment data come from the *Encuesta Nacional de Empleo* (National Employment Survey - NES), undertaken in the second trimester of 1991, 1993, 1995 and 1996 by the *Instituto*

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[4] We also estimated regression models for mortality at the level of the microregion -- groups of counties or municipalities (*municipios*) of at least 20,000 people – of which there are 713, although only 90 have sufficiently large populations to enable data analysis, and the city-level. These results were similar to the state-level analysis. We thus present the state-level analysis only.

[5] We experimented with using data on GDP at the state level but found the employment data to be a better measure of economic crisis. Further, the GDP data are only available from 1993 at the state level.

Nacional de Estadística, Geografía e Informática (INEGI) and the *Secretaría del Trabajo y Previsión Social*. The NES cover both the urban and rural areas of Mexico and include approximately 143,000 adults in 1991, 140,000 in 1993, 110,000 in 1995 and 365,000 in 1996. The sample is nationally representative and divided into urbanized and less urbanized areas. The 1991, 1993 and 1995 samples are designed only for disagreggation into less and more urbanized areas, while the 1996 sample is representative at the state level.[6]

Table 6.1 shows summary statistics for these employment rates. The male labor force participation rate fell from 91 percent in 1991 to 89 percent in 1996. The decline is not large, but there was also a shift towards unemployment as rates among adult males went from in 3.6% in 1994 to 6.1 in 1995 and 5.3 in 1996 (INEGI, 1998). Over the same time period, female labor force participation rose from 37 to 43 percent. Participation among youth and among the elderly fell. Both the increasing trend for women, and the decline for children and youth are in line with longer run trends, although the crises were accompanied by increased unemployment among youth and perhaps increased participation of women.

While we include overall trends in participation in our regressions, we note that this may not be the best measure of economic crisis. Employment declines among the elderly, for example, might result from either the healthiest and wealthiest choosing to retire, which would not have much effect on health, or from those with low family income not being able to find work, which might

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[6] For the municipality-level regressions we use the NES employment data but must rely on a sample of only 90 micro-regions that are included in all years of the survey and have more than 30 observations for adults in any year. The 90 micro regions cover 47 percent of the population included in the NES of 1996 and 83 percent of the urban population, yet only 15 percent of the rural sample. For the analysis at the city level we use the *Encuesta Nacional de Empleo Urbano* (National Survey of Urban Employment - NSUE) from 1992 to 1996 which are representative of 32 of the largest cities and 225,000 adults.

well affect health. Similarly, there may be shifts from the formal sector, with better working conditions and benefits, to the informal sector. We cannot match mortality to particular individuals, however, so we cannot examine how changes in employment for particular workers affect their health.

The second explanation is the public medical system theory: mortality increases because public sector spending on medical care falls absolutely, or relative to the need for public care. Public sector budgets declined in crisis years. Lara et al (1997) present the trends in public sector per capita health expenditure. In 1982, reported spending on health and labor (labor represents only 1 percent of spending) reached 3.6 percent of GDP. In 1987, it reached its lowest point of 2.7 percent and from 1990 to 1994, rose steadily to over 4 percent. Between 1994 and 1996 per capita health spending fell by about 15 percent and as a proportion of GDP from 3.8 percent to 3.4 percent (Figure 6.1). It is also important to note that during the 1990s there was some effort to increase the level of spending on the uninsured population as compared to the insured. There was a significant increase between 1990 and 1994 in per capita spending on the uninsured population through the PASSPA program (*Programa de Apoyo a los Servicios de Salud para Población Abierta*) which included the poorest states of Hidalgo, Oaxaca, Guerrero and Chiapas (Figure 4.5). Spending doubled from .26 pesos per capita to .58 in 1994, while spending in other regions remained relatively stable. Thus the PASSPA region went from being one where public health spending per capita was low compared to other parts of the country, to one where per capita allocations are relatively high. Still, between 1994 and 1995, spending declined in all regions, but most sharply in PASSPA, with a fall of 25 percent (Lara et al., 1997). In the 1990s, there was also a heavy focus on developing strong vertical public health programs to protect children such as increasing vaccine coverage (Ignacio-Santos, Veras Godoy and Flores del Campo, 2000;

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Gutierrez et al., 1999).

We measure the public sector's supply of medical resources using data on the distribution of public sector infrastructure (hospitals, clinics, doctors, and nurses) per capita.[7] These data are published by the Secretariat of Health and the Office of the President and refer only to the supply of public services (the Secretariat of Health, the IMSS, the ISSSTE, etc). Thus, they are reasonably exogenous measures of the ability to receive care. The supply of doctors, nurses and clinics per capita in the public sector, measured as the number of units per 1000 population, increased up to the period of crisis and then leveled off (Table 6.1). Although not evident from the data included in the table, there was a slight worsening between 1994 and 1995 following by a return to 1994 levels in 1996, and then a continued increase the number of public sector physicians per capita in 1997 and 1998. Further, the pattern varies across states. In some states, the number of public sector doctors per capita was rising throughout the period 1991 to 1996, while in others such as Mexico City there are declines over the period 1994 to 1996. Some of the increasing trend in the supply of physicians is associated with PASSPA states such as Chiapas.

Changes in the supply of doctors, nurses, clinics, and hospitals across states are highly correlated. The correlation between changes in physicians per capita and both nurses and hospitals per capita, for example, is .6. To avoid issues of multicollinearity, we only include the per capita supply of

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[7] We also looked at the demand for public health spending using data on the proportion of the population covered by social security (IMSS and ISSSTE). Social security coverage is a measure of formal sector, salaried employment, as well of health insurance coverage for workers and their families. IMSS coverage declined over the crisis period. Between 1994 and 1995, the proportion of the adult population with social security coverage declined from 18.5 percent to 17.2 percent. Most of the decline is among short-term contract workers who are highly vulnerable to lay-offs. Among this group, social security coverage declined by over 35 percent between 1994 and 1995. The social security coverage variable was not as strong a predictor of mortality as the employment and medical variables, however, so we do not report these results.

physicians in the regressions, although the results are very similar for hospitals, nurses and clinics.

We are also interested in the possibility that families responded to reduced public medical care budgets by increasing private payments. Overall, out-of-pocket health expenditures declined during the crisis based on data from the Household Income and Expenditure Surveys of 1992, 1994 and 1996., from 3.9 percent of GDP in 1994 to 3.1 percent of GDP in 1995. The decline is evident among middle-income and wealthier families in hospitalizations, and for families of all income levels for doctor visits and dental care (Figure 6.2). Further, these declines are most substantial among families with elderly members (27 percent), as compared to families with young children (15 percent) or families that include neither children nor elderly (18 percent). This drop is concentrated among the families in the wealthiest tercile (Figure 6.3).

We experimented with a variety of measures of out-of-pocket medical spending in our regressions. Unfortunately, there is an endogeneity problem with including such variables: when people are sicker, they will spend more on medical care out-of-pocket. In our preliminary results, this appeared to be the case: medical spending was positively associated with mortality. The appropriate solution is to have an instrument for medical spending uncorrelated with sickness. We could not come up with such an instrument, however, so we omit this variable from the regressions.

The third theory is that mortality increases because workers who enter the labor force suffer health declines. We test this using the labor force participation rates for youth and the elderly. To the extent that these variables are significantly related to mortality, we would need additional analysis to determine whether that is because they proxy for income changes or because increased work among these populations is associated with worse health. Still, the available data is sufficient to show whether or not there is a relationship between mortality at a given age and the participation

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rates of the same age group.

The final theory is that mortality increases because traditional caregivers have to enter the workforce and thus the supply of informal health and care-giving services falls. We proxy for this with the female labor force participation variable. Again, there is an identification problem with this variable: if increased female labor supply is associated with higher mortality, we do not know whether this is because income is falling or because family care-giving has declined. We return to this issue below.

Equal sized income changes may not have the same effect on all areas. In poorer areas, a given reduction in income might have a larger effect on mortality than a similarly sized or even larger change in rich areas. We include a measure of the illiteracy rate in the state (correlated with overall poverty) to address this. The illiteracy rate is measured in 1995 and 1996. We interact this with a dummy variable for the crisis years to see how economic crisis differentially affects high versus low poverty areas. The mean state had an illiteracy rate of 12.2 percent.

Table 6.2 presents regression estimates for age-specific mortality rates, differentiating by gender for ages 15 to 29 and 30 to 44.[8] Each row is a regression for a separate age group. The dependent variable is the logarithm of mortality for the age group indicated. The independent variables are shown in the next columns. The data are based on 32 states with data in 4 years, for a total of 124 observations given that a few states have missing employment data in early years. Each

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[8] The regressions at the microregion and city level tend to support the findings presented for the regressions at the state level. Female employment rates are positively correlated with mortality for aged 60-69 and 80 and over, as well to some extent for children. Further, there is some support for the access to medical care variables. Changes in the number of physicians per capita are negatively correlated with mortality and tends to be significant for most age groups suggesting the potential importance in changes in the supply of medical services.

cell gives the coefficients and t-statistics for each variable (other than the state and year dummies).

The results suggest two conclusions most strongly. First, female labor force participation rates are positively related to mortality among children and the elderly. A 3 percentage point increase in female labor force participation – a rough estimate of the excess change from 1991 through 1996– leads to an increase of 0.8 percent in mortality among children, 1.2 percent in mortality among youths, and about 0.4 percent in mortality among the elderly.[9] These results are generally statistically significant at the 10 percent, and sometimes 5 percent, level.

Second, changes in public sector medical resources have some affect on mortality, although the results are less strong than for female labor force participation. As the number of physicians per capita falls, mortality among the youngest age groups and particularly among child-bearing women, rises. The coefficients suggest that a decline of 1 percent in public sector physicians leads to a .4 percent increase in mortality rates among child-bearing women and a .25 percent increase in mortality rates among children aged 0 to 4. We ran the regressions using each of the four measures of access to medical care (nurses, doctors, clinics, and hospitals), and found similar results with each.

The other variables are generally not as consistently or statistically significantly related to mortality rates. When more elderly go to work, mortality rates among the elderly aged 60-69 rises. But this is not true for other age groups among the elderly, who we suspect are also working. Accordingly, we do not push this explanation particularly strongly. Male labor force participation rates have a negative effect on mortality (the expected sign) but are not statistically significant.

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[9] The female labor force participation rate (including all women aged 12 and over), roughly doubled between 1970 and 1990, reaching a level of just over 30 percent. This suggests a rate of increase of approximately .75 percent per year. Applying this rate over a 5-year period 1991-1996, and assuming that the rate of increase is the same for women 18-65 as for women aged 12 and over, would imply an increase of almost 4 percent as compared to the 7 percent observed in the data.

Youth employment rates are not significantly related to youth mortality. The indictor of poverty, the proportion of adults who are illiterate, is positively and significantly related to mortality only for children aged 0 to 4 and for elderly aged 60 to 69 but is negatively related to mortality for people above age 80.

Overall, the strongest conclusion is the link between female labor force participation rates and mortality for children and the elderly. This finding is consistent with two of our theories: that the overall size of the economic shock affects mortality and female labor force participation proxies for the size of the economic shock; and that when women go to work, they are less able to care for dependent children and elderly, who suffer adverse health consequences as a result. To differentiate between these two explanations, we separate out the female labor force participation rate into a rate for adult women living in families with at least one elderly member and a rate for women living in families without elderly members. If the caregiver hypothesis is correct, female labor force participation in families with elderly should impact elderly mortality rates. If the economic crisis effect is more apparent, this will not be disproportionately the case.

The regression results differentiating between women in families with and without elderly are presented in Table 6.3. While the standard errors increase substantially in this specification, as one would expect given the correlation between these variables, the evidence is more consistent with the economic shock theory than with the female caregiver theory. Female labor force participation in families without elderly is positively and significantly associated with mortality for some elderly and adult groups. At the same time, female labor force participation in families with elderly is insignificant in all of the regressions and frequently and the opposite sign. We therefore conclude that the effect of female labor force participation on mortality likely results from an income effect

more than a caregiver effect.

VIII. Conclusions

Our analysis of economic crisis in Mexico finds very clear evidence that economic crisis is associated with higher mortality among vulnerable populations – children and the elderly. During crisis periods, mortality rates for these groups rise absolutely and relative to less vulnerable groups. The mortality change implied by economic crisis is large. We estimate mortality rate increases in the 1982-84 crisis of roughly 6 to 9 percent and during the 1995-96 of 5 to 7 percent.

We provide tentative evidence of the explanations for this mortality increase. Using state-level panel data, we find that the magnitude of the economic shock – as measured by the share of women who enter the labor force – predicts increases in mortality. Further, reduction in public sector medical services adversely affects mortality for at least some groups, although this evidence is weaker than the results for female participation rates. We find no significant evidence that the availability of caregiver time or having more children and elderly go to work adverse affects health of these groups.

There are several important areas for future research in light of the results. Our research is based on aggregate data, particularly at the state level. Additional conclusions and evidence could be drawn from individual data that would make it possible to trace mortality in particular families. These data may soon be available from the longitudinal component of the National Urban Employment Survey.

We found that the elderly constitute a particularly vulnerable group in time of economic crisis. We hypothesize that the health of the elderly in developing countries is likely to be

particularly sensitive to economic trends and that the supply of health services may not be effective in preventing this response.

The growth of the elderly population presents a new challenge to health systems and social support networks in many developing countries where populations are becoming old before they become wealthy (Kalache and Sen, 1999). Historically, the very young have been dominant among vulnerable groups and health systems, including the Mexican public sector, have reacted by developing strong programs to support and protect the health of the young. The elderly constitute another vulnerable group, yet the effect of economic crisis on the elderly may not have been present or easily observable in the past as the proportion of the population to old age was small.

The growth of the elderly population places new and emerging demands on the health care system that add to the complexity and cost of the health care services required to meet the needs of the population. The evidence presented in this paper highlights the importance of developing institutions, interventions, health care services and other interventions tailored to the needs of older as well as younger population groups. The elderly deserve particular attention in evaluating the health and human costs of economic downturn and the range of policy responses that can be implemented to reduce these costs by building public safety nets and support for families.

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Figure 4.1: Unemployment Rate in Mexico City, Guadalajara and Monterrey, 1973-1997
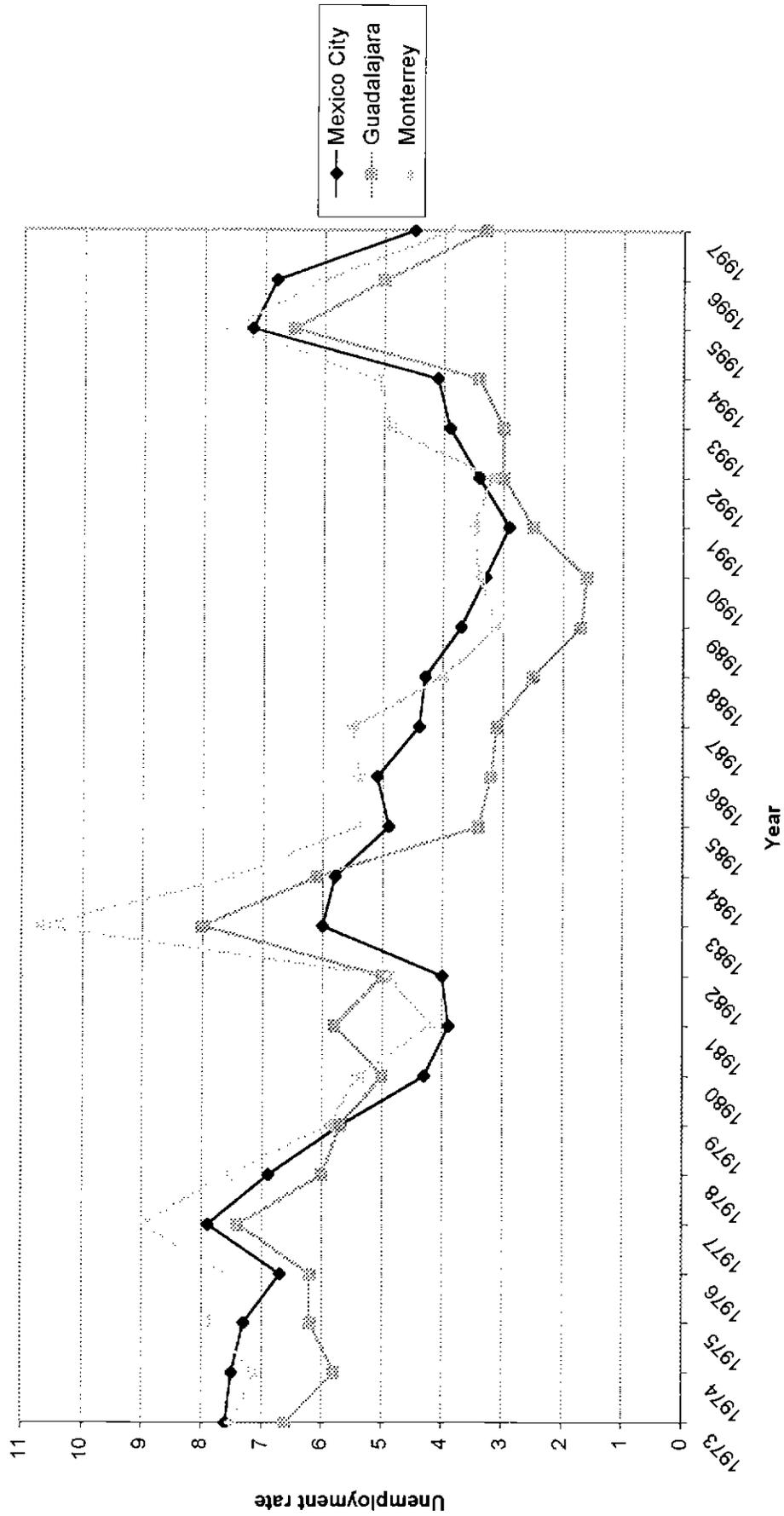
Source: INEGI, Documento Metodologico de la Encuesta Nacional de Empleo Urbano , 1998.

Figure 4.2: Growth Rate of GDP, Mexico 1981-1996
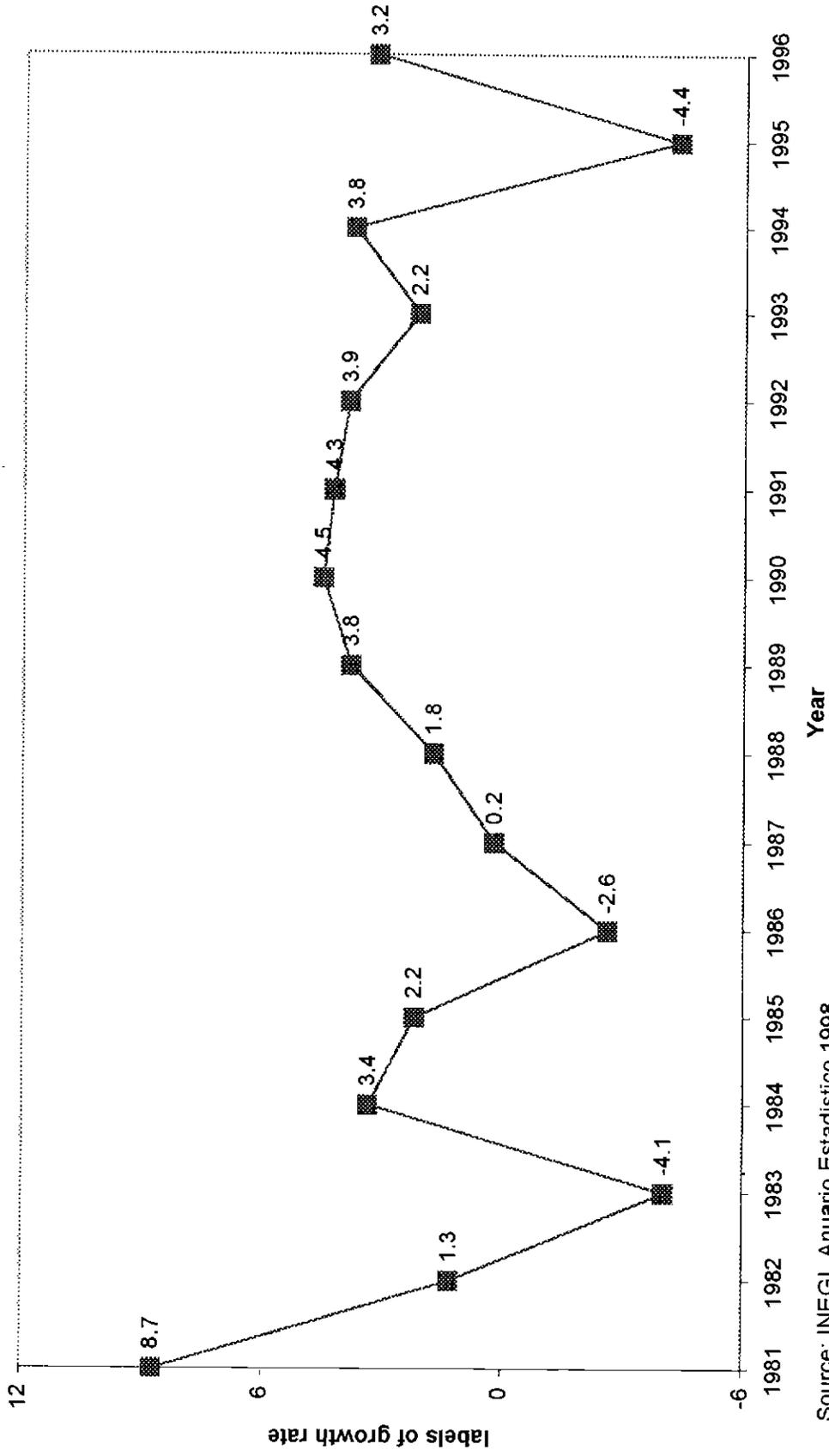
Source: INEGI, Anuario Estadistico 1998

Figure 4.3: Change in Minimum Wage and Price Index of Representative Basket of Goods and Services1/

—◆— Price Index of Representative Basket of Goods and Services   ⋯⋯ Minimum Wages
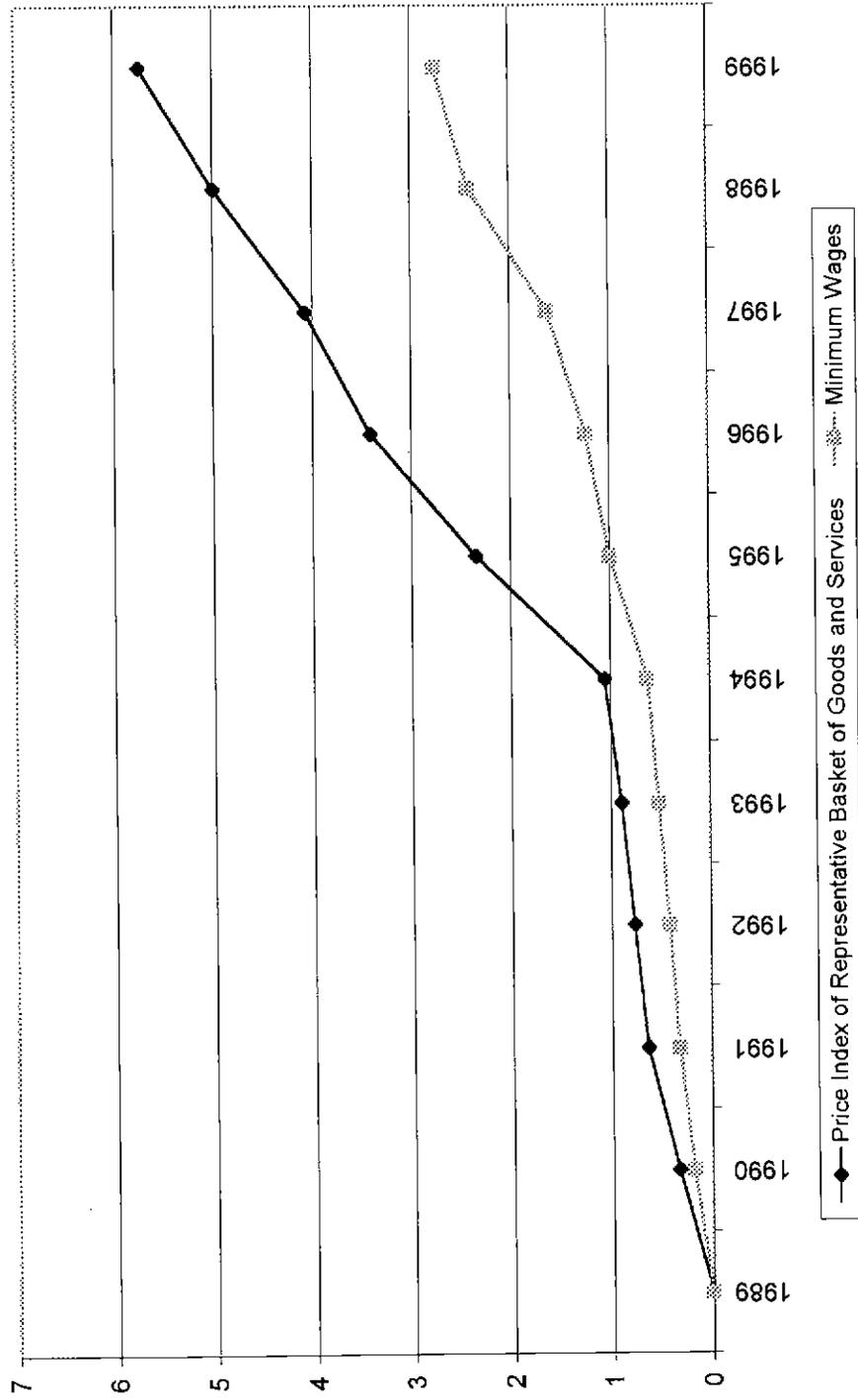
1/ Base Year =1994

Source: Banco de México (Internet). 2000

Figure 4.4: Change in average per capita state product
Ordered by change in state product between 1994 and 1995
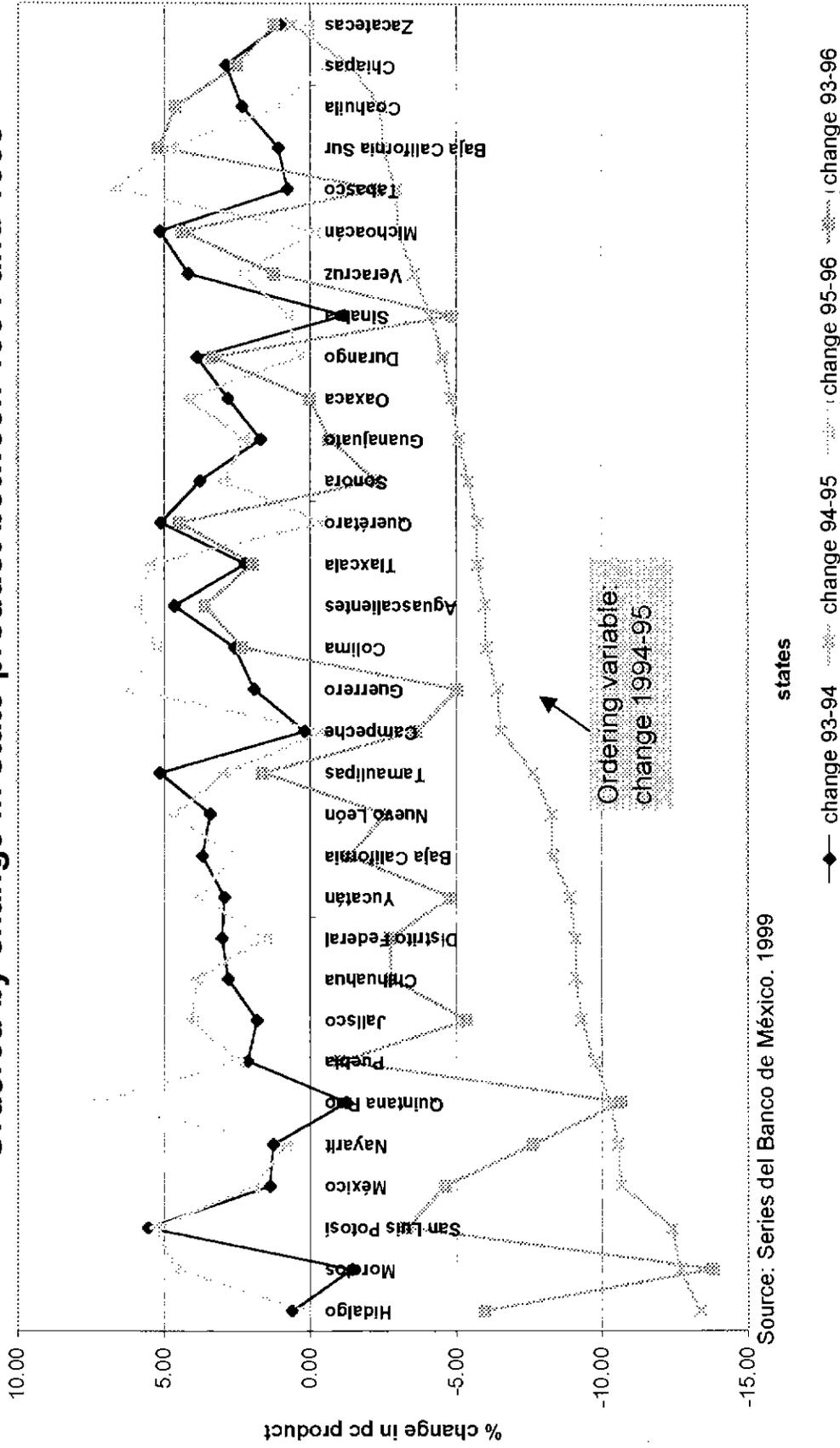
Source: Series del Banco de México. 1999

Figure 4.5:   Distribution of Health Services and Resources

Poverty Index
Source CONAPO

- ■ Very High (473)
- ■ High   (375)
- ▦ Medium   (969)
- ▦ Low   (388)
- ■ Very Low (223)

Ministry of Health Hospitals
By service type

- 910
- 455
- 91

- ■ Outpatient referal service
- ▦ Hospitalization
- ■ Specialized medical service

Hidalgo

Chiapas

Oaxaca

Guerrero
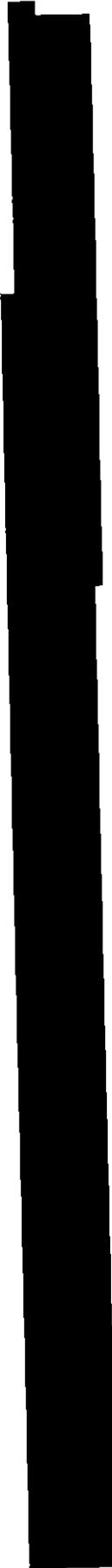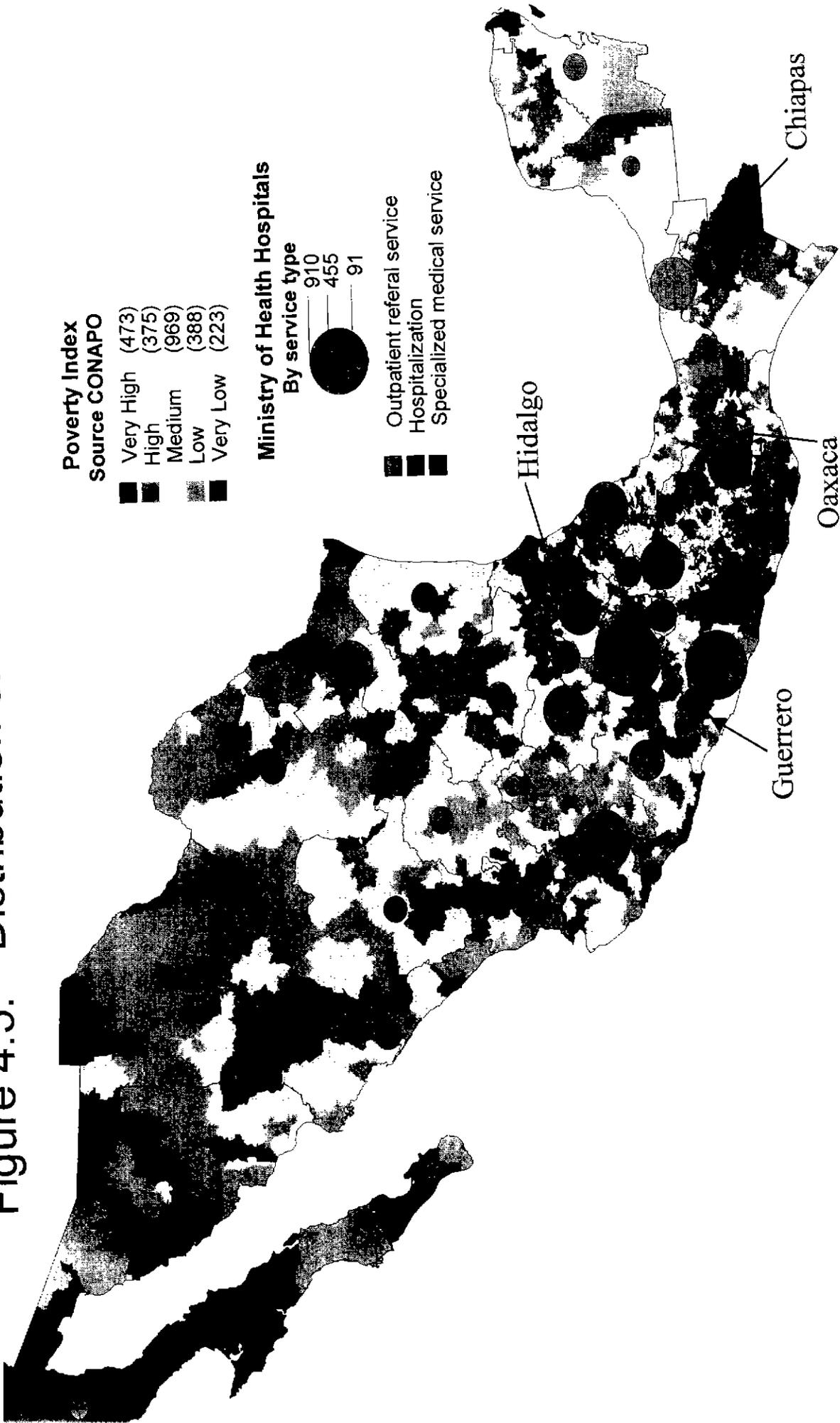
Figure 5.1: Mortality by Cause, Mexico 1980-1996

Legend:
- Total
- Communicable, Nutritional and Reproductive
- Non-communicable
- Injuries

Rate (1980=100)

Year

Source: Mexican Health Foundation based on Secretariat of Health and CONAPO.

Figure 5.2: Mortality by Gender and Age Group. 1980-1996
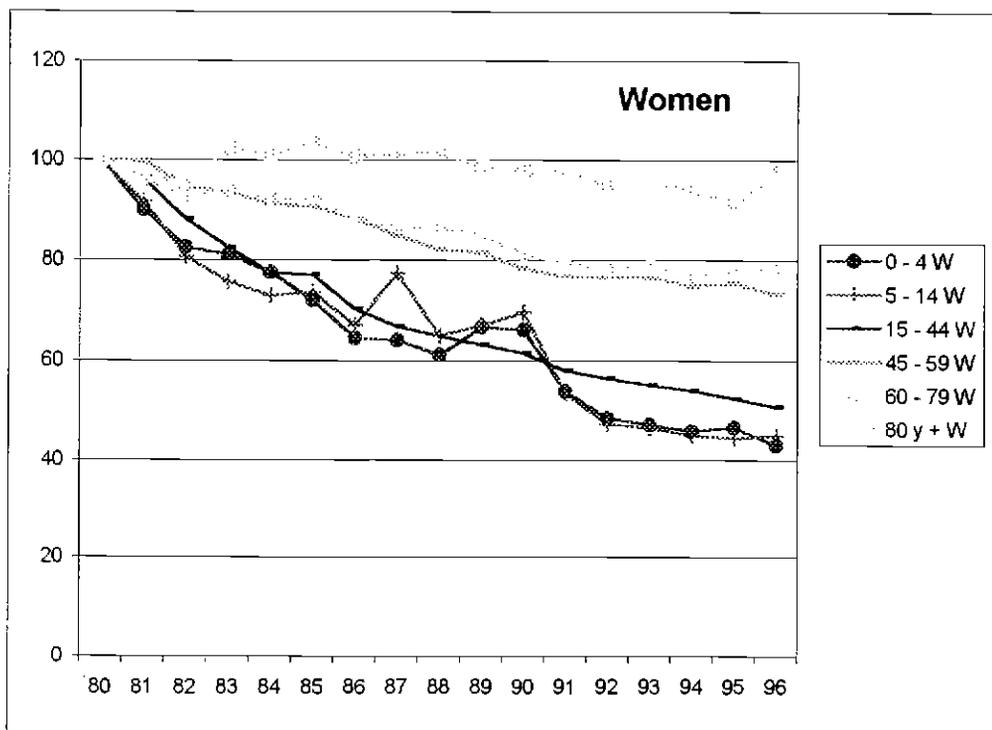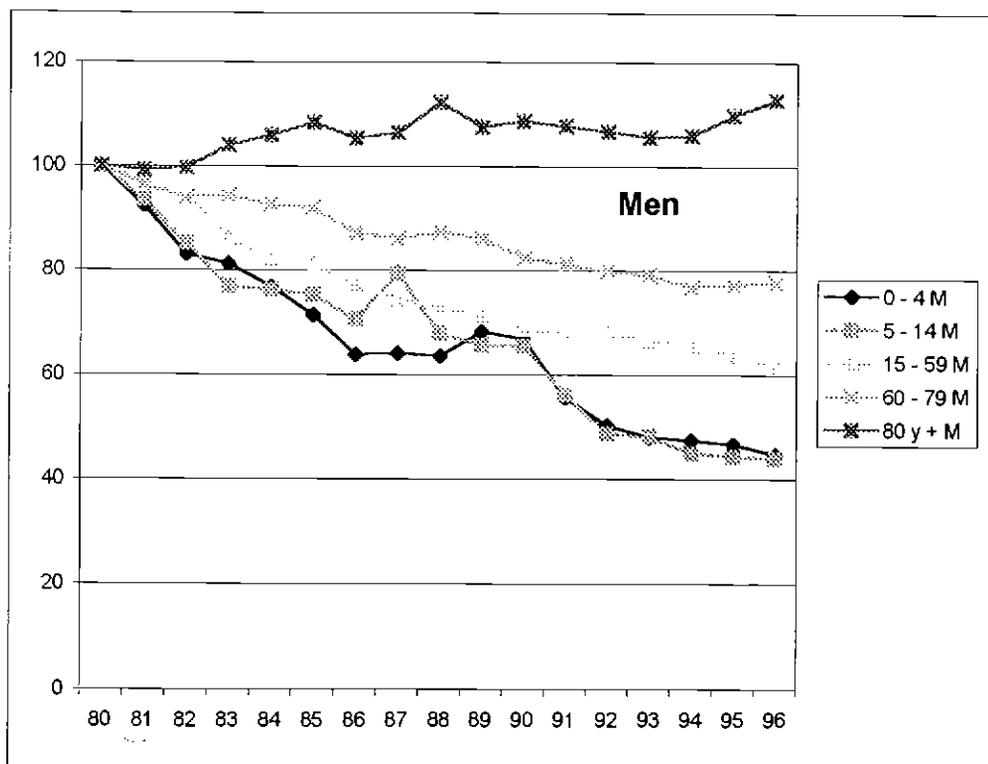
Source: Mexican Health Fundation based on Secretariat of Health and CONAPO.

Figure 5.3:Mortality Rates in Mexico by Age Group and Data Source*
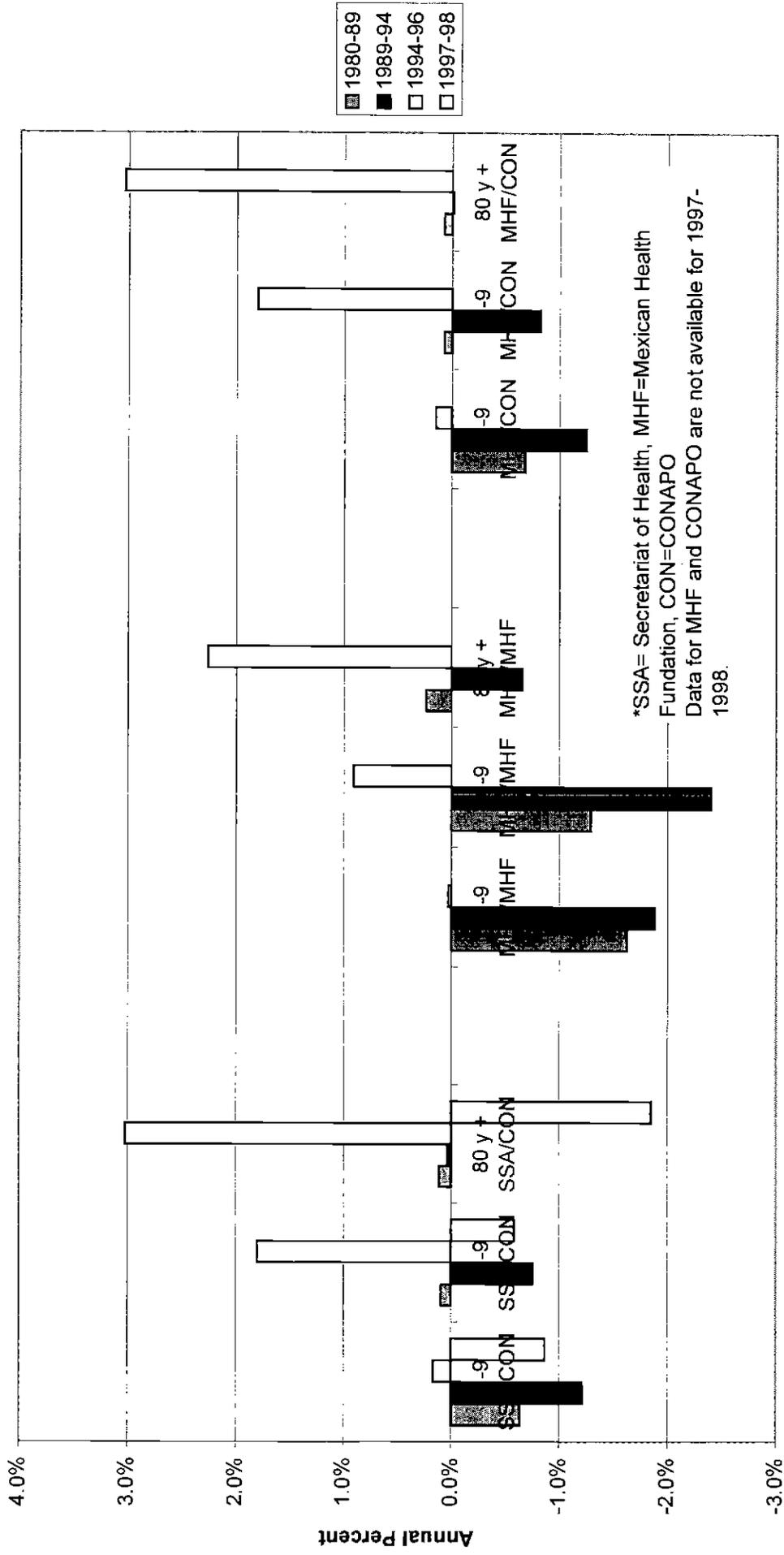
*SSA= Secretariat of Health, MHF=Mexican Health Fundation, CON=CONAPO Data for MHF and CONAPO are not available for 1997-1998.

Age Groups (60-69 years, 70-79 years and 80+ years)

Legend: 1980-89, 1989-94, 1994-96, 1997-98

Annual Percent

Figure 5.4: Changes in Mortality by Broad Cause Group

	0-4	60-69	70-79	80+	0-4	60-69	70-79	80+	0-4	60-69	70-79	80+	0-4	60-69	70-79	80+	0-4	60-69	70-79	80+	0-4	60-69	70-79	80+
1980-89	-4.5%	-4.6%	-3.5%	-0.3%	-4.8%	-5.1%	-3.9%	-1.9%	-3.2%	-0.8%	-0.7%	1.2%	-1.0%	-3.2%	-0.8%	0.3%	-1.8%	-3.6%	-2.8%	0.1%	-4.0%	-1.8%	-0.2%	
1989-94	-8.5%	-6.6%	-7.8%	-4.2%	-9.1%	-6.4%	-7.8%	-4.2%	-2.8%	-1.6%	-1.3%	0.6%	-0.7%	-2.7%	-1.8%	-0.1%	-2.9%	-3.5%	-3.3%	-0.8%	-5.3%	-4.3%	-1.7%	
1994-96	-3.9%	-2.9%	0.7%	4.7%	-4.4%	-2.4%	-0.2%	4.0%	-0.1%	0.4%	1.6%	3.0%	1.1%	0.7%	1.0%	1.4%	-1.6%	-6.4%	-3.9%	-0.8%	-3.9%	-7.9%	-1.5%	
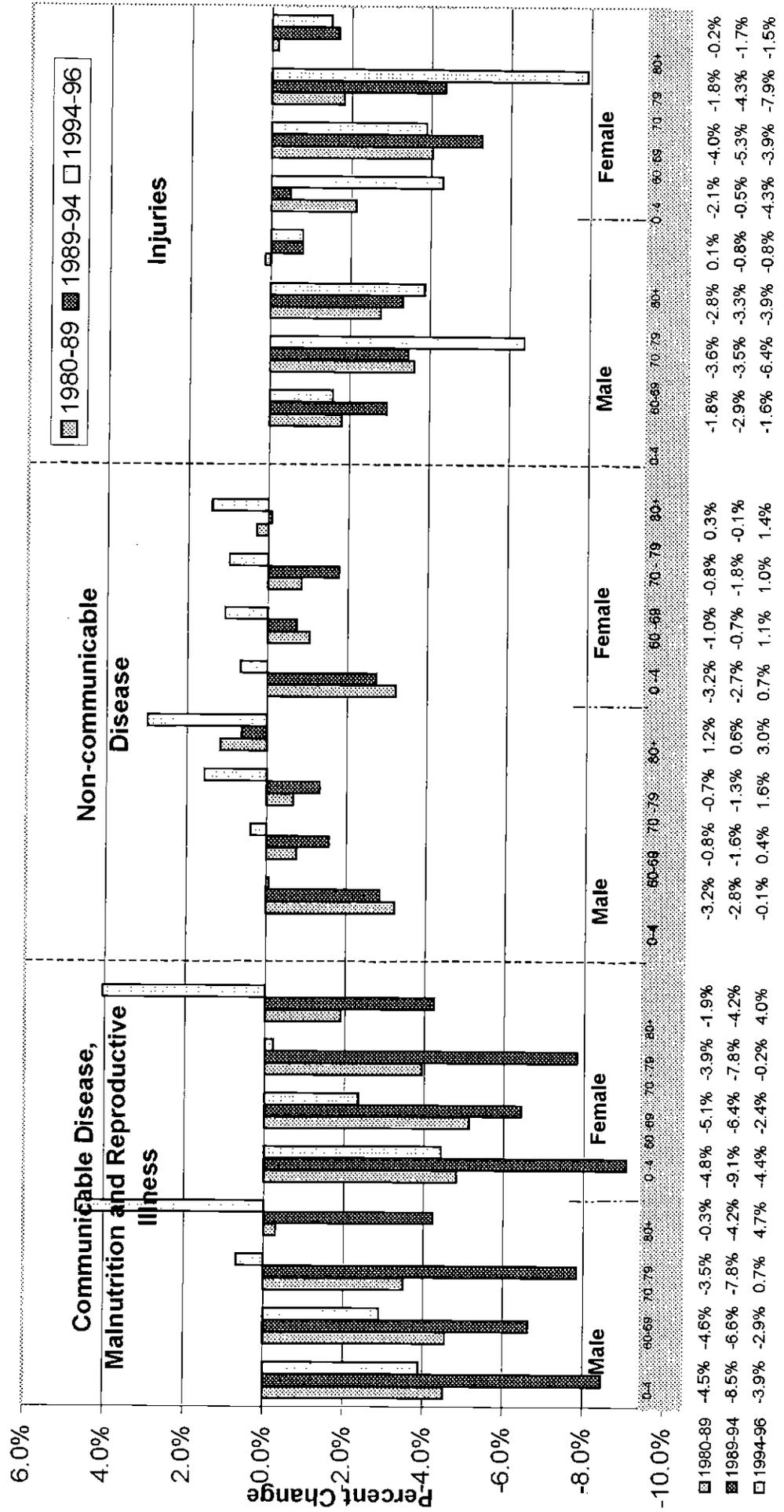
Figure 5.5: Changes in Mortality in 5 States

Changes in mortality in Chiapas

Changes in mortality in Oaxaca

Changes in mortality in Nuevo Leon

Changes in mortality in Quintana Roo


Changes in mortality in Distrito Federal
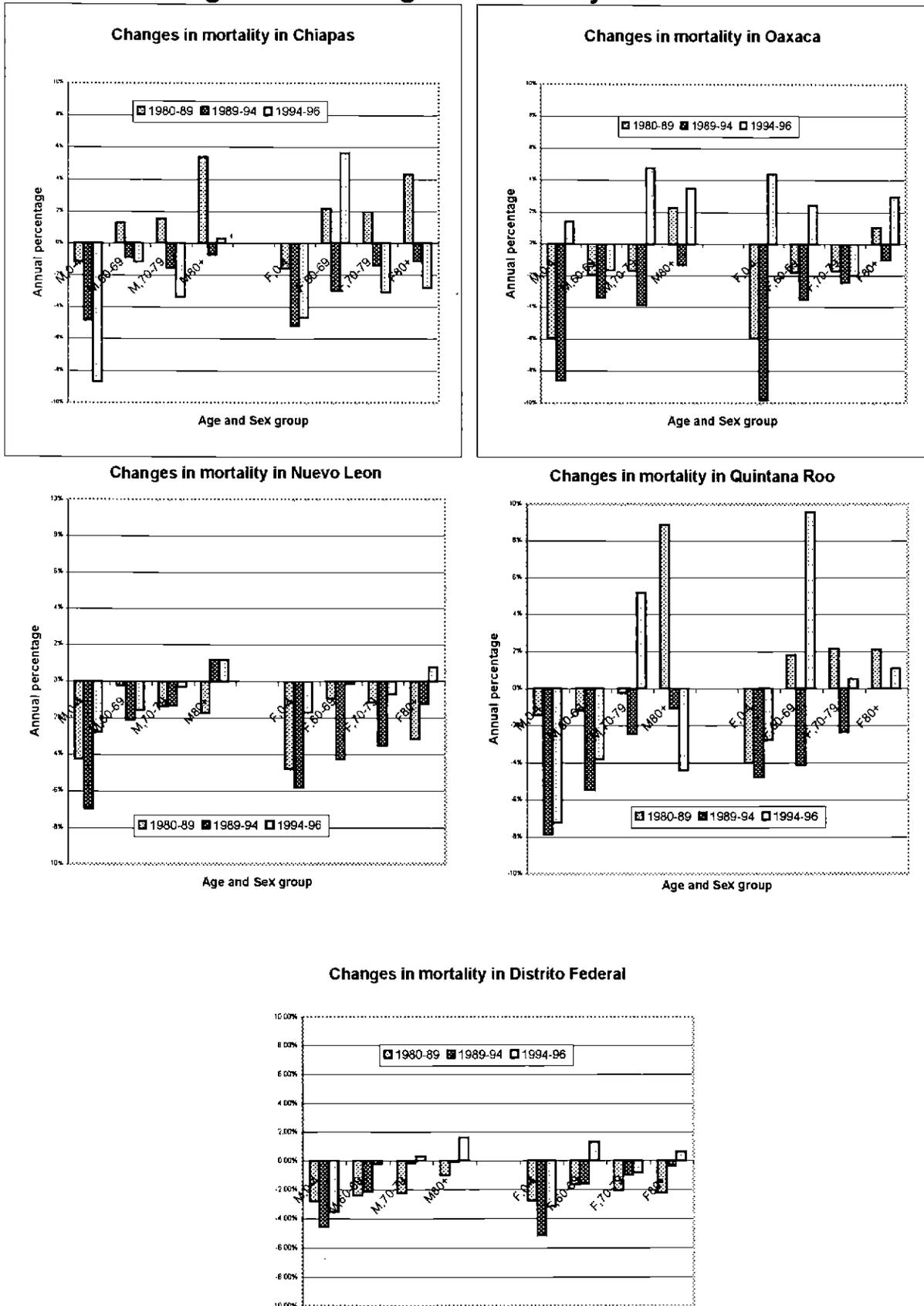
Source: Mexican Health Fundation based on Secretariat of Health and CONAPO.

Figure 6.1: Public Sector* Health Expenditure, 1990-1997
Pesos per capita and % of GDP

Legend:
- per capita health $
- % of GDP

% Change Yr2-	+14.7%	+4.7%	+7.1%	+6.2%	-10.5%	-4.3%	+12.0%
		+4.7%	+7.2%	+2.3%	-4.9%	-4.8%	+4.7%

Per capita health $ values: 4.4, 5.0, 5.3, 5.7, 6.0, 5.4, 5.1, 5.8

% of GDP values: 3.3, 3.4, 3.7, 3.8, 3.6, 3.4, 3.7

Public Sector* Per Capita Health Expenditure (constant 1994 pesos, *100)

% GDP

Year: 1990 1991 1992 1993 1994 1995 1996 1997
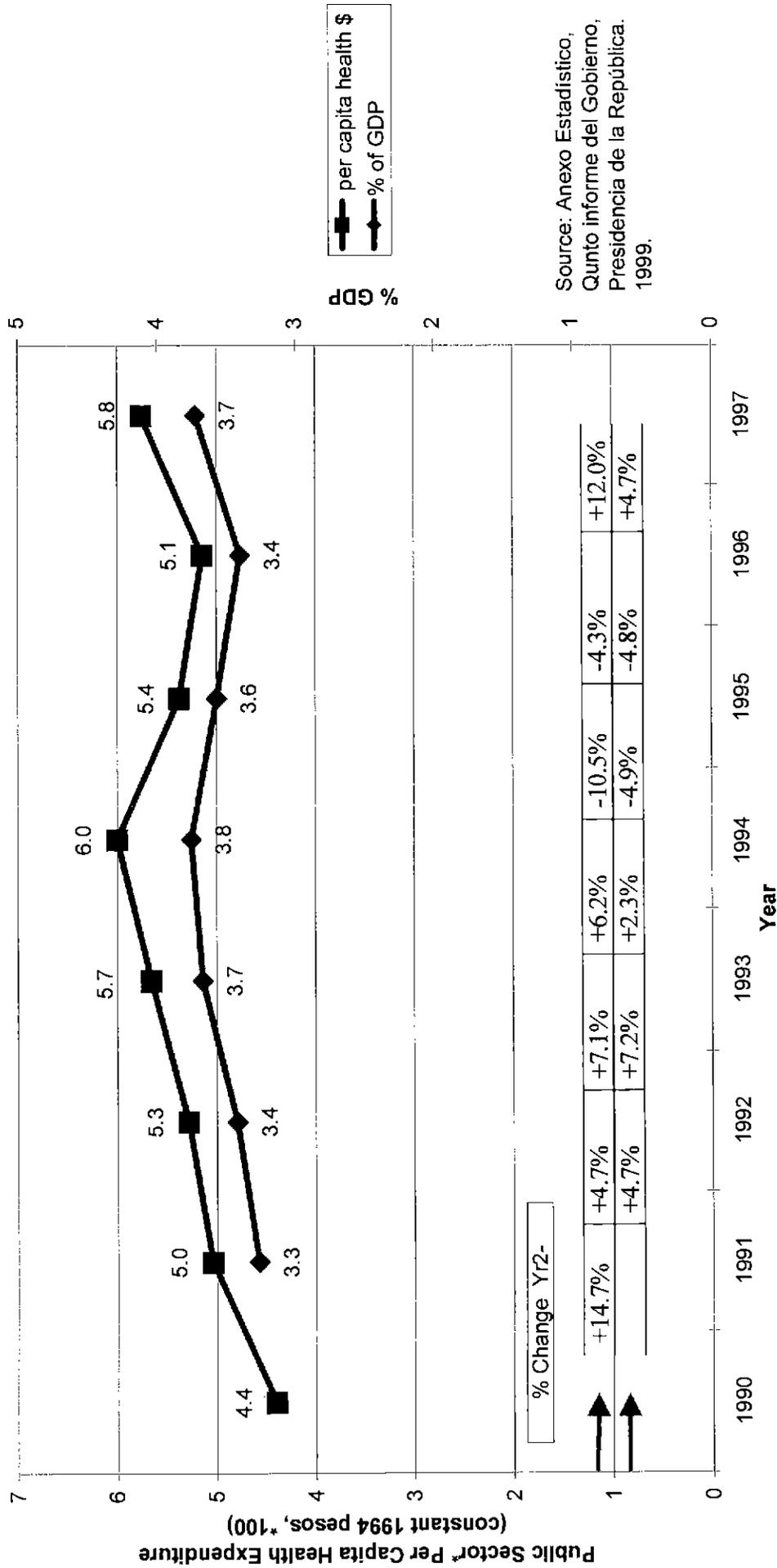
Source: Anexo Estadistico, Qunto informe del Gobierno, Presidencia de la República. 1999.

* Public sector corresponds to the National Health System (Sistema Nacional de Salud) which includes the Ministry of Health (Secretaria de Salud) and social security.

Figure 6.2 Annual average expenditure by household in
ambulatory care.
Mexico, 1994, 1996
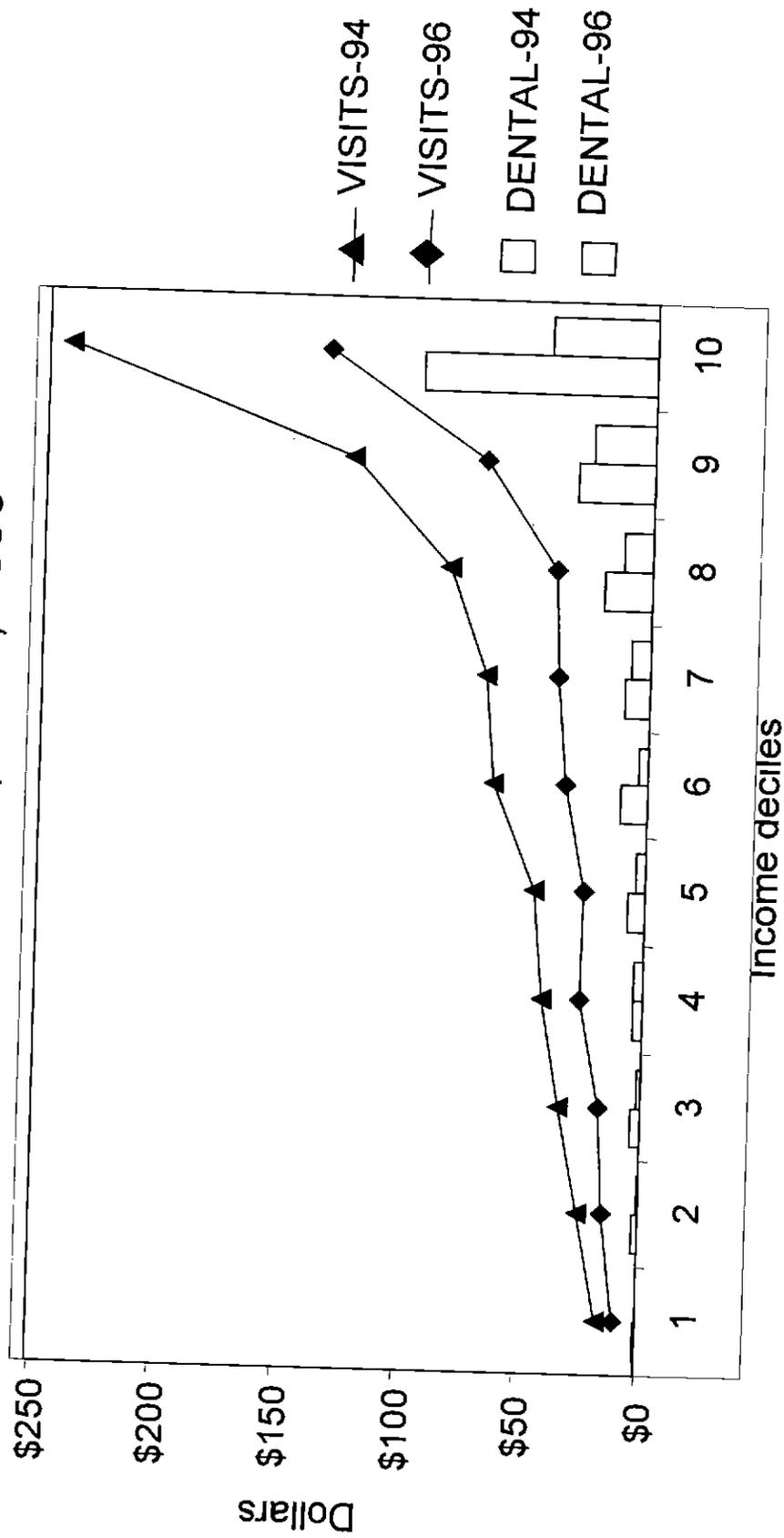
VISITS-94
VISITS-96
DENTAL-94
DENTAL-96

Dollars

$250
$200
$150
$100
$50
$0

1   2   3   4   5   6   7   8   9   10

Income deciles

Figure 6.3: Average Total Real Health Expenditure and Percent Change by Expenditure Tertile and Family Type for Years 1992, 1994 and 1996
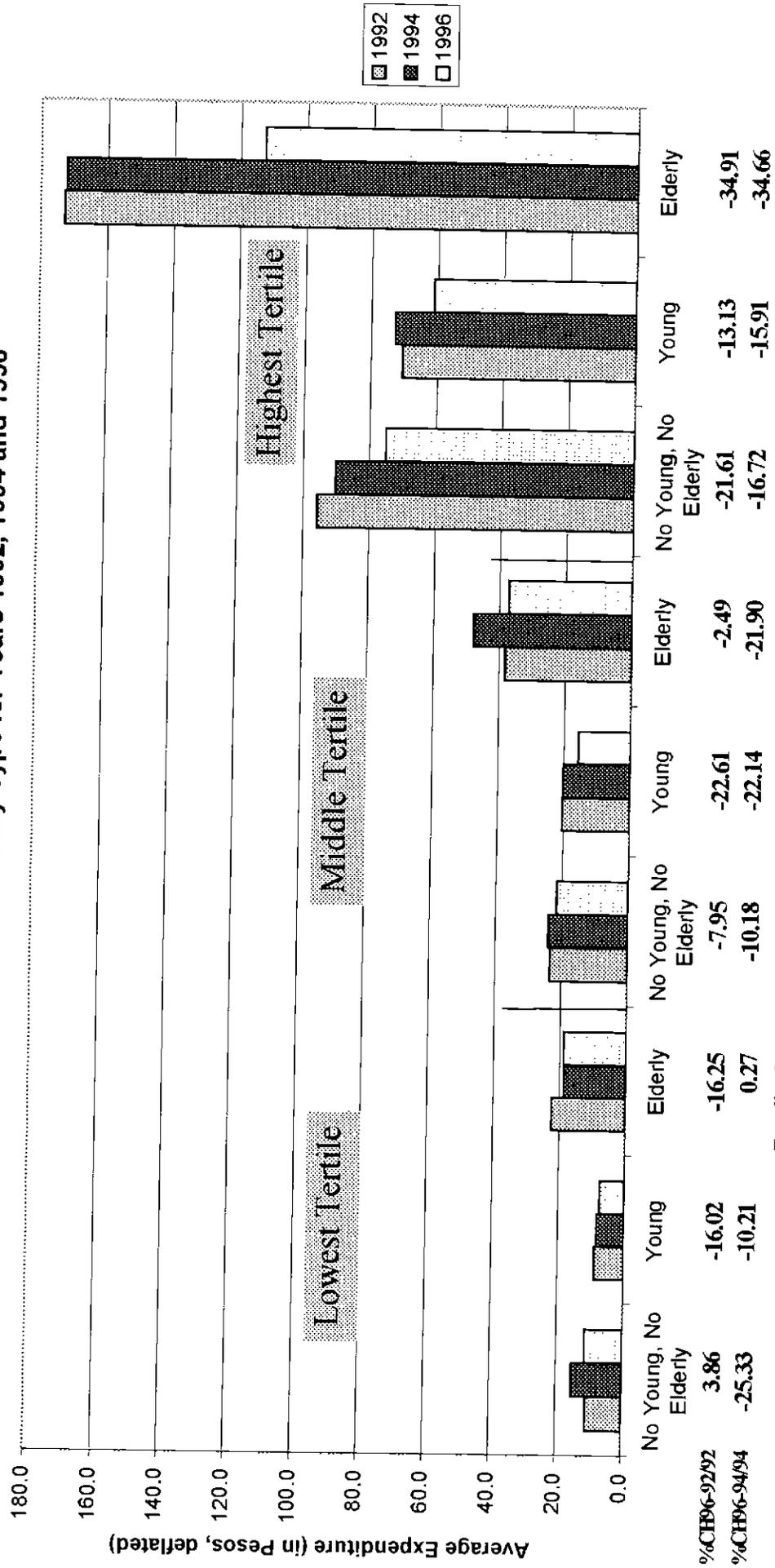
Source: INEGI. Encuesta Nacional Ingreso y Gasto de los Hogares. Mexico

Table 5.1
Annual Change in Mortality by Age and Sex

All						
	1980-82	1982-84	1984-85	1985-89	1989-94	1994-96
Total	-4.8%	-2.5%	-1.5%	-1.6%	-2.1%	0.3%

Men						
Age Group	1980-82	1982-84	1984-85	1985-89	1989-94	1994-96
Total	-4.4%	-3.3%	-1.7%	-1.5%	-2.1%	-0.2%
0-4	-8.9	-3.8	-7.0	-1.1	-7.0	-2.9
5-14	-7.8	-5.3	-1.3	-3.3	-7.3	-1.0
15-29	-2.5	-9.3	-1.7	-3.4	-2.2	-3.8
30-44	-3.2	-6.9	0.2	-4.5	-1.8	-4.6
45-59	-3.1	-4.2	-0.8	-2.3	-1.8	-2.3
60-69	-3.4	-1.4	1.1	-1.3	-2.3	-0.5
70-79	-2.2	0.2	-1.9	-1.3	-2.2	1.2
80+	-0.1	3.1	2.3	-0.2	-0.3	3.1

Women						
Age Group	1980-82	1982-84	1984-85	1985-89	1989-94	1994-96
Total	-5.4%	-1.4%	-1.2%	-1.7%	-2.1%	0.9%
0-4	-9.2	-3.0	-7.1	-1.9	-7.2	-3.1
5-14	-10.1	-4.9	0.8	-2.3	-7.1	-0.1
15-29	-5.8	-7.2	-1.6	-5.2	-4.0	-2.6
30-44	-6.4	-5.5	0.4	-5.1	-3.2	-4.0
45-59	-2.7	-1.9	-0.5	-2.6	-1.7	-1.1
60-69	-4.0	-0.9	-0.1	-1.3	-1.4	0.7
70-79	-2.9	0.6	0.5	-1.9	-2.6	0.6
80+	-2.3	3.0	2.4	-1.3	-0.9	1.8

Source: Mexican Health Foundation based on Secretariat of Health and CONAPO.

Table 5.2

Differences-in-Differences Estimates of the

Effect of Economic Crisis on Mortality

	1982-84 Crisis			1986-89 Crisis			1995-96 Crisis		
	Pre-Crisis	Crisis		Pre-Crisis	Crisis		Pre-Crisis	Crisis	
Age Group	1980-82	1982-84	Diff-in-diff	1984-1985	1985-1989	Diff-in-diff	1989-94	1994-96	Diff-in-diff
Affected (M&F)									
0-4	-9.0%	-3.5%	9.2%	-7.1%	-1.5%	10.3%	-7.1%	-3.0%	6.9%
60-69	-3.7	-1.2	6.2	0.5	-1.3	2.9	-1.9	0.0	4.7
70-79	-2.6	0.4	6.7	-0.8	-1.6	3.9	-2.4	0.9	6.1
80+	-1.4	3.0	8.1	2.3	-0.8	1.6	-0.7	2.3	5.8
Unaffected									
Male, 30-44	-3.2	-6.9	---	0.2	-4.5	---	-1.8	-4.6	---

Table 6.1: Means of Dependent Variables
By state and year

Variables	YEAR			
	1991	1993	1995	1996
Male Labor Force Participation Rate (18-64)	91.49	90.97	89.92	89.48
Female Labor Force Participation Rate (18-64)	36.83	40.78	43.21	43.20
Elderly Labor Force Participation Rate (65+)	31.76	32.77	28.68	27.63
Child and Youth Labor Force Participation Rate (12-17)	27.83	29.80	27.34	23.45
Doctors employed in the public sector per capita (*100)	1.15	1.18	1.25	1.27
Nurses employed in the public sector per capita (*100)	1.66	1.68	1.76	1.77
Public Clinics (consulta externa) per capita (*100)	0.19	0.18	0.19	0.20
Public Hospitals (Total units-clinics) per capita (*1000)	0.114	0.112	0.112	0.110
Illiteracy rate, by state * dummy if year=1995 or year=1996	0	0	12.15	12.15
Proportion of economically active women (18-85) in families with an elderly member (65+)	0.65	0.69	0.80	0.69
Proportion of economically active women (18-85) in families without an elderly member (65+)	0.43	0.48	0.60	0.51

Notes: 1/ Figures calculated without expansion factors.

2/ Most cells include one observation for each state for a total of 32 observations in each year.

Observations for the employment variables are missing for one state in 1991 and 1993.

Table 6.2: Regressions on Age-Specific Mortality by State, 1991, 1993, 1995 and 1996

(coefficient in bold; t-statistic below)

Age Group	ln(Physicians per capita)	Labor Force Participation (*100)				Illiteracy (*100)	Summary Statistics	
		Elderly 65+	Women 18-65	Youth 12-17	Men 18-65		R2	N
0-4	**-0.25**	**-0.09**	**0.29**	**0.07**	**0.33**	**0.43**	0.98	124
	-1.54	-0.86	1.79	0.37	0.79	2.07		
5-14	**0.38**	**0.19**	**0.41**	**-0.16**	**0.49**	**-0.36**	0.85	124
	1.69	1.32	1.87	-0.63	0.87	-1.27		
15-29: Women	**-0.21**	**0.10**	**0.31**	**0.02**	**-0.27**	**-0.10**	0.88	124
	-0.92	0.66	1.43	0.07	-0.48	-0.36		
Men	**0.01**	**-0.14**	**-0.05**	**-0.02**	**-0.28**	**-0.07**	0.91	124
	0.03	-1.11	-0.28	-0.10	-0.60	-0.29		
30-44: Women	**-0.38**	**-0.11**	**0.13**	**0.02**	**-0.20**	**0.18**	0.92	124
	-2.55	-1.15	0.90	0.10	-0.53	0.97		
Men	**-0.12**	**-0.08**	**0.18**	**0.10**	**-0.27**	**0.17**	0.92	124
	-0.80	-0.77	1.18	0.59	-0.68	0.91		
45-59	**0.00**	**0.00**	**0.19**	**0.04**	**0.04**	**0.03**	0.93	124
	0.03	0.05	2.27	0.40	0.20	0.28		
60-69	**-0.05**	**0.22**	**0.13**	**-0.08**	**-0.21**	**0.49**	0.95	124
	-0.69	4.29	1.74	-0.96	-1.07	5.03		
70-79	**-0.01**	**0.03**	**0.11**	**0.01**	**-0.11**	**0.08**	0.95	124
	-0.16	0.51	1.36	0.14	-0.52	0.82		
80+	**0.05**	**0.07**	**0.16**	**-0.04**	**-0.25**	**-0.20**	0.94	124
	0.58	1.24	1.81	-0.44	-1.10	-1.84		

Note: 1/ All regressions include state and year dummy variables (not reported).

Table 6.3: Regressions on Age-specific Mortality Dividing Female LFP by Whether Family includes Elderly by State, 1991, 1993, 1995, 1996

(coefficient in bold; t-statistic below)

Age Group (Years)	ln(Physicians per capita)	Elderly 65+	Labor Force Participation (*100)				Illiteracy (*100)	Summary Statistics	
			Women 18-65		Youth 12-17	Men 18-65		R²	N
			Families without elderly	Families with elderly					
0-4	**-0.24**	**-0.07**	**8.66**	**-7.57**	**0.08**	**0.21**	**0.44**	**0.98**	124
	-1.42	-0.62	0.76	-0.71	0.41	0.48	2.08		
5-14	**0.39**	**0.23**	**23.20**	**-9.72**	**-0.14**	**0.41**	**-0.34**	**0.85**	124
	1.72	1.52	1.51	-0.68	-0.54	0.70	-1.18		
15-29: Women	**-0.20**	**0.12**	**18.87**	**-2.41**	**0.04**	**-0.31**	**-0.08**	**0.88**	124
	-0.88	0.78	1.23	-0.17	0.16	-0.53	-0.30		
Men	**0.01**	**-0.14**	**-4.61**	**-0.34**	**-0.03**	**-0.29**	**-0.07**	**0.91**	124
	0.03	-1.12	-0.37	-0.03	-0.13	-0.62	-0.31		
30-44: Women	**-0.38**	**-0.10**	**12.54**	**-4.83**	**0.02**	**-0.20**	**0.19**	**0.92**	124
	-2.56	-1.04	1.24	-0.51	0.14	-0.52	1.02		
Men	**-0.12**	**-0.08**	**10.96**	**8.82**	**0.13**	**-0.23**	**0.19**	**0.93**	124
	-0.78	-0.78	1.06	0.91	0.76	-0.58	0.97		
45-59	**0.01**	**0.01**	**0.12**	**1.72**	**0.06**	**0.05**	**0.04**	**0.93**	124
	0.07	0.19	2.12	0.31	0.61	0.22	0.38		
60-69	**-0.04**	**0.23**	**0.02**	**-0.31**	**-0.07**	**-0.27**	**0.49**	**0.94**	124
	-0.57	4.35	0.37	-0.06	-0.83	-1.33	4.96		
70-79	**-0.01**	**0.03**	**0.08**	**4.36**	**0.03**	**-0.08**	**0.09**	**0.95**	124
	-0.16	0.53	1.45	0.85	0.33	-0.39	0.89		
80+	**0.05**	**0.09**	**0.13**	**-5.54**	**-0.04**	**-0.26**	**-0.19**	**0.94**	124
	0.58	1.48	2.09	-0.99	-0.38	-1.17	-1.74		

Note: 1/ All regressions include state and year dummy variables (not reported).