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THE EFFECTS OF POPULATION AGING ON HEALTH CARE UTILIZATION AND COSTS FOR THE CENTRO DE ASISTENCIA DEL SINDICATO MEDICO DEL URUGUAY (CASMU)

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ABSTRACT

This paper estimates the effects of population aging on costs and utilization of hospital services. In particular, it focuses on expected changes over the next two decades for a single Uruguayan health care organization, the Centro de Asistencia del Sindicato Medico del Uruguay (CASMU).

Using baseline data from 1991, utilization and average cost figures are calculated for three illness categories: all diagnoses, neoplasms, and cerebro/cardiovascular diseases. Four different projections of the CASMU population are made for the years 2000 and 2010. These projections incorporate different assumptions about the speed of the aging of the population and the size of the CASMU membership. Combining the baseline data with the four projections, it is possible to estimate the effects of aging on costs and utilization. These results are available for the CASMU population as a whole, and for specific age and sex categories.

One of the primary objectives of the study was to discern the costs of the demographic and epidemiologic transitions occurring in many developing countries. Since that aging process has already occurred to a large extent in Uruguay (with more than 10 percent of the population aged 65 and over), this study went beyond simply forecasting changes for the next two decades. The paper includes the development of an indicator of how costs may change as the proportion of elderly in the population changes. This indicator, termed an age elasticity of cost, is estimated for each of the four projections, using varying assumptions and time periods.

In addition to providing guidance to CASMU policymakers in planning for the future, this study provides insight into where costs increases will come from, and the opportunity to develop cost-effective policy responses. The study also demonstrates the feasibility of estimating the impact of aging on costs of health care services, with limited time and data.

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PREFACE

The idea for this project was developed about two years ago in discussions between the USAID Office of Health and Dr. Alfredo Solari, then-Minister of Public Health of the Republic of Uruguay. Originally the study was to be a collaborative effort involving staff of the Ministry of Public Health, the U.S. Bureau of the Census, the U.S. National Institute on Aging, and the Pan American Health Organization. For a variety of reasons, the research never got under way. The idea was revived in early 1992 when Dr. Felix Rigoli proposed to the Office of Health that data from the health care organization of which he was Director, the Centro de Asistencia del Sindicato Medico del Uruguay (CASMU), would be appropriate for examining the effects of population aging on health care costs. A.I.D. funds were allocated to Abt Associates Inc., under the Health Financing and Sustainability (HFS) Project, to support the research. In May of 1992, Dr. Michael Micklin, an international development consultant, was contracted to lead the effort. Subsequently, Mr. Steve Heinig of the HFS staff was assigned to assist Dr. Micklin with the work.

The scope of the study was reduced and altered from that originally intended. The data used pertain to a single health care organization, though the acquisition of comparable information from other Uruguayan health care institutions has been initiated. The methodology was developed in the field, after determining the availability and format of relevant indicators. Finally, emphasis was placed on determining the empirical effects of population aging on health care costs rather than on policy strategies related to health care finance. Additional analyses, however, were carried out by a health economist on the HFS Project, Ms. Holly Wong, to examine the economic and financing impact of the demographic changes, and to discuss policy implications for other countries facing epidemiologic and demographic transitions.

Dr. Micklin and Mr. Heinig conducted all of the field work in Uruguay. Dr. Micklin developed all of the demographic projections, estimated costs under Projections A and B, and was the primary author of Sections 1, 3, and 4. Ms. Wong estimated costs under Projections C and D (using Dr. Micklin's methodology and data estimates), carried out similar analyses for alternative time periods, and developed the age elasticities. She was the primary author for Sections 2, 5, and 6. All three authors contributed to sections for which they were not the primary author.

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EXECUTIVE SUMMARY

RESEARCH OBJECTIVES

As the world population ages, many developing countries are now faced with undergoing an epidemiologic and demographic transition. As a result of this process, patterns of diseases are changing and, thus, patterns of utilization of health care services are shifting. The purpose of this study was to estimate the effects of population aging on costs and utilization of hospital services. In particular, this analysis focused on the effects of population aging over the next two decades on selected costs for a single Uruguayan health care organization, the *Centro de Asistencia del Sindicato Medico del Uruguay* (CASMU).

Four specific objectives of this study were as follows:

(1) Identify expected changes in the age and sex composition of the membership of a specific Uruguayan health care organization over the next couple of decades.

(2) Estimate the effects of these changes on the utilization of overall hospital services and, specifically, those for cerebro/cardiovascular disease and tumors over this same period.

(3) Estimate the effects of changes in utilization on health care costs by age category, sex, and diagnosis.

(4) Suggest the implications of the results for the organization's health care programs and policies, particularly in the area of financing, as well as the effects of population aging on health care costs that may be expected by developing countries undergoing demographic and epidemiologic transition.

METHODOLOGY

The methodology for this study was developed during a two-week visit to Uruguay in June 1992, based on information available from CASMU. Data files include information on each hospitalized patient's age, sex, diagnosis, symptoms, surgical procedures, diagnostic tests, duration of hospitalization, and condition upon termination of treatment. These files were analyzed in conjunction with annual aggregate expenditure data for CASMU.

As used in this analysis, the term "costs" refers to expenditures or payments made by CASMU for hospital care on behalf of its beneficiaries. In order to isolate the effects of aging on costs, this study assumed that average costs calculated for the 1991 time period would remain constant over the next two decades. Thus, factors such as technology, mix of inputs, competition, and economies of scale were assumed to be held constant.

The term "utilization", as used in this study, refers to the amount of hospital services consumed by CASMU beneficiaries during a one year period. To isolate the effects of aging on utilization, this study assumed that the rate of utilization of hospital services by CASMU beneficiaries would remain constant,

within age and gender groups, for each of the illness categories under analysis. In this case, factors such as epidemiology, prices, and availability of services were also assumed to be held constant.

Using data from 1991 as a baseline for this study, utilization and average cost figures were calculated for three illness categories: all diagnoses, neoplasms, and cerebro/cardiovascular diseases. Four different projections of the CASMU population were made, for the years 2000 and 2010. Projections A and B assumed that the size of CASMU membership would remain constant, and Projections C and D allowed for growth in membership, in line with population growth. Projections A and C were based on official projections of demographic change (slower aging), and Projections B and D used revised projections (rapid aging). Each of these projections was made for CASMU membership as a whole, as well as for disaggregated age and gender groups.

To estimate the effects of aging on costs and utilization in the future, the baseline data from 1991 were combined with results of the four projections. Rates of hospitalization, average lengths of stay, and average costs per bed day were applied to the age and sex breakdowns under the four projections in order to estimate costs and utilization.

With these results, it was then possible to determine changes in cost and utilization in the years 2000 and 2010, for the CASMU population as a whole, as well as within specific age and sex categories. Furthermore, this analysis examined changes in cost per capita and per working age member of CASMU. Finally, in order to be able to apply results from this study to developing countries at different stages of the demographic transition than Uruguay, age elasticities of cost were developed to measure the change in costs associated with changes in the proportion of elderly in the population at large.

BACKGROUND INFORMATION

Uruguay currently has a population of approximately 3.1 million inhabitants, with an average annual growth rate of about 0.6 percent. The population is and has been concentrated in urban locations, with more than 85 percent in urban areas in 1985.

In 1989, Uruguay's per capita GNP was $2,620, with an average annual growth rate of 1.2 percent over the previous 25-year period. High rates of inflation have plagued the economy in recent years, peaking at 113 percent in 1989. A series of current devaluations have driven the official exchange rate from 10.8 New Pesos (N$) per U.S. dollar in 1981 to N$1,171 in 1990.

Government expenditures on health care have fluctuated widely during the past decades. In 1985, per capita health expenditure was $23.95, representing five percent of overall government expenditures.

As of 1992, CASMU included a total of 265,285 members, with slightly over half of that membership represented by women. During that year, 15.6 percent of the membership was aged 65 and over. In comparison with the overall Uruguayan population, CASMU members are more concentrated in the 45 and older age groups.

Hospitalization costs for CASMU members were determined for three illness categories, using 1991 data: all diagnoses, neoplasms, and cerebro-cardiovascular diseases. Average bed-day costs were estimated by combining total expenditure figures with utilization data. These figures were then combined with utilization data, broken down by age and sex, to determine costs of hospitalization as a whole, and for various age groups.

Based on current data, persons under 45 years of age account for a disproportionately small share of hospital costs, particularly for treatment of neoplasms and cerebro/cardiovascular disease. The costs of treating persons 65 and older were found to be at least twice the proportionate population distribution, with that ratio reaching five to seven times for those over 75 in the case of cerebro/cardiovascular disease.

PROJECTIONS OF COSTS OF HOSPITALIZATION

The effects of population aging on hospitalization costs were measured for each of four alternative scenarios. Between 1991 and 2000, costs for all diagnoses were estimated to increase between 1.8 and 10.3 percent, increasing with the assumed pace of aging and size of CASMU membership. Similar increases were found for neoplasms and cerebro/cardiovascular diseases, although rates were higher (e.g., 4.0 to 21.4 percent for the latter category). During the second decade under study, cost increases would decline slightly. In the case of all diagnoses, the increase in costs estimated ranged from 0.2 to 10.0 percent.

It was important to examine cost increases on a per capita basis, as two of the projections included increases due simply to growth in membership. In this manner, the cost of hospitalization per capita, for all diagnoses, was expected to increase by 1.8 to 3.9 percent by the year 2000; by the end of the following decade, the cumulative increase would be from 2.0 to 6.2 percent.

It was also relevant to consider the cost of hospitalization per working age member (15-64) for financing purposes. Total costs per working age member would increase by 1.1 to 5.1 percent by the year 2000. By the year 2010, under rapid aging assumptions, costs would increase by 7.6 percent. Under the slower aging assumptions, however, costs per working age member would actually decrease during the two-decade period.

One of the primary objectives of this study was to discern the costs of the demographic and epidemiologic transitions occurring in many developing countries. To a large extent, that aging process has already occurred in Uruguay, which already has more than 10 percent of its population aged 65 and over. Moreover, CASMU's membership reflects an even older age distribution, with 15.6 percent of the membership in the elderly age groups. As a result, these projections may not reflect the aging process most developing countries will go through, since Uruguay's population is already aged. With that in mind, additional analyses were conducted in order to extract conclusions relevant for other country settings.

Data from this analysis were used to develop an indicator of how costs may change as the proportion of elderly in the population changes. This indicator, an age elasticity of cost, was estimated for each of the four projections, over

ten and twenty year periods. The results ranged from 0.18 to 0.38, with most of the estimates clustered at about 0.25. This figure can be interpreted as follows: for every 10 percent increase in the proportion of the population that is elderly, there would be a 2.5 percent increase in costs of hospitalization per capita.

CONCLUSIONS AND RECOMMENDATIONS

The results from this study provide guidance to CASMU policymakers in planning for the future. For example, the cost of all hospitalizations per working age member of CASMU is expected to increase by one to five percent by the year 2000. In order to finance these increased costs, CASMU may wish to consider raising existing premiums and/or co-payments, so that the current working age population will be financing its own use of services in the future. CASMU could also consider other options for financing the increase in costs likely to occur from aging (e.g., seeking government general revenues to cover the costs of the retired population).

The results from this study also provide CASMU with insight into where the increase in costs comes from, and the opportunity to do more than simply seek ways to cover those increases. The detailed tables demonstrate the extent to which the elderly account for increased costs, particularly for neoplasms and cerebro/cardiovascular diseases. Because of the disproportionate burden of these diseases on overall costs, CASMU might consider specific interventions to forestall some of those cost increases. Preventive efforts, particularly through health education measures, could be useful and cost-effective policy responses.

It would also be useful for CASMU to conduct further analyses based on the data and methodology used in this study. Alternative assumptions regarding hospitalization rates, lengths of stay, and average costs could be used to simulate different utilization and cost scenarios.

Although focused on one organization within Uruguay, this study also provides useful results for other countries facing an epidemiologic and demographic transition in the coming decades. First, the methodology used in this study proved to be a feasible means of estimating, with limited time and data, the impact of aging on costs of health care services. Carrying out similar studies in other countries will also provide a broad base of results, from which comparative analyses can be done.

Second, although Uruguay's pace of aging may differ sharply from that of other developing countries, the age elasticities of cost developed allow policymakers elsewhere to apply this study's results to their own situations. Thus, for countries such as Bolivia or Brazil, with elderly populations of less than five percent of the total, some guidance on what to expect in the coming decades is possible. At the same time, it would be useful to carry out similar analyses in other countries, in order to test the robustness of the estimates of the age elasticities.

1.0 STATEMENT OF THE PROBLEM

1.1 RESEARCH OBJECTIVES

This study addresses some of the health issues related to population aging in the context of a single developing nation, the Republic of Uruguay. The principal objective is to estimate the effects of population aging over the next two decades on selected costs for a single Uruguayan health care organization, the *Centro de Asistencia del Sindicato Medico del Uruguay (CASMU)*. The study has narrowly focused its scope and effort in order to demonstrate an expedient method for researching demographic impacts on the costs of health care. This study can supplement the conclusions of more exhaustive case studies undertaken elsewhere.[1] The specific objectives of this research are to:

- Identify expected changes in the age and sex composition of the membership of a specific Uruguayan health care organization over the next two decades.
- Estimate the effects of these changes on the utilization of overall hospital services, and specifically those for cerebro/cardiovascular disease and tumors over this same period.
- Estimate the effects of changes in utilization on health care costs by age category, sex, and diagnosis.
- Suggest the implications of the results for the organization's health care programs and policies, particularly in the area of financing, as well as the effects of population aging on health care costs that may be expected by developing countries undergoing demographic and epidemiologic transition.

The design adapted for this study permits answers to questions not usually addressed in comparable research (cf. Knodel et al., 1992). First, the age distribution of the study population is differentiated into a number of functional categories. Of particular utility is the disaggregation of the elderly population into four age groups, thus permitting comparison of demographic change and health care costs between the younger-old and older-old. Second, separate analyses are conducted for each sex and for the population as a whole, thus permitting assessment of the effects of sex differentials on health care costs for varying age categories. Finally, in addition to estimates for all categories of illness treated by the health care organization selected for study, two chronic diseases that constitute the leading causes of death for the elderly, cerebro/cardiovascular disease and tumors, are examined separately. The data that are available can be subjected usefully to additional analysis, particularly

[1] USAID and the U.S. Bureau of the Census have sponsored three additional case studies on the economic impact of population aging on less-developed countries' (LDC) health sectors: "Case Study of Costa Rica," by E. Chaney, L. Sennott-Miller, and J. Miller, University of Iowa; "Aging and Health in Jamaica," by P. Gertler, J. Strauss, D. Ashley, and K. Fox, RAND and Ministry of Health, Jamaica; and "The Impact of Population Aging on Health Care Costs and Services, Lesotho as a Case Study," by W. Bicknell, N. Moji, C. Parks, and I. Meszoely, Boston University.

under varying assumptions about the prevalence of disease categories and the length of hospital stay.

The remaining sections of Chapter 1 describe the demographic context for this study, including the global pattern of population aging, and how this pattern conceptually relates to utilization and financing of health care services. Chapter 2 describes the methodology of this research. Chapter 3 describes demographic projections and the health care system of Uruguay. Chapter 4 presents the CASMU data, including population projections and cost estimates. Chapter 5 includes cost projections and a discussion of the applicability of these results to other countries and situations. Chapter 6 provides conclusions and recommendations for further analysis. The Appendix provides detailed tables and projections of population aging and cost impacts.

1.2 WORLD POPULATION AGING

Over the past several decades, the age structure of the human population has changed, though not dramatically (United Nations, 1985; Torrey et al., 1987). In 1950, approximately 34.5 percent of humankind was under 15 years of age, while only about 5.1 percent was age 65 or older. By 1985, these figures were estimated to be 33.5 percent and 6.0 percent, respectively. Over this period, the median age of the population fluctuated slightly, but was 23.4 years at the beginning and end of the interval (United Nations, 1991c: Table 46).

The process of population aging is expected to continue at an increased rate. United Nations medium variant projections indicate that, by the year 2000, the proportion of population under 15 years of age will have decreased to 31.4 percent, while the 65 and over population will have increased to 6.8 percent. Projections for the year 2025 show these proportions to be 24.5 percent and 9.7 percent, respectively. The median age at the turn of the century is expected to be 25.9 years, and to increase to 31.1 years over the next 25 years (United Nations, 1991c: Table 46).

In short, the age distribution of the human population is shifting, with a declining proportion of children and an increasing proportion of elderly, and this trend is expected to continue through at least the year 2150 (United Nations, 1992: Table 5). (The "elderly" population is typically defined as either those 60 years of age and older or those 65 years of age and older.) Moreover, the proportion aged 65 and over is expected to surpass that under 15 around 2075.

The policy implications of this pattern of change in population age structure are numerous; older people have different preferences and needs than do the young, and private and public sector policies will have to shift accordingly. It is important to note that policy adaptations must take into account not only the shifting age distribution of the population, but also the absolute increase in numbers of people at different ages. Consider that between 1985 and 2000 the global number of persons under age 15 is likely to increase by 342 million (21 percent), while the number aged 65 and older is expected to grow by 134.5 million (46 percent). For the period 2000-2025, the comparable figures are 118.3 million (6 percent) and 403.6 million (95 percent), respectively (United Nations, 1991b). In total, the world is expected to have nearly 425 million persons aged 65 or over in the year 2000, and around 828 million by 2025.

The growth of the elderly population is not, of course, distributed equally around the world. It differs, proportionally and absolutely, among countries and geopolitical regions and, most significantly, according to levels of socioeconomic development. In the more developed regions, the proportion of population aged 65 or older was estimated to be 11.5 percent in 1985, and is expected to increase to 13.7 percent in 2000 and 19.0 percent by 2025. In contrast, the less developed regions had only 4.2 percent of their population aged 65 or more in 1985, and this figure is expected to reach only 5.0 percent in 2000 and 8.0 percent in 2025 (United Nations, 1991c: Table 46).

Contrary to what might be concluded, potential problems of population aging are not confined primarily to the more developed nations. One need only recall that in 1985 the developing countries accounted for 76 percent of the global population, and medium variant projections indicate that this figure will increase to 80 percent by the turn of the century and 84 percent by 2025 (United Nations, 1991c: Table 46). Long-range (medium variant) projections indicate that the less developed nations could hold 90 percent of the world's people by 2150 (United Nations, 1992: Table 9). Moreover, both the rate of increase of the elderly population in less developed countries and the absolute numbers involved suggest the critical importance of this phenomenon for LDC (less developed country) governments. For example, between 1985 and 2000, the number of LDC residents aged 65 or more is expected to increase by 96 million (62 percent), while for the period 2000-2025, the net increase is projected to be 319 million (127 percent) (United Nations, 1991b). By the year 2000, the LDCs will have a total of nearly 252 million persons aged 65 or older, and this figure is likely to be just over 571 million by 2025.

1.3 IMPACT OF POPULATION AGING ON UTILIZATION OF HEALTH CARE SERVICES

A concise indicator of the changes and challenges generated by population aging is the dependency ratio, i.e., the ratio of persons aged 0-14 (youth dependency), 65 and older (old-age dependency), or 0-14 plus 65 and older (total dependency) to persons in the so-called "working ages" (15-64). (These ratios are typically multiplied by 1,000 so the indicator can be expressed as a whole number.) For the developing countries as a whole, medium variant projections show a steady decline in both total and youth dependency ratios over the period 1985-2025, from 70.5 to 51.0 for the former and from 63.3 to 38.9 for the latter (United Nations, 1991: Table 46). The old-age dependency ratio, however, is expected to rise from 7.2 in 1985 to 12.1 in 2025. Stated otherwise, while the total dependency ratio will, according to this projection, drop by nearly 28 percent and the youth dependency ratio by about 38 percent, the old-age measure will increase by 68 percent. A recent United Nations study argues that "Because older dependents lay claim to more public resources than do young dependents, the weight of the 'old' component of the total dependency ratio has great economic significance" (United Nations, 1985: 46). Viewed in terms of the absolute increase figures reported earlier, this statement suggests that LDC governments must respond to the varied needs of an additional 96 million elderly between 1985 and 2000 and another 319 million elderly during the next quarter-century. While the capacity of older persons to meet their requirements for income, shelter, and health care, among others, varies considerably among developing nations, there is little doubt that this pattern of age structure change is likely to impose

serious strains on the financial, human, and institutional resources available in most, if not all, of these societies (see Neysmith and Edwards, 1984; United Nations, 1985, 1991a; Mesa-Lago, 1989a, 1991a, 1991b; Tout, 1989; Neysmith, 1990).

Predictions of the health and policy impacts augured by these demographic projections are far more conjectural than the projections themselves. If the dependency level increases with the aging population, society will need to produce higher levels of health services per working individual, assuming the patterns of disease, employment, and all other things remain constant. But such patterns are not expected to remain constant. As the age distribution of a population shifts upward, both the relative and absolute numbers of persons at risk of suffering chronic, degenerative diseases increase and the need for specific types of health care changes accordingly. This change in pattern of incidence and prevalence of affliction is determined in part by epidemiologic transition.

The theory of epidemiologic transition "...focuses on the complex change in patterns of health and disease *and* on the interactions between these patterns and their demographic, economic, and sociologic determinants and consequences" (Omran, 1971: 510). Substantively, epidemiologic transition refers to the long-term shift in mortality and disease patterns whereby pandemics of infection are gradually displaced by degenerative and human-produced diseases as the chief form of mortality and primary cause of death (Omran, 1971: 516; also see Rogers and Hackenberg, 1987; Mosley and Cowley, 1991: 28-31; Pol and Thomas, 1992: 21-29). Demographic correlates of this transition typically include declines in fertility and mortality, increased life expectancy, and population aging. While improvements in social and economic conditions clearly facilitate the epidemiologic transition, they are increasingly unlikely to be necessary for it to occur, at least in its early stages. Advances in sanitation, primary health care, and nutrition in even the poorest LDCs are now possible, often through external assistance, without corresponding gains in education, social equality, economic performance, and other indicators of the development status of the society as a whole.

Evidence of the epidemiologic transition is seen in changing patterns of incidence and prevalence of disease and causes of death. In pre-transition developing societies, acute conditions and communicable diseases constitute the principal health problems. There is an absence of wide variations in age and gender-specific death rates. As the transition proceeds, due to an increased capacity to treat acute conditions and prevent contagious disease, mortality is reduced at all ages and people live longer, thus increasing the median age of the population. The principal categories of disease and causes of death shift from acute to chronic conditions such as heart disease, cancer, and stroke. Moreover, because in most societies there are gender differences in the risk of contracting these chronic conditions (with women typically at lower risk), sex differentials in mortality and life expectancy emerge.

Developing nations differ considerably in terms of their progress through the epidemiologic transition. As a general rule, though, the higher the life expectancy at birth and the greater the proportion of the population aged 65 or older, the more likely the society has reached the stage of the transition that Omran (1971) labels "the age of degenerative and man-made (sic) disease."

1.4 RELATIONSHIPS AMONG NEED, DEMAND, AND UTILIZATION

As a brief aside, it is important to distinguish among three related but different concepts that are relevant to this analysis: need, demand, and utilization. Need refers to both medically-defined need and self-perceived need, which are usually different. Demand refers to the quantity of medical care that people are willing to obtain as a function of their own characteristics, the characteristics of providers, and the environment, during a specified period. Utilization represents the amount of demand that is actually met by providers.

The relationships among these three concepts are important from both theoretical and policy perspectives. Need (of either type) will always be greater than or equal to demand, because some of those believing they require care will not in fact demand care at a health facility. Demand, on the other hand, will always be greater than or equal to utilization, since some of those people demanding care will not receive services. What is observed in practice is utilization: the amount of health care services that is actually provided.

It is important to recognize that utilization is affected by the amount of services demanded, which in turn is affected by a wide spectrum of variables. These variables include people's income, education levels, lifestyles, prices of services, quality and availability of services, location of providers, as well as numerous other factors.

Demand is also a function of both epidemiology and demography. Changes in epidemiology, which reflects the types of health problems that require care and the incidence of those problems, will have an influence on the demand for (and utilization of) health care services. Population changes, in terms of the relative and absolute sizes of age and gender groups, will also affect the demand for health services, even if there are no changes in epidemiology. As a result, a country undergoing an epidemiologic and demographic transition will undoubtedly experience changes in the need for, demand for, and utilization of health care services. However, all that can be observed is the change in utilization. (Although not readily observed, additional information on demand can be gathered through survey efforts, most frequently in the form of household surveys of demand for and utilization of health services. Such surveys generally collect information on patterns of illness, choice of provider - and why - and expenditures.)

1.5 SUMMARY

As world population aging continues into the next century, the proportion and absolute number of elderly will grow. The problems created will be particularly acute for the developing nations. Among the major issues that must be faced is how to provide adequate health care to the older population who often lack the resources to meet their own medical needs. In particular, treatment of chronic disease among the elderly is likely to strain the capacity of LDC health care systems. Health policymakers will require answers to a variety of questions about the effects of population aging on patterns of illness, the utilization of health services, and the costs of providing such services. Only then can they develop effective policies to support sustainable health care systems.

2.0 METHODOLOGY

2.1 SELECTION OF URUGUAY

There are a number of reasons why Uruguay makes a useful laboratory for a study of the effect of population aging on utilization and financing of health care services. Given the nation's level of economic development, and its mix of publicly and privately financed health care, conclusions drawn from the Uruguayan situation may serve as a window to view the potential impacts of aging in both developed and developing nations.

Uruguay has already undergone demographic transition to a degree that resembles the projected transition for other countries over the next decade (the nation's actual demographic profile is more fully described in Chapter 3). Uruguay has achieved remarkably wide medical coverage for its citizens, ensuring access to care for most of its population, and ensuring affordable care for these consumers through elaborate systems of health insurance.

This study began when the management of the CASMU offered the opportunity to examine its own utilization records, both for hospital in-patients and for out-patient visits to CASMU member physicians. CASMU is one of the 50 collective medical care institutions (IAMCs) operating in Uruguay. Its membership is drawn largely from Montevideo, and covers nearly 28 percent of the IAMC subscribers in that department and approximately 18 percent of those in the entire country. CASMU has over twice the membership of the next largest IAMC

2.2 DATA AVAILABILITY

The methodology for this study was developed during a two-week visit to Uruguay in June 1992, based on the information available from CASMU. The CASMU data file includes information on each hospitalized patient's age, sex, principal and secondary diagnoses, symptoms of illness, surgical procedures, diagnostic tests, duration of hospitalization and/or number of out patient consultations, condition at termination of treatment and, if applicable, cause of death. Data are available by month and year from approximately 1982 to the present (although coding and data entry are complete only through May 1992). These data are stored on magnetic tape and can be accessed and manipulated easily through standard software programs. The unit of record for these data is the episode of hospitalization per patient, identified by the date of admittance.

The individual hospitalized patient files do not contain actual or estimated costs of the services provided. Rather, expenditures are reported each trimester and summarized annually, in aggregate form. They are presented, in current prices (New Pesos), in terms of several categories, including service site, type of service, and type of expenditure. Summary figures reported are the monetary values for the various cost components, cost per patient, and cost per bed-day of occupancy. Some data are available for out-patients, but systematic information on age-sex composition and diagnosis is lacking. It was therefore necessary to focus the study on hospitalized patients.

Cost data are available for approximately the same period as the patient data and are also stored on magnetic tape. Examination of these data indicate

that they are relatively complete and internally consistent. For the earliest years of reporting, data are missing for some months, which influenced the selection of statistical series for purposes of the analysis.

2.3 DEFINITION OF TERMS AND ASSUMPTIONS

The term ***costs*** as used in this analysis refers to expenditures or payments made by CASMU for hospital care on behalf of its beneficiaries. This includes expenditures at CASMU-owned facilities as well as at CASMU contractors.

For purposes of this analysis, a number of assumptions were made regarding costs. Average bed-day costs estimated for the 1991 CASMU membership, for each of three illness categories, were used to make projections about total costs for CASMU in later years. The underlying assumption was that this average cost would remain constant into the future.

While this assumption allowed this study to isolate the effects of aging on costs, it should be recognized that in reality, average costs will be affected by several variables. These include, for example: changes in technology which may help to improve efficiency of existing diagnostic methods and treatments, and thus reduce the costs of diagnosis or treatment; inflation, technology, and other changes in the input markets (e.g., labor, pharmaceuticals, equipment) which will affect their use and the relative costs of care; entry into (or exit from) the market of alternative providers, such that higher (or lower) competition will lower (or raise) costs; or economies of scale, which may lower average costs as utilization increases.

The term ***utilization*** refers to the amount of hospital services that is consumed by CASMU beneficiaries. As explained earlier, this amount should not be taken to reflect demand. In cases where the demand for services is less than the supply of services, all demand is met and utilization and demand are one and the same. However, in cases where demand is greater than supply, utilization is equal to supply, and there is unmet demand. Based on available information, it is not clear which is the current situation in Uruguay. All that can be assumed is that it is likely that in Uruguay, as everywhere else in the developed and developing world, there is unmet demand. Thus, what is observed in Uruguay is not demand but rather utilization. The estimates made in this analysis therefore reflect projected utilization, with an unknown level of demand and an unknown level of unsatisfied demand.

For this analysis, it was further assumed that the rate of utilization of hospital services by CASMU beneficiaries would remain constant, within age and gender groups, and for each of the illness categories. As in the case of costs, this assumption allowed the analysis to focus on the effects of aging on costs. However, it should be recognized that utilization rates (like average costs) are likely to be influenced by a variety of variables, including epidemiology, income, prices, and supply-side factors such as availability of services, quality, and location.

In summary, there are numerous factors that are likely to influence both average costs and utilization over time. This analysis, however, assumes these to be constant in order to focus on the effect of aging. The projections and results from this study assume:

- Constant epidemiological pattern;
- Constant technology;
- Constant (in real terms) costs of production inputs;
- Constant competitiveness within the health sector;
- Constant system of health care financing; and
- Changing population sizes in each age and gender group according to demographic projections.

Therefore, utilization of hospital services, on a per capita basis, within each age and gender group, will remain constant and equal to today's observed level. This analysis projects the increase in utilization and costs that is attributable to demographic changes only, with all other factors outlined earlier remaining constant.

2.4 ANALYTICAL STEPS

This section describes the analytical steps taken to project costs and utilization for CASMU over a 20-year period. Examples using actual data from Section 4 are provided to assist the reader in understanding how the results were achieved.

2.4.1 Establishment of Baseline Data

CASMU membership data from May 1992 were used as the basis from which all projections were made. During that period, there was a total of 265,285 members, with 15.6 percent aged 65 and above.

2.4.2 Projections of CASMU Population for Years 2000 and 2010

From the baseline data, four sets of projections for the CASMU population were made. These projections differed in terms of their assumptions about the speed of aging and the size of CASMU membership. Projections A and B assumed that the CASMU membership would remain constant, whereas Projections C and D allowed for growth in membership, in line with population growth. Projections A and C were based on the official projections of demographic change (slower aging), whereas B and D used the revised projections (rapid aging).

Thus, under Projections A and B, CASMU membership in later years remained at 265,285, although the breakdowns among age and sex shifted. For example, under Projection A, by the year 2000, the proportion of elderly would increase to 16.7 percent. Alternatively, under Projection D, in the year 2000, the proportion of elderly would increase to 18.1 percent, and the total membership would increase by six percent to 281,838.

Each of these projections was made for CASMU membership as a whole, as well as for disaggregated age and gender groups. The breakdowns by age, including detailed categories for the elderly, allow for clear indications of the effects of aging.

2.4.3 Determination of Hospitalization Rates

Hospitalization rates for each of the illness categories (all diagnoses, neoplasms, cerebro/cardiovascular diseases, and other diagnoses) were determined

by comparing the number of persons hospitalized with the number of CASMU members. These rates were determined for each of the age and sex groupings, using data from the 1991-1992 period.

For example, 7,651 persons in the 65 and over age group were hospitalized for all diagnoses, out of a total of 41,422 CASMU members in that age group. The resultant hospitalization rate for that age group, for both sexes and for that illness category, was thus 18.5 percent. The corresponding rate for all age groups was 11.6 percent.

2.4.4 Determination of Average Lengths of Stay

Data on average length of stay (number of bed-days in hospital) for CASMU patients were available from the years 1986 and 1991. These were available on a disaggregated basis by age, sex, and for the four disease categories under analysis. The figures from 1991 were used for this analysis.

For example, the average length of stay for CASMU members 65 and over, for all diagnoses, was 8.0 days. The corresponding rate for all age groups was 5.2 days.

2.4.5 Estimation of Average Cost Per Bed-Day

Costs of hospitalization, represented by an average bed-day cost, were estimated for all diagnoses, neoplasms, and cerebro/cardiovascular diseases. This was accomplished by taking total costs to CASMU for the disease category and dividing that by the number of bed-days of hospitalization during a given year. Data were available from three fiscal year periods. In cases where services were provided at different facilities with different costs, weighted averages were determined.

For example, during the 1991/92 period, N$78 billion was spent on all diagnoses, with 189,000 estimated bed-days. The average bed-day cost was thus N$412,552.

2.4.6 Estimation of Costs by Age and Gender Category

Using the average bed-day costs previously determined, costs for each age and gender category were estimated for each of the three disease categories. This was done by multiplying the number (N) hospitalized (H), average length of stay (ALOS), and average bed-day cost (AC) for each of the age and sex groupings. Thus, for example, looking at all diagnoses, both sexes, and those CASMU members 65 and older:

Number in category:	41,422	(N)
Hospitalization rate:	18.5%	(H)
Number hospitalized:	7,651	(N * H)
Avg. length of stay (ALOS):	8.0 days	(ALOS)
Avg bed-day cost:	N$412,552	(AC)
Total cost:	N$25.25 billion	(N * H * ALOS * AC)

2.4.7 Projection of Costs for Other Years

Costs for other years were projected in a similar manner. Under each of the four projections, the number of CASMU members in each age and sex category were determined (N). The hospitalization rate (H) for each category was applied to determined the number hospitalized. The average length of stay (ALOS) and bed-day cost (AC) figures from the base period were then applied to arrive at a total cost. Thus, for example, using Projection D, the following estimate was made for the 65 and over population, both sexes, all diagnoses, for the year 2000:

Number in category:	50,938	(N)
Hospitalization rate:	18.5%	(H)
Number hospitalized:	9,409	(N * H)
ALOS:	8.0 days	(ALOS)
Avg bed-day cost:	N$412,552	(AC)
Total cost:	N$31.05 billion	(N * H * ALOS * AC)

In all projections, the hospitalization rate, ALOS, and average bed-day cost determined from the 1991 data were assumed to remain constant. In this way, the resulting change in total cost could be attributed solely to demographic changes.

3.0 COUNTRY BACKGROUND

This chapter summarizes selected features of Uruguayan society. First, demographic conditions and trends are reviewed, emphasizing population size and growth, fertility and mortality, and age-sex composition. Second, the socioeconomic context is described, with particular attention to the economic and social conditions that influence health-related behavior, the demand for health services, and the ability of Uruguayans to gain access to the health care system. Third, the contemporary health care system is examined, concentrating on the supply of health care practitioners, the types of facilities through which care is provided, and the social insurance system that covers medical costs.

3.1 DEMOGRAPHIC CONDITIONS AND TRENDS

3.1.1 Data Sources and Quality

The principal source of demographic data is the national population census, the most recent one having been conducted in 1985. Many of these data are summarized in publications of the United Nations Population Division. Also relevant is the vital statistics system, reputed to provide some of the most accurate data available in Latin America. Data on mortality and morbidity are available in publications of the Pan American Health Organization. The Direccion General de Estadistica y Censos also implements a continuous sample survey of households that provides a variety of demographic information at national and sub-national levels. In short, the system of demographic data collection, reporting and analysis in Uruguay is quite good.

3.1.2 Size and Growth

According to the 1985 census, the country had a total of 3,008,270 inhabitants. The official, medium variant estimate for 1990 is 3,094,000, yielding an average annual growth rate of approximately 0.6 percent. In fact, the population has been growing slowly for many decades, with the average annual rate of increase estimated at 1.0 percent for the period 1960-70 and 0.4 percent for 1970-82 (World Bank, 1984: Table 19).

Two sets of population projections are available. The official projection (United Nations, 1991c) is summarized in Exhibit 1 for the period 1990-2010. According to this projection, the Uruguayan population would increase to 3,094,000 in 1990, 3,274,000 by the turn of the century, and 3,453,000 in the year 2010. An alternative projection has been developed (Arriaga and Damonte, 1991a) that assumes levels of mortality that are lower than those used for the official projection (Arriaga and Damonte, 1991b), and these results are shown in Exhibit 2. The revised projection for the national population for 1990 is only 0.2 percent larger than the official projection; however, by 2000, the revised projection exceeds the official one by 2.0 percent and by 2010 the difference is 4.1 percent. The absolute differences are but 5,000 people in 1990, 67,000 in 2000, and 142,000 in 2010.

EXHIBIT 1
ABBREVIATED AGE DISTRIBUTION OF THE URUGUAYAN POPULATION BY SEX, 1990-2010 (Official Projection)[1]

	Male		Female		Both Sexes	
	N	%	N	%	N	%
1990						
0-14	408	27.1	391	24.6	798	25.8
15-44	645	42.8	653	41.2	1,298	42.0
45-64	306	20.3	333	21.0	640	20.7
65 +	151	10.0	209	13.2	359	11.6
65-69	57	3.8	67	4.2	124	4.0
70-74	40	2.6	52	3.3	92	3.0
75-79	30	2.0	44	2.8	73	2.3
80 +	24	1.6	46	2.9	70	2.3
Totals	1,508	100.0	1,586	100.0	3,094	100.0
Median Age	29.5		32.2		31.0	
2000						
0-14	400	25.1	382	22.8	782	23.9
15-44	716	44.9	713	42.5	1,429	43.6
45-64	309	19.4	340	20.2	648	19.8
65 +	171	10.7	244	14.5	413	12.6
65-69	61	3.8	73	4.4	134	4.1
70-74	49	3.1	65	3.9	113	3.5
75-79	32	2.0	48	2.9	80	2.4
80 +	29	1.8	58	3.4	86	2.6
Totals	1,595	100.0	1,679	100.0	3,274	100.0
Median Age	30.0		33.3		31.7	

EXHIBIT 1 (continued)

	Male		Female		Both Sexes	
	N	%	N	%	N	%
2010						
0-14	406	24.1	388	22.0	795	23.0
15-44	757	44.9	739	41.8	1,495	43.3
45-64	349	20.7	384	21.7	733	21.2
65+	174	10.3	258	14.6	430	12.4
65-69	58	3.4	71	4.0	129	3.7
70-74	45	2.7	62	3.5	107	3.1
75-79	36	2.1	54	3.1	89	2.6
80+	35	2.1	71	4.0	105	3.0
Totals	1,685	100.0	1,767	100.0	3,453	100.0
Median Age	31.9		34.6		33.1	

[1] Medium variant projection; numbers in thousands

Source: United Nations, *The Sex and Age Distributions of Population: The 1990 Revision*. Population Studies No. 122. New York: Department of International Economic and Social Affairs, 1991.

EXHIBIT 2
ABBREVIATED AGE DISTRIBUTION OF THE URUGUAYAN POPULATION BY SEX, 1990-2010 (Revised Projection)

	Male		Female		Both Sexes	
	N	%	N	%	N	%
1990						
0-14	407	27.0	391	24.6	798	25.7
15-44	645	42.7	654	41.1	1,299	41.9
45-64	306	20.3	335	21.1	641	20.7
65+	151	10.0	210	13.2	361	11.7
65-69	57	3.8	68	4.3	125	4.0
70-74	40	2.7	53	3.3	93	3.0
75-79	30	2.0	44	2.8	74	2.4
80+	25	1.7	45	2.8	70	2.3
Totals	1,509	100.0	1,590	100.0	3,100	100.0
Median Age	29.4		32.2		30.8	
2000						
0-14	402	24.7	385	22.5	787	23.6
15-44	720	44.3	716	41.8	1,436	43.0
45-64	315	19.4	346	20.2	661	19.8
65+	190	11.6	267	15.6	456	13.7
65-69	65	4.0	77	4.5	142	4.3
70-74	53	3.3	70	4.1	123	3.7
75-79	36	2.2	53	3.1	89	2.7
80+	35	2.1	66	3.8	101	3.0
Totals	1,627	100.0	1,713	100.0	3,341	100.0
Median Age	30.5		33.8		32.1	

EXHIBIT 2 (continued)

	Male		Female		Both Sexes	
	N	%	N	%	N	%
2010						
0-14	413	23.5	394	21.4	807	22.4
15-44	766	43.6	745	40.5	1,511	42.0
45-64	363	20.7	393	21.4	756	21.0
65+	215	12.2	306	16.7	521	14.5
65-69	65	3.7	77	4.2	141	3.9
70-74	53	3.0	70	3.8	123	3.4
75-79	44	2.5	63	3.4	108	3.0
80+	53	3.0	97	5.3	150	4.2
Totals	1,756	100.0	1,839	100.0	3,595	100.0
Median Age	32.7		35.5		34.1	

Numbers in thousands

Source: Unpublished population projections reported in E.E. Arriaga and A.M. Damonte, 1991a. "Aging in Uruguay." Preliminary Draft.

3.1.3 Fertility and Mortality

The principal factor underlying Uruguay's relatively low rate of population growth is the low fertility rate that has prevailed for some time. The total fertility rate estimated for 1985-90 is 2.4 births per woman. One way of interpreting this indicator is that Uruguay has completed 95 percent of the transition to replacement level fertility (Micklin, 1991: Table B7).[2] Mortality indicators for 1989 include a crude death rate of 10 per thousand population, an infant mortality rate of 22 per thousand live births, and a life expectancy at birth of 73 years (World Bank, 1991: Tables 1, 27 and 28). These indicators compare favorably with those of the more industrialized nations.

3.1.4 Age and Sex Composition

Consistent with the trends observed for fertility, mortality, and population growth, Uruguay shows an age-sex structure typical of early transition countries. In 1985, approximately 27 percent of the population was under 15 years of age and nearly 11 percent was aged 65 or over. Official projections show a decreasing proportion of youth and children and an increase in the size of the elderly population such that, by 2025, only 21 percent of the Uruguayan population would be less than 15 years of age and just over 13 percent would be 65 or over (United Nations, 1991b: 370). The revised projection results in an even more rapid process of population aging. In fact, the most rapidly growing component of the population is the elderly, particularly the "oldest-old."

Because of the sizeable sex differential in mortality, the sex ratio (i.e., the number of males per 100 females) favors women after age 20 and the gap increases through the oldest categories of the age distribution. For example, in 1985, the sex ratio for the total population was 95. At ages 15-19, it was 102; at ages 45-49, it was 94; and at age 80 or more, it was 56. As male mortality decreases relative to female mortality, the sex differential can be expected to decrease, but not substantially (United Nations, 1991b: 370-371 and Arriaga and Damonte, 1991a).

The implications of the two sets of population projections for the age-sex composition of the Uruguayan population are summarized in Exhibits 3-5. Using the 1985 census as a basis for comparison, it is clear that the revised projection makes a substantial difference in the absolute size and relative growth of the elderly population, and that the size of the effect increases with age. Note also that both the sex and dependency ratios are higher if one uses the revised projection.

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[2]The Index of Fertility Transition is calculated as MTFR -TFR85-90/MTFR - 2.1, where MTFR is 8.5 (the maximum rate in the world at a given date; in this case, Rwanda, 1985-90), TFR85-90 is the country rate, and 2.1 is the replacement level TFR. The Index can vary between 0 and 100.0.

EXHIBIT 3
PROJECTED TRENDS IN SELECTED DEMOGRAPHIC INDICATORS FOR THE ELDERLY POPULATION OF URUGUAY, 1985-2010
(Official Projection)

	1985	1990	2000	2010
Assumptions[1]				
TFR[2]		2.43	2.25	2.15
e_0, male[3]		68.9	69.6	70.4
e_0, female		75.3	76.1	76.9
Population (000s)				
Total	3,008	3,094	3,274	3,453
65+	329	359	413	430
70+	219	235	279	301
75+	124	143	146	194
80+	61	70	86	105
Absolute increment over 1985 (000s)				
Total		86	266	445
65+		30	84	101
70+		16	60	82
75+		19	22	70
80+		9	25	44
% increase over 1985				
Total		2.9	8.8	14.8
65+		9.1	25.5	30.7
70+		7.3	27.4	37.4
75+		15.3	17.7	56.4
80+		14.8	41.0	72.1

EXHIBIT 3 (continued)

	1985	1990	2000	2010
% of total population				
65+	10.9	11.6	12.6	12.4
70+	7.3	7.6	8.5	8.7
75+	4.1	4.6	5.0	5.6
80+	2.0	2.3	2.6	3.0
Population 75+ as % of				
65+	37.7	39.8	35.4	45.1
70+	56.6	60.8	52.3	64.4
Men per 100 women				
65+	73.6	72.2	70.1	67.4
70+	68.6	66.2	64.3	62.0
75+	62.9	60.0	57.6	56.8
80+	55.0	52.2	50.0	49.3
Dependency Ratios[4]				
Total	60.7	59.7	57.6	54.9
Old-Age	17.6	18.5	20.0	19.3

[1] Assumptions refer to the five-year period prior to the date shown.

[2] Medium variant total fertility rate.

[3] Life expectancy at birth.

[4] Total population.

Sources: Calculated from data provided in United Nations, *The Sex and Age Distributions of Population: The 1990 Revision*. Population Studies No. 122. New York: Department of International Economic and Social Affairs, 1991 and United Nations, *World Population Prospects 1990*. Population Studies No. 120. New York: Department of International Economic and Social Affairs, 1991.

EXHIBIT 4
PROJECTED TRENDS IN SELECTED DEMOGRAPHIC INDICATORS FOR THE ELDERLY POPULATION OF URUGUAY, 1985-2010
(Revised Projection)

	1985	1990	2000	2010
Assumptions[1]				
TFR[2]		2.37	2.21	2.13
e_0, male[3]		71.0	74.7	76.8
e_0, female		77.7	81.2	83.3
Population (000s)				
Total	3,008	3,099	3,341	3,595
65 +	329	361	456	521
70 +	219	236	314	380
75 +	124	144	190	257
80 +	61	70	101	150
Absolute increment over 1985 (000s)				
Total		91	333	587
65 +		32	127	192
70 +		17	95	161
75 +		20	66	133
80 +		9	40	89
% increase over 1985				
Total		3.0	11.1	19.5
65 +		9.7	38.6	58.4
70 +		7.8	43.4	73.5
75 +		16.1	53.2	107.3
80 +		14.8	65.6	145.9

EXHIBIT 4 (continued)

	1985	1990	2000	2010
% of total population				
65+	10.9	11.7	13.7	14.5
70+	7.3	7.7	9.4	10.6
75+	4.1	4.7	5.7	7.2
80+	2.0	2.3	3.0	4.2
Population 75+ as % of				
65+	37.7	39.8	41.8	49.4
70+	56.6	60.7	60.7	67.7
Men per 100 women				
65+	73.6	71.8	71.1	70.1
70+	68.6	66.4	65.9	65.4
75+	62.9	60.7	60.0	60.6
80+	55.0	54.9	53.4	54.2
Dependency Ratios[4]				
Total	60.7	59.7	59.3	58.6
Old-Age	17.6	18.6	21.8	23.0

[1] Assumptions refer to the five-year period prior to the date shown.

[2] Medium variant total fertility rate.

[3] Life expectancy at birth.

[4] Total population.

EXHIBIT 5
DIFFERENCES IN SELECTED DEMOGRAPHIC INDICATORS FOR THE ELDERLY POPULATION OF URUGUAY, 1985-2010, ACCORDING TO OFFICIAL AND REVISED PROJECTIONS[1]

	1985	1990	2000	2010
Assumptions[2]				
TFR[3]		-0.06	-0.04	-0.02
e_0, male[4]		2.1	5.1	6.4
e_0, female		2.4	5.1	6.4
Population (000s)[5]				
Total	0	5	67	142
65+	0	2	43	91
70+	0	1	35	79
75+	0	1	44	63
80+	0	0	15	45
% increase over 1985				
Total		0.1	2.3	4.7
65+		0.6	13.1	27.7
70+		0.5	16.0	36.1
75+		0.8	35.5	50.9
80+		0.0	24.6	73.8
% of total population				
65+	0.0	0.1	1.1	2.1
70+	0.0	0.1	1.4	1.9
75+	0.0	0.1	0.7	1.6
80+	0.0	0.0	0.4	1.2
Population 75+ as % of				
65+	0.0	0.0	6.4	4.3
70+	0.0	-0.1	8.4	3.3

EXHIBIT 5 (continued)

	1985	1990	2000	2010
Men per 100 women				
65+	0.0	-0.3	1.0	2.7
70+	0.0	0.2	1.6	3.4
75+	0.0	0.7	2.4	3.8
80+	0.0	2.7	3.4	4.9
Dependency Ratios[6]				
Total	0.0	0.0	1.7	3.7
Old-Age	0.0	0.1	1.8	3.7

[1] Revised projection - official projection.

[2] Assumptions refer to the five-year period prior to the date shown.

[3] Medium variant total fertility rate.

[4] Life expectancy at birth.

[5] These figures also represent differences in the absolute population increment between 1985 and the reference date.

[6] Total population.

3.1.5 Population Distribution

The Uruguayan population has been concentrated in urban localities for many decades. In 1960, fully 80 percent of the country's inhabitants lived in urban areas, and by 1985 that proportion had increased to 85 percent (United Nations, 1991d: Table A.1). In 1985, Montevideo, the national capital, contained 39 percent of the total population and 47 percent of the urban population (United Nations, 1991d: Tables A.14 and A.15).

3.2 SOCIOECONOMIC CONDITIONS AND TRENDS

3.2.1 Data Sources and Quality

Social and economic data are available from the population census, the aforementioned continuous sample survey, and the Ministry of Finance. Such data are also summarized in publications of the United Nations, World Bank, and Inter-American Development Bank. Data quality appears to be relatively good.

3.2.2 Education

Uruguay has one of the highest literacy rates in the world, reported to be 95 percent in 1985. For the total population, the mean number of years of schooling was 6.1 (United Nations Development Programme, 1991: 128), a low figure by more developed country standards but relatively high for developing nations. (Only six years of education are compulsory). In 1986, approximately seven percent of GNP was spent on education, and for 1987-88, education accounted for about 15 percent of total public expenditures (United Nations Development Programme, 1991: 148). Again, these figures are considerably higher than the average for developing nations.

3.2.3 Employment

The national level of unemployment fluctuated during the 1980s, peaking at around 16 percent in 1983 and then dropping gradually to about 8-10 percent in 1990 (Inter-American Development Bank, 1991: 164; Economic Commission for Latin America and the Caribbean, 1990: 74). Data from the continuous sample survey for 1990 show an estimated unemployment rate of 9.2 percent for Montevideo and 7.7 percent for the Interior. Among the interior provinces, unemployment ranged from 1.6 percent in San Jose to 11.8 percent in Artigas. Joblessness was highest among the population with a secondary education, reaching 13 percent in Montevideo and 11 percent in the Interior; it was lowest among persons with no education or only primary instruction (Republica Oriental del Uruguay, 1991b: Cuadro 21A and Grafico No. 23).

3.2.4 Economic Performance and Income

In 1989, Uruguay's per capita GNP stood at $2,620, with an average annual growth rate of 1.2 percent over the period 1965-89 (World Bank, 1991: Table 1; Urrutia, 1991b). Like most Latin American nations, Uruguay's economic performance fluctuated over the 1980s, but was generally stagnant. At the beginning of the decade, gross domestic product (GDP) was growing at an average annual rate of about 1.9 percent; by mid-decade, this figure was 0.3 percent, and for 1990, it was 0.9 percent (Inter-American Development Bank, 1991: 168).

Average annual growth of GDP reached its low point (-9.4 percent) in 1982, with a high of 7.5 percent in 1986. Inflation rose to 112.5 percent in 1989, one of the highest levels in the nation's history (Inter-American Development Bank, 1991: 163, 165). A series of currency devaluations drove the official exchange rate from 10.8 New Pesos (N$) per U.S. dollar in 1981 to N$1,171 in 1990 (Inter-American Development Bank, 1991: Table F-1). Outstanding external debt as a proportion of GDP rose from around 18 percent in 1980 to 51 percent in 1985, then dropped to 40 percent in 1990 as a result of a stringent fiscal adjustment program.

Exhibit 6 provides a summary of economic conditions in Uruguay during the period 1981-90. From these data, it is clear that the overall situation improved considerably during the latter half of the decade. Nonetheless, the fiscal resources of the country are limited.

According to data from the continuous sample survey, during the first quarter of 1990 the national median monthly income per urban household was N$386,500. (Exchange rate: US$1 = N$1,171.) For Montevideo, the median figure was N$450,000, while for the Interior provinces it was N$300,000 (Republica Oriental del Uruguay, 1991b: Cuadro 55). Median per capita incomes were $N132,200 for the country as a whole, N$158,000 for Montevideo, and N$106,000 in the Interior (Republica Oriental del Uruguay, 1991b: Cuadro 56). According to results from the 1985 census of population, 27.6 percent of the population and 22.3 percent of the nation's households had at least one unsatisfied basic need. (The categories of basic need reported include type of housing, refuse disposal, water supply, type of sanitary service, access to the educational system, and means of subsistence.) For Montevideo, these figures were 12.4 percent and 14.3 percent, respectively, while for the Interior they were 17.4 percent and 29.2 percent (Republica Oriental del Uruguay, 1991a: Cuadros 1.5.1 and 1.5.2).

3.3 THE HEALTH CARE SYSTEM

3.3.1 Data Sources and Quality

Health care is available in Uruguay through both the public and private sectors. Data regarding public sector health care are collected and reported by the Ministry of Public Health (MSP) (e.g., Republica Oriental del Uruguay, 1989d, 1991a: 4.01-4.07, 1992b, n.d.). Indicators provided include fiscal information, types of facilities available, levels of human resources, and descriptions of services provided and health policy priorities. Comparable information for the private sector is provided in most instances by the various institutions and is aggregated through the Sistema Nacional de Informacion (SINADI), a division of the MSP. Relevant data are also provided in publications of the Pan American Health Organization (e.g., 1982, 1986, 1990). The data reported vary in terms of precision, quality, and timeliness, but are generally believed to be reasonably accurate. Information on the demand for health care is found in the National Health Survey (Republica Oriental del Uruguay, 1984) conducted in 1982, as well as in recent surveys conducted by the National Statistics and Census Office.

EXHIBIT 6
SELECTED ECONOMIC INDICATORS, URUGUAY, 1981-1990

	GDP[1]	GDP per Capita[2]	Total External Debt[1]	Total External Debt as Percent of GDP
1981	$9,069	$3,093	$2,174	24.0
1982	8,254	2,797	2,647	32.1
1983	7,784	2,621	3,292	42.3
1984	7,683	2,571	3,271	42.6
1985	7,710	2,563	3,919	50.8
1986	8,282	2,738	3,906	47.2
1987	8,779	2,886	4,271	48.6
1988	8,827	2,885	3,826	43.3
1989	8,947	2,908	3,750	41.9
1990[3]	9,037	2,921	3,602	39.9
Percent Change, 1981-1985	-15.0	-17.1	80.3	112.1
Percent Change, 1986-1990	9.1	6.7	-7.8	-15.6

[1] Millions of constant 1988 U.S. dollars.

[2] Constant 1988 U.S. dollars.

[3] Preliminary data.

Source: Inter-American Development Bank, *Social and Economic Progress in Latin America: 1991 Report*. Washington, DC, 1991, Tables B-1, B-2, and E-1.

3.3.2 Provision of Health Services

The Uruguayan health care system is one of the most complex in Latin America (Mesa-Lago, 1989a), consisting of multiple institutions and programs. Four sectors have been distinguished. (The description of Uruguayan health care sectors relies heavily on an unpublished manuscript by Carmelo Mesa-Lago.) The *social insurance sector* is managed by the Social Insurance Bank (Banco de Prevision Social, BPS) and includes sickness insurance and maternity-infant care for private salaried workers. The BPS operates one maternity hospital and five clinics (all but one in Montevideo), though these facilities account for less than one percent of all hospital beds in the country. The *private sector* includes Institutions of Highly Specialized Medicine (IMAEs) and a few private hospitals and clinics, accounting for about 10 percent of the nation's hospital beds. The *public sector* includes all facilities, services, and personnel under the auspices of the MSP as well as institutions controlled by specific public sector agencies such as the armed forces and the police. The MSP is responsible for providing health care to all non-insured persons who are citizens or residents for at least one year and who lack the economic means to pay for such services. Those who pass a means test receive free care, while the remainder pay a proportion of costs, ranging from 20 to 100 percent, depending on their level of income. The MSP operates approximately 60 hospitals and 200 clinics and health centers (Uruguay, 1992d), accounting for about 68 percent of the country's hospital beds. The specialized public institutional facilities provide another five percent of hospital beds. The *fourth sector consists of about 50 mutual aid societies ("mutualistas") and cooperatives of physicians ("cooperativas")*, referred to generally as Instituciones de Asistencia Medica Colectiva (IAMCs). The IAMCs operate about 17 percent of the nation's hospital beds, principally in clinics. These collectives are available to all persons insured by the BPS (except those under collective labor agreements); in addition to monthly contributions to BPS, IAMC members pay user fees to the institution. These co-payments are for ambulatory services and pharmaceuticals only; in-patient services do not require co-payments. IAMCs also have non-insured voluntary members who pay the full cost of services.

Estimates of institutional health care coverage in 1981 are shown in Exhibit 7. The overall level of coverage reported (98 percent) is very high.[3] At the national level, 43 percent of coverage is provided through IAMCs, followed by the MSP (32 percent) and the private sector (8 percent). Montevideo stands out from the Interior departments in that the IAMCs account for a substantially larger proportion of health care coverage (78 percent), with correspondingly lower amounts of coverage via the MSP (11 percent) and the private sector (2 percent). (A recent study by the National Statistics and Census Office shows increased participation of the IAMCs, covering 54.5 percent of the overall Uruguayan population. Source: *Cobertura Para la Asistencia de la Salud, Ano 1991*, Informe No. 2, Dic. 1992, Direccion General de Estadisticas y Censos.) A

[3]It should be noted that this figure reflects "coverage" in terms of where the population is able to obtain health care services, or through what source of financing. This should be differentiated from the concept as frequently used in the U.S., which generally refers to the availability of health insurance. Thus, for example, the U.S. Bureau of the Census reported that during the last quarter of 1990, 13 percent of the U.S. population lacked health coverage (U.S. Bureau of the Census, Health Insurance Coverage: 1987-1990, 25 June, 1992). In Table 7, that figure would be comparable to the 33.6 percent of the Uruguayan population without coverage or provided services through the MSP.

EXHIBIT 7
DISTRIBUTION OF HEALTH COVERAGE BY INSTITUTIONS AND DEPARTMENTS, URUGUAY, 1981 (percent)

Department	MSP[1]	Mutual Aid Societies and Cooperatives	Private	Other[2]	Without Coverage
Montevideo	11.2	77.8	1.6	7.1	2.3
Artigas	43.1	21.5	28.7	6.7	*
Canelones	23.1	59.2	7.2	7.4	3.1
Cerro Largo	42.8	31.8	18.9	5.4	1.1
Colonia	15.9	45.9	23.8	13.1	1.3
Durazno	35.7	35.3	13.1	15.3	0.6
Flores	41.0	26.9	20.0	12.1	*
Florida	30.8	55.1	6.1	7.2	0.8
Lavalleja	28.4	53.1	14.8	3.7	*
Maldonado	15.0	63.6	19.5	1.9	*
Paysandu	35.5	46.0	12.9	4.5	1.1
Rio Negro	37.3	47.0	3.2	10.5	2.0
Rivera	45.3	24.9	23.2	6.1	0.5
Rocha	33.6	42.7	17.8	5.9	*
Salto	29.9	51.6	15.9	2.6	*
San Jose	32.7	43.9	15.6	7.8	*
Soriano	36.1	34.5	19.8	7.9	1.7
Tucuarembo	30.2	25.6	41.3	2.8	0.1
Treinta y Tres	46.9	39.2	9.4	4.4	0.1
National Average	31.8	43.1	15.3	7.8	1.8

[1] Ministry of Public Health.

[2] Includes care in the workplace.

* Not applicable.

Noto: Institutions are located in the capitals of the Interior departments and throughout Montevideo.

Source: Adapted from Carmelo Mesa-Lago, *Ascent to Bankruptcy: Financing Social Security in Latin America*. Pittsburgh: University of Pittsburgh Press, 1989, Table 67; based on data from Republic of Uruguay, *Anuario Estadistico*, 1983.

more recent unpublished analysis by the same investigator concludes that these estimates are too high. The revised figures indicate that overall coverage was only 86 percent in 1981, and had increased slightly to 88 percent by 1987. Given the country's economic difficulties, particularly during the first half of the 1980s, these lower estimates of coverage may be more plausible than those offered in Exhibit 7. (These lower estimates of health care coverage are consistent with results of both a household survey conducted in 1971 by the Direccion General de Estadistica y Censos and the 1982 National Health Survey which find 12.8 and 13.4 percent of the population, respectively, without coverage. Source: Republica Oriental del Uruguay, 1984: Tabla 78.)

Government expenditures on health care have fluctuated widely during the past couple of decades. Figures presented in Exhibit 8 for the period 1972-85 show an increase in per capita health expenditures from $12.76 in 1972 to $23.95 in 1985, with peaks of $36.65 in 1974 and $34.22 in 1980. A similar pattern is seen in terms of health care expenditures as a proportion of total government expenditures and of GNP. (It should be noted, however, that the figures for per capita health expenditures of the Central Government may not be fully representative, given the high degree of contributions toward private providers and the social security fund, which are not counted in the central government budget. Some estimates place the per capita health expenditure within six to eight percent of GNP, approximately US$ 200 per capita per year.)

Exhibit 9 presents additional indicators regarding the Uruguayan health care system. The supply of hospital beds has remained roughly constant at five to six per thousand inhabitants since 1960. In contrast, the supply of physicians has increased substantially, from 12 per 10,000 inhabitants in 1960 to 28/10,000 in 1987. Recent studies have suggested that there may already be an oversupply of physicians and further increases may be detrimental to both the medical labor market and the cost of health care (Meerhoff and Lewis, n.d., Meerhoff et al., 1988).

3.3.3 Demand for Health Services

Although measured demand for health services is critical for explaining patterns of health care utilization and projecting future demand, the only more or less representative source of information on this topic is the 1982 National Health Survey. One suggestive finding from this study is that the proportion of respondents who would consult a physician regarding a chronic illness is significantly higher among the elderly (age 60 or over) than among other adults: 71 percent vs. 59 percent (Republica Oriental del Uruguay, 1984: Cuadro 49). If this finding is predictive of actual behavior, then continued aging of the population should lead to increased demand on health services. Other trends in Uruguayan society, including improved economic status of families and individuals, rising levels of education, and increased availability and accessibility of health care services, will also lead to changes in the nature of demands on the health care system. There is a need for better and more extensive data on this important topic.

EXHIBIT 8
CENTRAL GOVERNMENT HEALTH EXPENDITURES, URUGUAY, 1972-85

	Per Capita[1]	As Percentage of Total Government Expenditures	As Percentage of GDP
1972	12.76	3.31	0.52
1973	26.34	6.89	1.08
1974	36.65	8.50	1.46
1975	23.75	5.49	0.89
1976	25.33	5.76	0.92
1977	24.40	5.60	0.88
1978	31.53	7.18	1.09
1979	26.97	6.21	0.88
1980	34.22	6.68	1.06
1981	30.49	5.44	0.93
1982	28.42	4.11	0.97
1983	29.22	5.42	1.07
1984	21.35	4.30	0.80
1985	23.95	5.28	0.90

[1] 1988 U.S. dollars.

Source: Pan American Health Organization, *Health Conditions in the Americas: 1990 Edition*, Vol. I. Scientific Publication No. 524, 1990, Tables I-7, I-8, and I-9. (Based on data from the Inter-American Development Bank).

EXHIBIT 9
HEALTH SERVICES AND LEVELS IN URUGUAY, 1960-1987

			Mortality Rate		
	Hospital Beds per 1,000 Persons	Physicians per 10,000 Persons	General	Infant	Life Expectancy
1960	5.5	12.2	9.8	50	63.8
1965	5.1	11.4	9.6	48	65.4
1970	5.9	10.9	9.8	46	65.6
1975	••	14.1	10.1	44	66.0
1980	6.0	17.5	10.0	38	67.1
1985	5.0[1]	20.0[2]	10.0	29	68.4
1987	4.6	28.1[3]	10.0	24	68.9

[1] 1984

[2] Authors' estimate, 1984

[3] 1986

Sources: Hospital Beds and Physicians: 1960-80: Carmelo Mesa-Lago, *Ascent to Bankruptcy: Financing Social Security in Latin America*. Pittsburgh: University of Pittsburgh Press, 1989, Table 70, pp. 221; 1985-87: Pan American Health Organization, *Health Conditions in the Americas: 1990 Edition*, Scientific Publication No. 524, Washington, DC, 1990, Vol. I, pp. 287-298, Vol. II, Table 4, p. 260; Mortality and Life Expectancy: United Nations, *World Population Prospects 1990*. Population Studies No. 120. New York: Department of International Economic and Social Affairs, 1991, pp. 592-593.

4.0 THE CASMU DATA

4.1 AGE AND SEX COMPOSITION OF MEMBERSHIP

4.1.1 Current Patterns

Exhibit 10 presents the age and sex distribution of the CASMU membership for 1989 and 1992, and Exhibit 11 shows the changes that have occurred in this distribution. The first point to note is that membership size declined by about three percent during this three-year period. Second, male membership declined by about twice as much as female membership, so that in 1992 female members outnumbered male members by about 9,000. Third, while there were declines in all age groups under 65 years of age, the elderly membership (65 and over) increased by about 11 percent. Moreover, the number of elderly male members increased relatively more than elderly female members, perhaps reflecting the slightly larger decline in male mortality assumed by Arriaga and Damonte (1991a, 1991b). Also consistent with national population projections is the considerably larger increase within the elderly population of those 80 years or older.

4.1.2 Comparison with the Uruguayan Population

It is useful to ask how the age-sex distribution of the CASMU membership compares with other segments of the Uruguayan population, particularly if there is any intent to generalize the results of this study to the larger society. Exhibit 12 provides a rough comparison of the CASMU membership (1992) with the Uruguayan total and urban populations (1990, revised projection) and the population of Montevideo (1985). As anticipated, CASMU members are more concentrated in the 45 and older age groups than are the three comparison populations. They are closest in age distribution to the population of Montevideo, which is not surprising since they are drawn largely from that population. CASMU also tends to show a higher sex ratio (i.e., number of males per 100 women) at the older ages, perhaps because all of its members have access to quality health care. (In most populations that have largely completed the demographic and epidemiologic transitions, sex ratios decline sharply after age 60, approximately, because of the considerably longer life expectancy of women. That difference can be reduced somewhat through high quality health care designed to deal with chronic diseases, which appears to be the situation with the CASMU membership.)

4.1.3 Comparison with Other IAMCs

It is also useful to ask how the age distribution of the CASMU membership differs from that of other IAMC populations. Data for the latter for 1982-91 are presented in Exhibit 13, and can be compared with those for CASMU from Exhibit 12. Generally, the CASMU distribution is very similar to that of Montevideo IAMCs.

EXHIBIT 10
ABBREVIATED AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, MAY 1989 AND MAY 1992

	Both Sexes		Male		Female	
	N	%	N	%	N	%
1989						
0-14	51,020	18.6	25,965	19.4	25,055	17.9
15-44	111,643	40.7	55,664	41.5	55,979	40.0
45-64	74,311	27.1	38,653	27.5	37,458	26.7
65+	37,173	13.6	15,549	11.6	21,624	15.4
65-69	13,248	4.8	6,186	4.6	7,062	5.0
70-74	9,351	3.4	4,040	3.0	5,311	3.8
75-79	7,493	2.7	2,909	2.2	4,584	3.3
80+	7,011	2.6	2,414	1.8	4,667	3.3
Totals	274,147	100.0	134,031	100.0	140,116	100.0
1992						
0-14	47,177	17.8	24,055	18.8	23,122	16.9
15-44	104,879	39.5	51,553	40.2	53,326	38.9
45-64	71,807	27.1	34,997	27.3	36,810	26.8
65+	41,422	15.6	17,607	13.7	23,815	17.4
65-69	14,572	5.5	6,791	5.3	7,781	5.7
70-74	10,705	4.0	4,815	3.8	5,890	4.3
75-79	7,686	2.9	3,055	2.4	4,631	3.4
80+	8,459	3.2	2,946	2.3	5,513	4.0
Totals	265,285	100.0	128,212	100.0	137,073	100.0

EXHIBIT 11
CHANGE IN THE AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, MAY 1989 - MAY 1992

	Both Sexes		Male		Female	
	Net Δ	% Δ	N	%	Net Δ	% Δ
0-14	-3,843	-7.5	-1,910	-7.4	-1,933	-7.7
15-44	-6,764	-6.1	-4,111	-7.4	-2,653	-4.7
45-64	-2,504	-3.4	-1,856	-5.0	-648	-1.7
65 +	4,249	11.4	2,058	13.2	2,191	10.1
65-69	1,324	10.0	605	9.8	719	10.2
70-74	1,354	14.5	775	19.2	579	10.9
75-79	193	2.6	146	5.0	47	1.0
80 +	1,378	19.5	532	22.0	846	18.1
Totals	-8,862	-3.2	-5,819	-4.3	-3,043	-2.2

EXHIBIT 12
ABBREVIATED AGE DISTRIBUTION BY SEX AND SEX RATIO BY AGE, URUGUAYAN POPULATION (TOTAL AND URBAN), MONTEVIDEO, AND CASMU MEMBERSHIP (percentages)

	Uruguay (Total)[1]				Uruguay (Urban)[1]			
	Male	Female	Both Sexes	Sex Ratio	Male	Female	Both Sexes	Sex Ratio
0-14	27.0	24.6	25.7	104.1	27.9	24.3	26.0	104.0
15-44	42.7	41.1	41.9	98.7	42.3	41.0	41.7	93.3
45-64	20.3	21.1	20.7	91.4	19.8	21.2	20.5	84.5
65 +	10.0	13.2	11.7	71.8	10.0	13.5	11.8	66.6
65-69	3.8	4.3	4.0	83.3	3.7	4.4	4.0	76.5
70-74	2.7	3.3	3.0	75.9	2.6	3.4	3.0	70.0
75-79	20	2.8	2.4	66.7	2.0	2.9	2.4	62.3
80+	1.7	2.8	2.3	55.0	1.7	2.9	2.3	52.2
Totals	100	100	100	94.9	100	100	100	90.4
	Montevideo[2]				CASMU Membership[3]			
	Male	Female	Both Sexes	Sex Ratio	Male	Female	Both Sexes	Sex Ratio
0-14	26.1	22.0	23.9	103.4	18.8	16.9	17.8	104.0
15-44	42.3	40.3	41.3	91.4	40.2	38.9	39.5	96.7
45-64	21.7	23.4	22.6	80.8	27.3	26.8	27.1	95.1
65 +	9.8	14.3	12.2	60.0	13.7	17.4	15.6	73.9
65-69	3.5	4.4	4.0	70.3	5.3	5.7	5.5	87.2
70-74	2.8	3.9	3.4	62.9	3.8	4.3	4.0	81.7
75-79	1.9	2.9	2.4	57.6	2.4	3.4	2.9	66.0
80+	1.6	3.2	2.4	44.5	2.3	4.0	3.2	53.4
Totals	100	100	100	87.0	100	100	100	93.5

[1] 1990 (revised projection)

[2] 1985 (census)

[3] 1992 (CASMU data archive)

EXHIBIT 13
ABBREVIATED AGE DISTRIBUTION OF IAMC MEMBERSHIP BY RESIDENCE, URUGUAY, 1982-1991 (percentages)[1]

	82	83	84	85	86	87	88	89	90	91	X 82-91
Montevideo											
0-14	18	17	17	15	18	18	17	17	16	16	16.9
15-44	43	41	41	43	42	43	44	44	45	44	43.0
45-64	27	28	29	28	26	26	26	26	26	26	26.8
65 +	12	14	14	13	13	13	13	13	13	14	13.2
Total	100	100	101	99	99	99	100	100	100	100	99.8
Unknown	18	13	6	1	1	0	2	2	2	2	4.7
Interior											
0-14	19	18	17	16	14	14	15	15	17	15	16.0
15-44	48	48	47	48	50	50	49	50	47	50	48.7
45-64	25	25	25	27	25	26	25	25	25	25	25.3
65 +	7	8	10	9	10	10	10	9	10	9	9.2
Total	99	99	99	100	99	100	99	99	99	99	99.2
Unknown	5	5	5	4	0	0	2	2	1	1	2.5
Total											
0-14	18	17	17	15	17	16	16	17	16	16	16.5
15-44	43	43	43	45	44	45	46	46	46	46	44.7
45-64	27	27	27	28	26	26	25	25	25	25	26.1
65 +	12	12	13	12	12	12	12	12	12	12	12.1
Total	100	99	100	100	99	99	99	100	99	99	99.4
Unknown	16	12	5	2	1	1	2	2	2	1	4.4

[1] Base for percentages excludes persons of unknown age.

Source: SINADI. unpublished tabulation, 1992

4.2 PROJECTIONS

Four sets of projections for the CASMU population were developed for the years 2000 and 2010, using the 1992 age-sex distribution as a base. These projections differ in terms of assumptions regarding (1) the speed of the aging of the population and (2) changes in the size of the CASMU membership, as indicated in Figure 1. Two of those projections are included here, while the other two are contained in the report's Appendix. Projection A (Exhibit 14) assumes slower aging (as represented by the official projection) and no change in the size of the CASMU membership. In other words, this projection ages the CASMU membership in proportion to age and sex distributional changes reflected in the official projection and constrains the number of members to the size shown in May of 1992. Projection B (Appendix: Table 1) also posits no change in the size of the membership over 1992, but assumes a more rapid pace of aging, as represented by the revised projection. Projection C (Appendix: Table 2) uses the slower (official) hypothesized pattern of aging, but assumes that growth of the CASMU membership is proportional to the official projection of growth for the nation, i.e., 5.8 percent for males and 5.9 percent for females over the period 1990-2000 and 5.6 percent for males and 5.2 percent for females during the following decade. Finally, Projection D (Exhibit 15) assumes the more rapid pace of population aging reflected in the revised projection as well as growth of the CASMU population that is proportional to the revised projection for the nation, i.e., 7.8 percent for both sexes for 1990-2000 and 7.9 percent for males and 7.3 percent for females over the period 2000-2010.

FIGURE 1
SUMMARY OF PROJECTIONS OF CASMU POPULATION

	Slow Aging Assumptions	Rapid Aging Assumption
Constant CASMU Size	Projection A (Exhibit 14)	Projection B (Appendix: Table 1)
Changing CASMU Size	Projection C (Appendix: Table 2)	Projection D (Exhibit 15)

The four projections differ in several important ways. Since Projections A and B are constrained to a given total population, they can vary only in terms of their age and sex distributions. First, as expected, Projection B yields a somewhat larger proportion of elderly, particularly in the year 2010. Second, male-female differences are more pronounced, especially in the latter year, with the second projection. Third, the 80 and over population is considerably larger for both sexes in Projection B.

Projections C and D permit growth in the total CASMU membership in addition to changes in the age-sex distribution. According to Projection C, CASMU would have an additional 12,000 members in 2000 and another 15,000 by 2010. The result of Projection D is an increment of 15,000 members by 2000 and another 21,500 by 2010. Projection C yields approximately similar age distributions for 2000 and 2010, with the total and male age distributions actually becoming slightly

EXHIBIT 14
PROJECTION A: ABBREVIATED AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, 2000, AND 2010 (official projection)[1]

	Both Sexes		Male		Female	
	N	%	N	%	N	%
2000						
0-14	43,051	16.2	21,668	16.9	21,383	15.6
15-44	107,122	40.4	52,567	41.0	54,555	39.8
45-64	70,734	26.7	35,643	27.8	35,091	25.6
65+	44,378	16.7	18,334	14.3	26,044	19.0
65-69	14,626	5.5	6,539	5.1	8,087	5.9
70-74	12,367	4.7	5,513	4.3	6,854	5.0
75-79	7,609	2.9	2,949	2.3	4,660	3.4
80+	9,510	3.6	3,205	2.5	6,305	4.6
Totals	265,285	100.0	128,212	100.0	137,073	100.0
2010						
0-14	41,039	15.5	20,642	16.1	20,397	14.9
15-44	105,296	39.7	52,182	40.7	53,114	38.8
45-64	75,194	28.3	37,822	29.5	37,372	27.3
65+	43,755	16.5	17,565	13.7	26,190	19.1
65-69	13,300	5.0	5,897	4.6	7,402	5.4
70-74	10,912	4.1	4,744	3.7	6,168	4.5
75-79	8,012	3.0	3,077	2.4	4,935	3.6
80+	11,120	4.2	3,718	2.9	7,402	5.4
Totals	265,285	100.0	128,212	100.0	137,073	100.0

[1]1992 CASMU membership aged in proportion to age distribution changes reflected in the official national projection, 1990-2000 and 2000-2010. This projection assumes no change in size of CASMU membership over that of 1992.

EXHIBIT 15
PROJECTION D: ABBREVIATED AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, 2000, AND 2010 (revised projection)[1]

	Both Sexes		Male		Female	
	N	%	N	%	N	%
2000						
0-14	45,437	16.1	23,156	17.0	22,281	15.3
15-44	113,196	40.2	56,256	41.3	56,940	39.1
45-64	72,268	25.6	35,279	25.9	36,989	25.4
65+	50,938	18.1	21,522	15.8	29,416	20.2
65-69	16,356	5.8	7,764	5.7	8,592	5.9
70-74	13,975	5.0	6,402	4.7	7,573	5.2
75-79	8,930	3.2	3,542	2.6	5,388	3.7
80+	11,532	4.1	3,814	2.8	7,718	5.3
Totals	281,838	100.0	136,212	100.0	145,626	100.00
2010						
0-14	46,320	15.3	23,663	16.1	22,657	14.5
15-44	117,826	38.8	59,230	40.3	58,596	37.5
45-64	81,394	26.8	39,830	27.1	41,564	26.6
65+	57,690	19.0	24,251	16.5	33,439	21.4
65-69	15,346	5.1	6,908	4.7	8,438	5.4
70-74	13,958	4.6	6,614	4.5	7,344	4.7
75-79	10,659	3.5	4,409	3.0	6,250	4.0
80+	17,580	5.8	6,173	4.2	11,407	7.3
Totals	303,229	100.0	146,973	100.0	156,256	100.0

[1]1992 CASMU membership aged in proportion to age distribution changes reflected in the revised national projection, 1990-2000 and 2000-2010. This projection also assumes that the size of the CASMU membership increases in proportion to the projected increase of the national population over the periods 1990-2000 and 2000-2010. For the period 1990-2000, both the male and female populations would increase by 7.8 percent. For 2000-2010, the male population would increase by 7.9 percent and the female population by 7.3 percent.

younger. Projection D clearly shows the effects of population aging particularly in the latter year and for the female population.

4.3 PATTERNS OF HEALTH CARE

Health care costs are influenced by a variety of variables (Drummond et al., 1987, Jacobs, 1991). With regard to hospitalization, some of the most important factors include the proportion of the population that is hospitalized, given a particular type of disease, the length of time patients are provided with care, the mix and cost of inputs required to provide care to patients, the efficiency with which services are provided, and the level of care demanded by consumers. This analysis treats the first two of these factors.

4.3.1 Hospitalization by Diagnosis

Hospitalization rates for CASMU membership during the 1991-92 period are shown in Exhibit 16. These rates are used for purposes of this analysis, and are assumed to remain constant. It should be noted that this assumption could be challenged for two reasons. First, future changes in health care policy could result in a lower (or perhaps higher) probability of hospitalization for certain diagnoses. For example, in many countries there has been a growing tendency to treat patients on an out-patient basis whenever possible because of the lower costs. Second, prevalence rates of given diseases are subject to change, e.g., the long-term rise in heart disease observed in many industrialized nations.

4.3.2 Length of Stay in Hospital

Data on length of stay (LOS) for hospitalized CASMU patients for the years 1986 and 1991 are presented in Exhibit 17. These data are separated by age, sex of patient, and diagnosis. While these appear to have declined overall during the five-year interval, the 1991 figures have been used for this analysis.

4.4 HOSPITALIZATION COSTS

Hospitalization costs for the CASMU membership are estimated for three categories of illness: (1) all diagnoses, (2) neoplasms, and (3) cerebro- and cardiovascular disease. The latter two categories of illness were chosen for analysis for several reasons. First, they can be related theoretically to the later stages of the epidemiologic and demographic transitions, a situation that has characterized the Uruguayan population for some time. Second, cardiovascular and cerebrovascular disease are the principal members of a larger class of chronic illness (diseases of the circulatory system) that over the past several decades has accounted for an increasingly large majority of deaths in Latin America and the Caribbean (Pan American Health Organization, 1990, Vol I, Figure 13) and in Uruguay (1992C). Third, because these diseases are linked to common behavioral risk factors, they are amenable to prevention and control. Thus appropriate intervention strategies could result in decreased morbidity and lowered health care costs. Finally, these diseases are especially prevalent among the older members of the population. Cost information for all diagnoses is also presented in order to estimate the impact of aging on overall hospitalization costs. (Data are also available for a residual category of "other diagnoses," but would add little to the substantive analysis.)

EXHIBIT 16
ESTIMATED HOSPITALIZATION RATES, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES, SEX, AND DIAGNOSIS, 1991-92

	No.[1]	All Diagnoses		Neoplasms		Cerebro/Cardiovas-cular Disease		Other Diagnoses	
		N[2]	%	N[2]	%	N[2]	%	N[2]	%
Both Sexes									
0-14	47,177	6,339	13.44	75	0.16	12	0.03	6 252	13.25
15-44	104,879	9,502	9.06	600	0.57	244	0.23	8,658	8.26
45-64	71,807	7,385	10.28	1,063	1.48	1,104	1.54	5,218	7.27
65 +	41,422	7,651	18.47	1,045	2.52	1,921	4.64	4,685	11.31
65-69	14,572	2,079	14.27	316	2.17	421	2.89	1,342	9.21
70-74	10,705	1,836	17.15	270	2.52	424	3.96	1,142	10.67
75-79	7,686	1,613	20.99	218	2.84	431	5.61	964	12.54
80 +	8,459	2,123	25.10	241	2.85	645	7.63	1,237	14.62
All Ages	265,285	30,877	11.64	2,783	1.05	3,281	1.24	24,813	9.35
Males									
0-14	24,055	3,450	14.34	49	0.20	6	0.02	3,395	14.11
15-44	51,553	2,184	4.24	155	0.30	134	0.26	1,895	3.68
45-64	34,997	3,522	10.06	402	1.15	768	2.19	2,352	6.72
65 +	17,607	3,699	21.01	547	3.11	941	5.34	2,211	12.56
65-69	6,791	1,133	16.68	179	2.64	263	3.87	691	10.18
70-74	4,815	973	20.21	142	2.95	254	5.28	577	11.98
75-79	3,055	755	24.71	111	3.63	200	6.55	444	14.53
80 +	2,946	838	28.45	115	3.90	224	7.60	499	16.94
All Ages	128,212	12,855	10.03	1,153	0.90	1,849	1.44	9,853	7.68

EXHIBIT 16 (continued)

	No.[1]	All Diagnoses		Neoplasms		Cerebro/Cardiovas-cular Disease		Other Diagnoses	
		N[2]	%	N[2]	%	N[2]	%	N[2]	%
Females									
0-14	23,122	2,889	12.49	20	0.11	6	0.03	2,857	12.36
15-44	53,326	7,318	13.72	445	0.83	110	0.21	6,763	12.68
45-64	36,810	3,863	10.49	661	1.80	336	0.91	2,866	7.79
65+	23,815	3,952	16.59	498	2.09	980	4.12	2,474	10.39
65-69	7,781	946	12.16	137	1.76	158	2.03	651	8.37
70-74	5,890	863	14.65	128	2.17	170	2.89	565	9.59
75-79	4,631	858	18.53	107	2.31	231	4.99	520	11.23
80+	5,513	1,285	23.31	126	2.29	421	7.64	738	13.39
All Ages	137,073	18,022	13.15	1,630	1.19	1,432	1.04	14,940	10.90

Number of persons in age category, May 1992.

Number of persons hospitalized with a given diagnosis during the preceding year.

Note: It was not possible to identify or control for multiple hospitalizations for individual persons.

Source: CASMU data.

EXHIBIT 17
MEAN LENGTH OF STAY IN HOSPITAL, CASMU MEMBERSHIP, BY DIAGNOSIS, AGE, AND SEX, 1986 AND 1991[1]

	Males		Females		Both Sexes	
	1986	1991	1986	1991	1986	1991
All Diagnoses						
0-14	3.0	2.7	3.1	2.9	3.1	2.8
15-44	5.3	5.0	3.9	3.5	4.3	3.8
45-64	7.4	7.1	5.7	5.2	6.5	6.1
65+	9.1	8.0	9.0	8.0	9.0	8.0
65-69	8.9	7.7	8.5	7.8	8.7	7.8
70-74	8.4	6.5	8.6	7.5	8.5	8.0
75-79	9.6	8.3	9.7	8.1	9.7	8.2
80+	9.8	7.6	9.4	8.3	9.5	8.0
All Ages	6.0	5.8	5.1	4.7	5.5	5.2
Malignant Neoplasms						
0-14	3.2	2.6	2.3	1.7	2.9	2.3
15-44	5.0	6.9	3.8	3.5	4.1	4.4
45-64	9.9	9.3	6.3	5.7	7.9	7.1
65+	10.4	9.2	10.2	8.2	10.3	8.7
65-69	9.9	7.5	10.2	8.0	10.1	7.8
70-74	10.2	10.4	8.8	8.3	9.5	9.4
75-79	10.7	10.2	11.5	8.1	11.1	9.2
80+	11.1	9.2	11.2	8.4	11.2	8.8
All Ages	9.0	8.6	6.5	5.8	7.6	7.0

EXHIBIT 17 (continued)

	Males		Females		Both Sexes	
	1986	1991	1986	1991	1986	1991
Cerebro/Cardiovascular Disease						
0-14	3.2	8.5	4.3	4.3	3.6	6.4
15-44	7.2	6.0	4.5	5.8	5.9	5.9
45-64	9.6	8.8	8.4	7.4	9.2	8.4
65+	10.7	9.2	10.4	9.1	10.6	9.2
65-69	11.5	9.1	11.2	11.2	11.4	9.9
70-74	10.2	10.1	9.7	9.0	10.0	9.7
75-79	10.6	9.9	11.2	9.7	10.9	9.8
80+	10.4	7.6	9.9	8.1	10.0	7.9
All Ages	9.7	8.8	8.9	8.4	9.4	8.6
Other Diagnoses						
0-14	3.0	2.7	3.1	2.9	3.1	2.8
15-44	5.2	4.8	3.9	3.4	4.3	3.7
45-64	6.4	6.2	5.3	4.8	5.8	5.4
65+	8.2	7.3	8.4	7.5	8.3	7.4
65-69	7.8	7.2	7.5	7.0	7.6	7.1
70-74	7.4	7.3	8.3	6.9	7.8	7.1
75-79	9.0	7.2	8.8	7.4	8.9	7.3
80+	9.2	7.3	8.9	8.4	9.0	8.0
All Ages	5.2	4.9	4.6	4.3	4.9	4.5

[1] The figures presented reflect mean number of bed-days in hospital.

Source: CASMU data archives.

Cost data are available for three fiscal periods, September-August 1989/90, 1990/91, and 1991/92. The cost data provided for 1991/92 are based on estimated budgets for the period; CASMU officials indicate that budgeted costs have proven to be very close to actual costs in past years.

4.4.1 All Diagnoses

For 1989/90, a total of N$16.3 billion was spent to cover 172,479 bed-days of hospitalization, yielding an average bed-day cost of N$94,611. (The weighted average exchange rate for 1989/90 was US$1 = N$903.) For 1990/91, the amount spent on hospitalization was N$39.1 billion, an average bed-day cost of N$220,269. (The weighted exchange rate for 1990/91 was US$1 = N$1,737.) The figure budgeted for 1991/92 was N$78 billion, for an average bed-day cost of N$412,552. (The weighted average exchange rate for 1991/92 was US$1 = N$2,624.)

4.4.2 Neoplasms

Hospital treatment for neoplasms is divided into two categories, depending on whether surgery is required. Surgery is performed for approximately 50 percent of the neoplasm diagnoses at either of two CASMU facilities, Sanatorio 1 and Sanatorio 2. In 1989/90, Sanatorio 1 accounted for 39.6 percent of the discharges from these two hospitals. During 1990/91, this figure increased to 50.3 percent and for 1991/92, it declined slightly to 49.1 percent. During the first period, the average bed-day cost for Sanatorio 1 was N$133,958; for Sanatorio 2, it was N$115,691, yielding a weighted average of N$122,924. For 1990/91, the weighted average was N$300,261, and for 1991/92, the weighted average cost was N$597,559. The average bed-day charge for the 50 percent of neoplasm cases that do not require surgery is assumed to be that for CASMU contractors. For 1989/90, this figure was N$62,606; for 1990/91, it was N$139,127; and for 1991/92, it was N$220,051. Given that 50 percent of neoplasm cases undergo surgery, the average bed-day cost for all neoplasm cases is N$92,765 for 1989/90, N$219,694 for 1990/91, and N$408,805 for 1991/92.

4.4.3 Cerebro/cardiovascular Disease

CASMU members with this category of illness are treated either at Sanatorio 4 or by one of the contractors. For the three-year period, Sanatorio 4 accounted for between 10 and 20 percent of the discharges from the two types of facility. For the first period under consideration, the average bed-day cost for Sanatorio 4 was N$151,575, while for the contractor facilities it was, as indicated, N$62,606. During 1990/91, the daily average was N$329,664 for Sanatorio 4 and N$139,127 for the contracted facilities. For 1991/92, the cost per bed-day at Sanatorio 4 was N$668,065, and for the contractors, N$220,051. Using the proportions of discharges accounted for by the two types of facility for the periods under examination yields average bed-day costs for hospital treatment of cerebro/cardiovascular disease of N$71,414 for 1989/90, N$177,615 for 1990/91, and N$265,300 for 1991/92.

4.4.4 Summary of Average Bed-Day Costs

Differences and short-term trends in average bed-day costs for the diagnoses considered here are summarized in Exhibit 18. The increased cost of medical care over this two-year period is not unexpected, given the high and increasing annual rate of inflation in recent years. (Inflation rates - based on consumer price indexes - for the aforementioned periods account for much, although not all, of the cost increases. From 1990 to 1991, inflation was on the order of 100 percent, and from 1991 to 1992, more than 30 percent. [International Financial Statistics, International Monetary Fund, June 1992.]) While other factors, such as changes in medical technology, shifts in the relative mix of input use, or different treatment patterns, may have played a role in these cost increases, this study was unable to analyze those in any detail.

EXHIBIT 18
AVERAGE BED-DAY COSTS FOR HOSPITALIZATION BY DIAGNOSIS, CASMU MEMBERSHIP, 1989/90, 1990/91, AND 1991/92

	All Diagnoses	% increase	Neoplasms	% increase	Cerebro/cardio-vascular Disease	% increase
1989/90	N$94,611		N$92,765		N$71,414	
1990/91	N$220,269	133%	N$219,694	138%	N$177,615	149%
1991/92	N$412,552	87%	N$408,805	86%	N$265,300	49%

One surprising result from analysis of the data is the relative level of costs among the three diagnosis categories. It would seem somewhat counter-intuitive that neoplasms and cerebro/cardiovascular diseases would have lower costs than would all diagnoses. One possible explanation lies in the fact that those two diagnostic categories have correspondingly longer lengths of stay, such that costs are spread over a longer period of time, thereby diluting the cost picture. This is confirmed by the fact that if one analyzes costs on a per-admission basis rather than per bed-day, the average costs for neoplasms and cerebro-cardiovascular are higher than for all diagnoses.

4.4.5 Current Patterns

Current (1991) cost calculations for hospitalization of CASMU members, differentiated by age and sex, are presented in Exhibits 19-21, and summarized in Exhibit 22. (The cost estimates presented in these and subsequent exhibits are not absolutely precise. Several of the components of the calculations were rounded. Moreover, estimates disaggregated by sex were calculated independently within diagnostic categories. Thus component costs may not sum exactly to total costs.) Generally, costs increase with age and are higher for the larger female population. Among the elderly, the largest costs are observed for the 80 and over population. Relative cost distributions are reported in Exhibit 23 and Figure 2, which show even more clearly that the elderly account for a disproportionate share of hospitalization costs, particularly with regard to cerebro/cardiovascular disease.

EXHIBIT 19
ESTIMATED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 1991
(all diagnostic categories)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
Both Sexes				
0-14	47,177	6,339	2.8	7,322,468
15-44	104,879	9,502	3.8	14,896,263
45-64	71,807	7,385	6.1	18,584,849
65+	41,422	7,651	8.0	25,251,483
65-69	14,572	2,079	7.8	6,690,026
70-74	10,705	1,836	8.0	6,059,564
75-79	7,686	1,613	8.2	5,456,660
80+	8,459	2,123	8.0	7,006,783
All Ages	265,285	30,877	5.2	66,055,063
Males				
0-14	24,055	3,450	2.7	3,842,922
15-44	51,553	2,184	5.0	4,505,068
45-64	34,997	3,522	7.1	10,316,357
65+	17,607	3,699	8.0	12,208,238
65-69	6,791	1,133	7.7	3,599,145
70-74	4,815	973	8.5	3,412,011
75-79	3,055	755	8.3	2,585,257
80+	2,946	838	7.6	2,627,461
All Ages	128,212	12,855	5.8	30,872,585

EXHIBIT 19 (continued)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
		Females		
0-14	23,122	2,889	2.9	3,456,402
15-44	53,326	7,318	3.5	10,566,694
45-64	36,810	3,863	5.2	8,287,180
65+	23,815	3,952	8.0	13,043,244
65-69	7,781	946	7.8	3,044,139
70-74	5,890	863	7.5	2,670,243
75-79	4,631	858	8.1	2,867,154
80+	5,513	1,285	8.3	4,400,073
All Ages	137,073	18,022	4.7	35,353,520

[1] Number of persons in age category.

[2] Mean number of days of hospital bed-occupancy (length of stay) for 1991.

[3] Thousands of N$ (new pesos); calculated at N$412,552 per bed-day.

Sources: Exhibits 10, 16, and 17

EXHIBIT 20
ESTIMATED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 1991
(Neoplasms)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
Both Sexes				
0-14	47,177	75	2.3	70,519
15-44	104,879	600	4.4	1,079,245
45-64	71,807	1,063	7.1	3,085,374
65+	41,422	1,045	8.7	3,716,651
65-69	14,572	316	7.8	1,007,623
70-74	10,705	270	9.4	1,037,547
75-79	7,686	218	9.2	819,899
80+	8,459	241	8.8	866,994
All Ages	265,285	2,787	7.0	7,951,789
Males				
0-14	24,055	48	2.6	51,019
15-44	51,553	155	6.9	437,217
45-64	34,997	402	9.3	1,528,358
65+	17,607	548	9.2	2,061,031
65-69	6,791	179	7.5	548,821
70-74	4,815	142	10.4	603,723
75-79	3,055	111	10.2	462,849
80+	2,946	115	9.2	432,516
All Ages	128,212	1,154	8.6	4,077,625

EXHIBIT 20 (continued)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
Females				
0-14	23,122	25	1.7	17,374
15-44	53,326	443	3.5	633,852
45-64	36,810	663	5.7	1,544,915
65+	23,815	498	8.2	1,669,396
65-69	7,781	137	8.0	448,050
70-74	5,890	128	8.3	434,314
75-79	4,631	107	8.1	354,311
80+	5,513	126	8.4	432,679
All Ages	137,073	1,631	5.8	3,865,537

[1] Number of persons in age category.

[2] Mean number of days of hospital bed-occupancy (length of stay) for 1991.

[3] Thousands of N$ (new pesos); calculated at N$408,805 per bed-day. This figure assumes that 50 percent of neoplasm patients undergo surgery and 50 percent do not. The average bed-day cost for surgery patients is N$597,559 while for non-surgery patients the figure is N$220,051.

Sources: Exhibits 10, 16, and 17

EXHIBIT 21
ESTIMATED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 1991
(Cerebro/Cardiovascular Disease)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
Both Sexes				
0-14	47,177	12	6.4	20,375
15-44	104,879	244	5.9	377,230
45-64	71,807	1,104	8.4	2,460,286
65+	41,422	1,921	9.2	4,688,700
65-69	14,572	421	9.9	1,105,744
70-74	10,705	424	9.7	1,091,126
75-79	7,686	431	9.8	1,120,574
80+	8,459	645	7.9	1,351,836
All Ages	265,285	3,281	8.6	7,546,591
Males				
0-14	24,055	6	8.5	13,530
15-44	51,553	134	6.0	213,301
45-64	34,997	768	8.8	1,793,004
65+	17,607	941	9.2	2,296,755
65-69	6,791	263	9.1	634,942
70-74	4,815	254	10.1	680,601
75-79	3,055	200	9.9	525,294
80+	2,946	224	7.6	451,647
All Ages	128,212	1,849	8.8	4,316,590

EXHIBIT 21 (continued)

	No.[1]	No. Hospitalized	Avg. LOS[2]	Total Cost (N$)[3]
		Females		
0-14	23,122	6	4.3	6,845
15-44	53,326	110	5.8	172,339
45-64	36,810	336	7.4	659,642
65+	23,815	980	9.1	2,365,945
65-69	7,781	158	11.2	469,475
70-74	5,890	170	9.0	405,909
75-79	4,631	231	9.7	594,458
80+	5,513	421	8.1	904,700
All Ages	137,073	1,432	8.4	3,204,771

[1] Number of persons in age category.

[2] Mean number of days of hospital bed-occupancy (length of stay) for 1991.

[3] Thousands of N$ (new pesos); calculated at N$265,300 per bed-day.

Sources: Exhibits 10, 16, and 17

EXHIBIT 22
SUMMARY OF ESTIMATED COSTS OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES, DIAGNOSIS, AND SEX, 1991[1]

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	7,322	3,843	3,456	71	51	17	20	14	7
15-44	14,896	4,505	10,567	1,079	437	634	377	213	172
45-64	18,585	10,316	8,287	3,085	1,528	1,545	2,460	1,793	660
65 +	25,251	12,208	13,043	3,717	2,061	1,669	4,689	2,297	2,366
65-69	6,690	3,599	3,044	1,008	549	448	1,106	635	469
70-74	6,060	3,412	2,670	1,038	604	434	1,091	681	406
75-79	5,457	2,585	2,867	820	463	354	1,121	525	594
80 +	7,007	2,627	4,400	867	433	433	1,352	452	905
All Ages	66,055	30,873	35,354	7,952	4,078	3,866	7,547	4,317	3,205

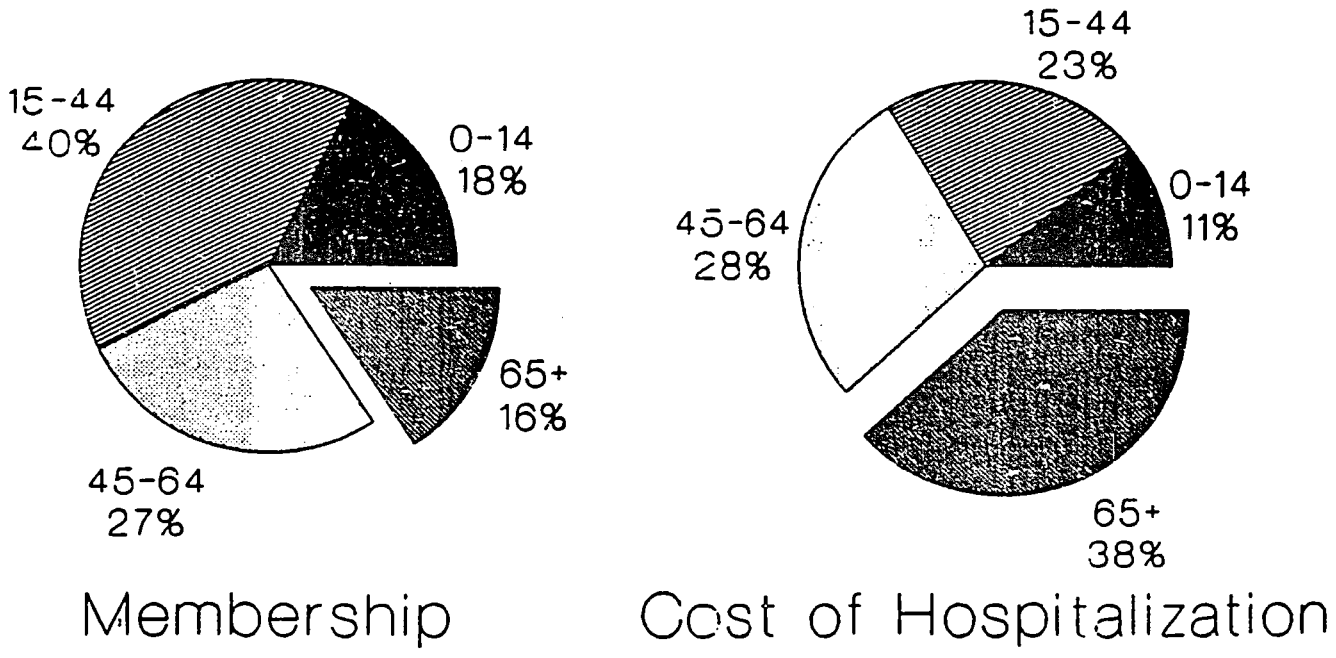
[1] Millions of new pesos (N$).

EXHIBIT 23
PERCENTAGE OF COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 1991

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	11.1	12.4	9.8	0.9	1.2	0.5	0.3	0.3	0.2
15-44	22.6	14.6	29.9	13.6	10.8	16.4	5.0	4.9	5.4
45-64	28.1	33.4	23.4	38.8	37.5	39.9	32.6	41.6	20.5
65+	38.2	39.5	36.9	46.7	50.6	43.2	62.1	53.2	73.8
65-69	10.1	11.7	8.6	12.7	13.5	11.6	14.6	14.7	14.6
70-74	9.2	11.0	7.6	13.0	14.8	11.3	14.5	15.8	12.7
75-79	8.3	8.4	8.1	10.3	11.3	9.2	14.8	12.2	18.6
80+	10.6	8.5	12.4	10.9	10.6	11.2	17.9	10.5	28.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

FIGURE 2

CASMU MEMBERSHIP AND HOSPITALIZATION
Cost Compared by Major Age Group



Membership data from 1992;
Hospitalization data from 1991.

Exhibit 24 presents calculations of the ratio of percent of population in a given age-sex category to percent of hospitalization costs accounted for by that category. This is done separately for the three diagnostic categories. A score of 100 indicates equivalence in the distribution of population and hospital costs. Clearly, persons under 45 years of age account for a disproportionately small share of hospital costs, particularly for treatment of neoplasms and cerebro/cardiovascular disease, as do females in the 45-64 age group. The costs of treating persons 65 and older are at least twice the proportionate population distribution, and the ratio reaches 500-700 for those over 75 in the case of cerebro/cardiovascular disease.

EXHIBIT 24
RATIO OF POPULATION TO HOSPITALIZATION COSTS BY AGE, SEX, AND DIAGNOSIS, CASMU MEMBERSHIP, 1991[1]

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	62	66	58	5	6	3	2	2	1
15-44	57	36	77	34	27	42	13	12	14
45-64	104	122	87	143	137	149	120	152	76
65+	245	288	212	299	369	248	398	388	424
65-69	184	221	151	231	255	204	262	277	256
70-74	230	289	177	325	389	263	362	416	295
75-79	286	350	238	355	471	271	510	508	547
80+	331	370	310	341	461	280	559	456	705

[1] Percentage of costs/percentage of population * 100.

5.0 RESULTS OF PROJECTIONS OF HOSPITALIZATION COSTS

5.1 PROJECTED COSTS IN YEARS 2000 AND 2010

The effects of population aging on hospitalization costs under the four alternative scenarios are summarized in Exhibit 25. (Detailed cost estimates for each of the three disease categories, separated by sex and age, using Projections A and B, are included in the Appendix, Tables 1 and 2. Results from Projections C and D are also included, although not with as extensive detail.) Costs of hospitalization for CASMU members are estimated using both the official and revised population projections, and assuming both no change and growth in the size of the CASMU membership. Thus, for example, total costs for all diagnoses are estimated to increase from N$66 billion in 1991 to N$67 billion in the year 2000 under Projection A, or to N$69 billion under Projection B. Under Projection D, which assumes rapid aging and an increase in the CASMU membership, by the year 2010, total costs would rise to N$80 billion. Exhibit 25 presents data for each of the three diagnosis categories, and includes the costs incurred for the 65 and over population. For example, while the elderly population accounted for 47 percent of the costs of neoplasm hospitalizations in 1991, that figure would increase slightly to 49 percent in 2000 (under Projection A), and would then drop back to 47 percent in 2010.

Exhibit 26 translates the data on projected costs of hospitalization into percentage changes, giving a more precise picture of the effects of population aging. The increase in total costs during the first of the two decades ranges from 1.8 percent under Projection A to 10.3 percent under Projection D; similar patterns are reflected for the two specific disease categories, but are universally higher. Looking at the two-decade period from 1991-2010, the increase in total costs ranges from 2.0 percent in Projection A to 21.4 percent in Projection D. It should be noted that the increases during the second decade are generally smaller than during the first, and in a few cases (for the over 65 population under Projection A), costs actually decrease during that period.[4]

In all cases, the percentage increase in costs for the elderly population exceeds that for the total population. Under Projection C, for example, during the 1991-2000 period, costs for all diagnoses will increase by 6.6 percent for the CASMU membership as a whole, but by 12.2 percent for the membership older than 65 years. This reflects the fact that the elderly population, although growing in both absolute and relative numbers, still accounts for a relatively small proportion of the overall membership. Thus, because costs are growing at lower rates (and in some cases decreasing) for the other age segments, the large increase in costs due to the elderly is somewhat mitigated, resulting in lower overall costs.

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[4] The fact that costs decrease in this category is a function of the way in which Projection A is carried out. Under this scenario, the size of CASMU is held constant, while the different segments of the population are aged in line with population projections. As a result, the number of CASMU members aged 65 and over decreases, resulting in a drop in costs for that age group. While this calculation gives some idea of cost changes due to relative changes in the age breakdown of CASMU membership, the results are skewed by the fact that holding the size of CASMU constant forces the number of elderly members to drop. Although those at the top end of the age distribution may drop out over a 10-year period, members from the significantly larger 45-64 age group are likely to move into the elderly group. Therefore, these projections should be interpreted with this caveat in mind.

5.2 RELEVANCE OF URUGUAY'S EXPERIENCE TO OTHER DEVELOPING COUNTRIES

The results from the projections of hospitalization costs would appear to be relatively low, particularly in the case of Projection A (the "slow" aging assumption), in which total costs would increase by two percent over the next two decades. The significantly higher figures under Projections C and D must be considered in light of the fact that the membership of CASMU is growing, and therefore part of the increase in costs is due to population growth, not to the aging of the population per se. (This is treated in further detail in Section 5.4.)

In many respects, however, these figures must be interpreted in an appropriate context. The results indicate that in the 20-year period, under Projection A, the costs of hospitalization for CASMU members will increase by two percent solely as a result of the aging of the population. Again, this analysis has not been able to consider other factors which would affect those costs, such as changes in demand for services, different mix of inputs for providing services, or inflationary effects.

Another important factor to take into account is the aging of the population itself. One of the primary objectives of this exercise was to discern the costs of the demographic and epidemiological transitions occurring in many developing countries. To that extent, the relevant research question is: What will happen in most developing countries as their populations age?

As indicated earlier in this report, this transition has already occurred, by and large, within Uruguay. Using a rule of thumb that an "aged" population is one in which less than 25 percent of the population is under the age of 15 and in which at least 10 percent is over the age of 65, Uruguay is not a country going through the transition, but one which has already completed it. Population statistics for 1990 indicate that 11.6 percent of the population was in the 65 and older age group. (For purposes of comparison, statistics from the U.S. Bureau of the Census, International Data Base indicate the following proportions of the population 65 and over in several countries: Germany, 15 percent; United States, 13 percent; Japan, 13 percent; Argentina, 9 percent; Jamaica, 7 percent; Brazil, 5 percent; Bolivia, 4 percent.) Furthermore, the 1991 data for CASMU, on which this analysis is based, indicate that 15.6 percent of the membership was elderly.

As a result, these projections of cost increases over the next 20 years do not reflect the aging process most developing countries will go through. Rather, since Uruguay's population is already "aged," the increase in costs due to further aging shown here is likely to be lower than what can be expected by other countries.

5.3 ESTIMATES FROM PREVIOUS TIME PERIODS

Given that the baseline 1991 figures already reflected an "aged" population, an attempt was made to analyze a time period during which a more pronounced aging trend took place. As part of this study, this methodology was applied to data from 1980. Results are shown in Exhibit 27.

EXHIBIT 25
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP

	1991	2000				2010			
		Proj. A	Proj. B	Proj. C	Proj. D	Proj. A	Proj. B	Proj. C	Proj. D
All Diagnoses Total	66,055,000	67,250,001	68,599,600	70,432,283	72,886,846	67,387,687	70,127,734	74,379,554	80,159,600
65 +	25,251,000	27,052,256	29,228,484	28,330,649	31,052,582	26,673,962	30,776,379	29,331,638	35,168,704
65+/Total	38%	40%	43%	40%	43%	40%	44%	39%	44%
Neoplasms Total	7,952,000	8,179,125	8,374,983	8,574,298	8,908,418	8,294,736	8,702,027	9,150,122	9,955,338
65+	3,717,000	3,976,283	4,296,377	4,169,859	4,570,488	3,922,934	4,524,000	4,317,190	5,176,321
65+/Total	47%	49%	51%	49%	51%	47%	52%	47%	52%
Cereb/ cardio Total	7,547,000	7,844,855	8,171,744	8,226,307	8,673,767	7,934,539	8,554,731	8,734,877	9,767,970
65+	4,689,000	5,015,992	5,430,691	5,260,440	5,765,849	4,954,743	5,718,701	5,446,304	6,530,131
65+/Total	62%	64%	66%	65%	67%	62%	67%	63%	67%

Figures are in thousands of new pesos (N$).

Projection A: official projection, no change in size of CASMU membership.
Projection B: revised projection, no change in size of CASMU membership.
Projection C: official projection, CASMU membership grows at same rate as population.
Projection D: revised projection, CASMU membership grows at same rate as population.

EXHIBIT 26
PERCENT CHANGE IN COST OF HOSPITALIZATION, CASMU MEMBERSHIP

	1991 - 2000				2000 - 2010			
	Proj. A	Proj. B	Proj. C	Proj. D	Proj. A	Proj. B	Proj. C	Proj. D
All Diagnoses								
Total	1.8%	3.9%	6.6%	10.3%	0.2%	3.9%	5.6%	10.0%
65 +	7.1%	15.8%	12.2%	23.0%	-1.4%	5.3%	3.5%	13.3%
Neoplasms								
Total	2.9%	5.3%	7.8%	12.0%	1.4%	3.9%	6.7%	11.8%
65+	7.0%	15.6%	12.2%	23.0%	-1.3%	5.3%	3.5%	13.3%
Cerebro/cardio								
Total	4.0%	8.3%	15.1%	21.4%	1.1%	4.7%	6.2%	12.6%
65+	7.0%	15.8%	12.2%	31.0%	-1.2%	5.3%	3.9%	13.3%

Projection A: official projection, no change in size of CASMU membership.
Projection B: revised projection, no change in size of CASMU membership.
Projection C: official projection, CASMU membership grows at same rate as population.
Projection D: revised projection, CASMU membership grows at same rate as population.

EXHIBIT 27
PROJECTED COSTS OF HOSPITALIZATION, 1980 - 1991

	1980[1]	1990[2]	% increase	1991[3]	% increase[4]
All Diagnoses Total	58,283,514	59,383,415	1.9%	66,055,063	13.3%
65 +	16,994,116	18,759,727	10.4%	25,251,483	48.6%
65 + /Total	29%	32%	---	38%	---
Neoplasms Total	6,170,717	6,366,810	3.2%	7,951,789	28.9%
65 +	2,501,286	2,761,159	10.4%	3,716,651	48.6%
65 + /Total	41%	43%	---	47%	---
Cereb/ cardio Total	5,528,677	5,799,137	4.9%	7,551,287	36.6%
65 +	3,155,471	3,483,309	10.4%	4,688,700	48.6%
65 + /Total	57%	60%	---	62%	---

Cost figures are in thousands of constant (1991) new pesos (N$).

[1] 1980 figures are based on actual population data and breakdowns by age category. The relative proportions are applied to the 1991 CASMU membership total of 265,285. The proportion of the population aged 65 and over is 10.5 percent.

[2] 1990 figures are based on actual population data and breakdowns by age category. The relative proportions are applied to the 1991 CASMU membership total of 265,285. The proportion of the population aged 65 and over is 11.6 percent.

[3] 1991 figures reflect actual CASMU membership for that year. The proportion of the membership aged 65 and over is 15.6 percent.

[4] Increase from 1980.

These calculations were made using actual population breakdowns from 1980 and 1990, and applying those to the 1991 CASMU membership and to the average bed-day costs previously developed. In this scenario, total costs for all diagnoses would have increased by 1.9 percent during the 10-year period, a figure very similar to that estimated under Projection A. Again, the increase in costs for the elderly population is significantly higher (10.4 percent) in each of the three disease categories.

If the 1980 projections are compared to costs estimated for the 1991 CASMU membership, the increase in costs is quite striking. From 1980 to 1991, total costs for all diagnoses would have increased by 13.3 percent; for the elderly population, that figure would be almost 50 percent. For the two other disease categories, the increase in costs is similarly high (29 percent for neoplasms, and 37 percent for cerebro/cardiovascular).

To account for the dramatic difference between the two estimates, it is necessary to examine the underlying population breakdowns. As indicated above, the rate of aging during the 1991 - 2000 period was relatively low, given that Uruguay's population seems to have already completed the demographic and epidemiologic transition. Similarly, in estimating the change in costs from 1980 to 1990, using actual age breakdowns for the population, the proportion of elderly increased from 10.5 percent in 1980 to 11.6 percent in 1990. However, when the 1980 data are compared with that from 1991, the proportion of elderly increases from 10.5 percent to 15.6 percent. Given that dramatic rise, it is not surprising that costs would jump so precipitously. It is important to recognize, though, that such a dramatic increase in aging (and therefore costs) is not likely to occur during a decade. It results from the fact that the 1980 data reflect the age breakdown of the actual population in Uruguay. On the other hand, the 1991 data reflect the age breakdown of the CASMU membership only, which is relatively older than the overall population. Thus, although these estimates should not be interpreted out of context, they do provide some indication of the potential increase in costs due to an aging population.

5.4 COSTS OF HOSPITALIZATION PER CAPITA

As noted, the estimates of cost increases from Projections A through D must be interpreted carefully. The results from Projections A and B may be skewed by the fact that the size of the CASMU membership is held constant throughout the 20-year period. Because this constrains (perhaps unrealistically) the numbers of members in each of the age groups, particularly the elderly, the results may not accurately reflect the makeup of CASMU membership with a growing population. Thus, Projections C and D would appear to provide better indications of realistic cost increases. At the same time, though, the significantly higher figures from those two projections include increases in costs due to increased numbers of members, rather than solely due to aging. To circumvent that difficulty, however, is a relatively simple matter of examining the costs per capita under Projections C and D, so that the increase in cost due to aging can be isolated.

Exhibit 28 provides data on the costs of hospitalization per capita, and per working age CASMU member, under each of the four projections. Clearly, when examined on a per capita basis, the increases in costs from Projections C and D drop to the same range as the figures for Projections A and B. Thus, for example, the cost of hospitalization per capita (for all diagnoses) would be expected to increase by 1.8 to 3.9 percent by the year 2000; by the end of the following decade, the cumulative increase would be from 2.0 to 6.2 percent. These results are shown graphically in Figure 3.

From a financing perspective, it is also relevant to consider the cost of hospitalization per working age member (15-64), since it is this segment of the membership that is likely to making payments to CASMU, and subsidizing other members (children and the elderly). As shown in Exhibit 28 and Figure 4, total costs per working age member would increase by 1.1 to 5.1 percent by the year 2000. By the year 2010, under Projections B and D (the rapid aging assumption), these costs would increase by 7.6 percent. However, under the other two scenarios, using the slow aging assumption, costs per working age member would actually decrease during the two-decade period. In this case, the increase in working age CASMU members would outweigh the overall increase in costs.

5.5 ESTIMATING AN AGE ELASTICITY OF COST

While the cost per capita and per working age member figures give a clearer indication of the effect of aging, the fact remains that these analyses have been carried out for a country that has substantially completed the aging process. To that extent, the results may not accurately indicate what is likely to happen in developing countries which have yet to face an aging population.

Nevertheless, it is possible to use the data from this analysis to develop an indicator of how costs may change as the proportion of elderly in the population changes. Rather than directly taking the results of this analysis of an Uruguayan situation, policymakers in other countries could apply a more general guideline to estimating the likely impact of aging. Using the results of the four projections developed earlier, as well as the estimates from previous time periods, it was possible to analyze the relationship between aging of the population and cost increases, and to develop an indicator for use by policymakers.

Economists use the concept of elasticities to measure the way in which a change in one variable (such as price or income) will affect another variable (such as quantity demanded). Elasticities are expressed in terms of the percentage change in one variable (e.g., quantity) that will result from a percentage change in another (e.g., price). As part of this analysis, an indicator termed an "age elasticity of cost" was developed. This indicator reflects the change in costs per capita that will occur with a given change in the proportion of the elderly in the population. The age elasticity of cost was estimated for each of the four projections, over 10 and 20-year periods, and was also estimated using the 1980 data. Results are shown in Exhibit 29.

EXHIBIT 28
COST OF HOSPITALIZATION PER CAPITA AND PER WORKING AGE CASMU MEMBER

	1991	2000				2010			
		Proj. A	Proj. B	Proj. C	Proj. D	Proj. A	Proj. B	Proj. C	Proj. D
Total Cost	66,055,000	67,250,001	68,599,600	70,432,283	72,886,846	67,387,687	70,127,734	74,379,554	80,159,600
% increase over 1991		1.8%	3.9%	6.6%	10.3%	2.0%	6.2%	12.6%	21.4%
Total Cost Per Capita	249,000	253,500	258,590	253,530	258,610	254,020	264,350	254,040	264,350
% increase over 1991		1.8%	3.9%	1.8%	3.9%	2.0%	6.2%	2.0%	6.2%
Total Cost Per Working Age Member	373,860	378,110	392,960	378,160	393,000	373,360	402,390	373,120	402,370
% increase over 1991		1.1%	5.1%	1.2%	5.1%	-0.1%	7.6%	-0.2%	7.6%

Cost figures are in thousands of new pesos (N$).

Projection A: official projection, no change in size of CASMU membership.
Projection B: revised projection, no change in size of CASMU membership.
Projection C: official projection, CASMU membership grows at same rate as population.
Projection D: revised projection, CASMU membership grows at same rate as population.

FIGURE 3

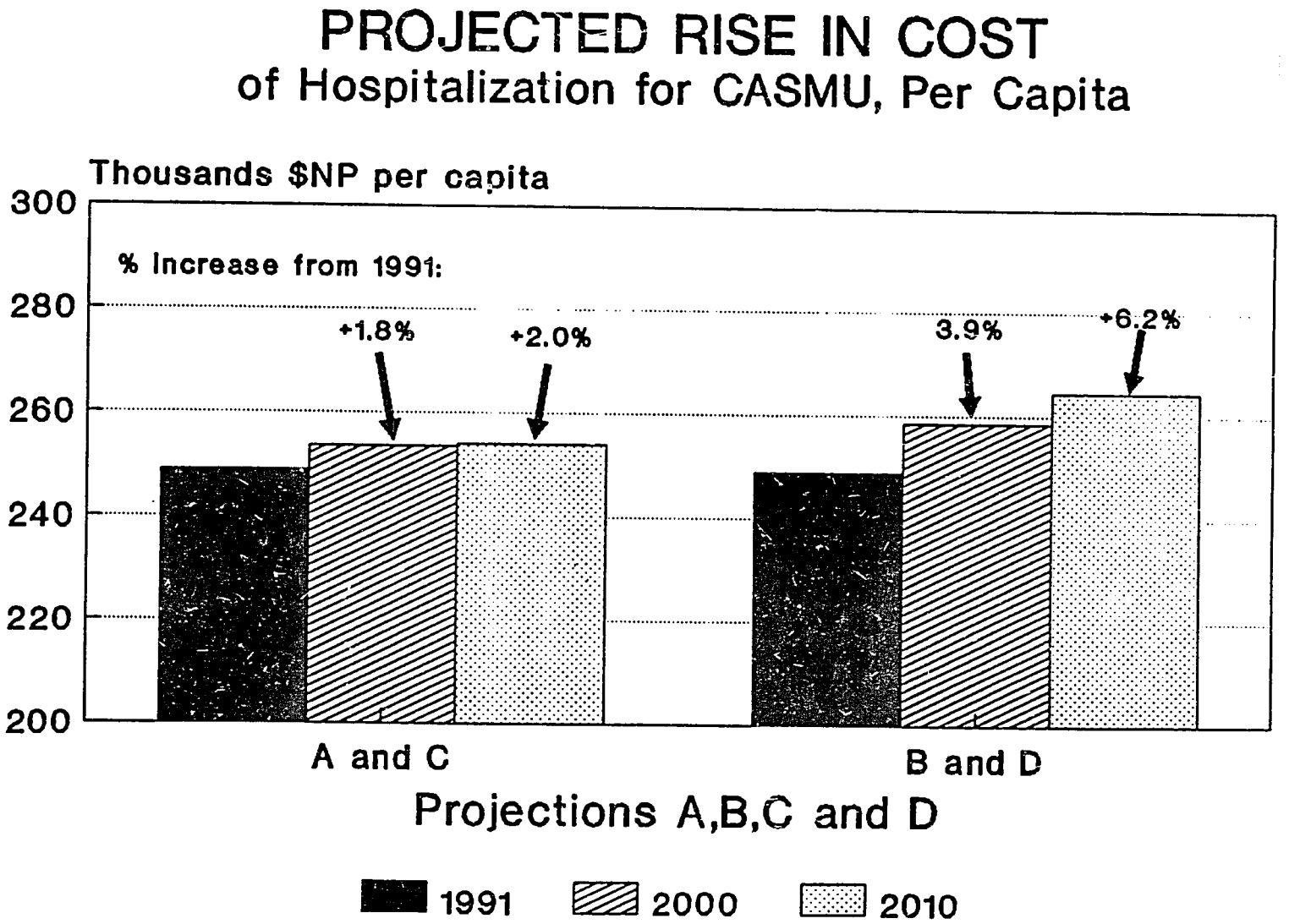
PROJECTED RISE IN COST
of Hospitalization for CASMU, Per Capita
Thousands $NP per capita
300
280
260
240
220
200
% Increase from 1991:
+1.8%
+2.0%
3.9%
+6.2%
A and C
B and D
Projections A,B,C and D
1991
2000
2010

FIGURE 4

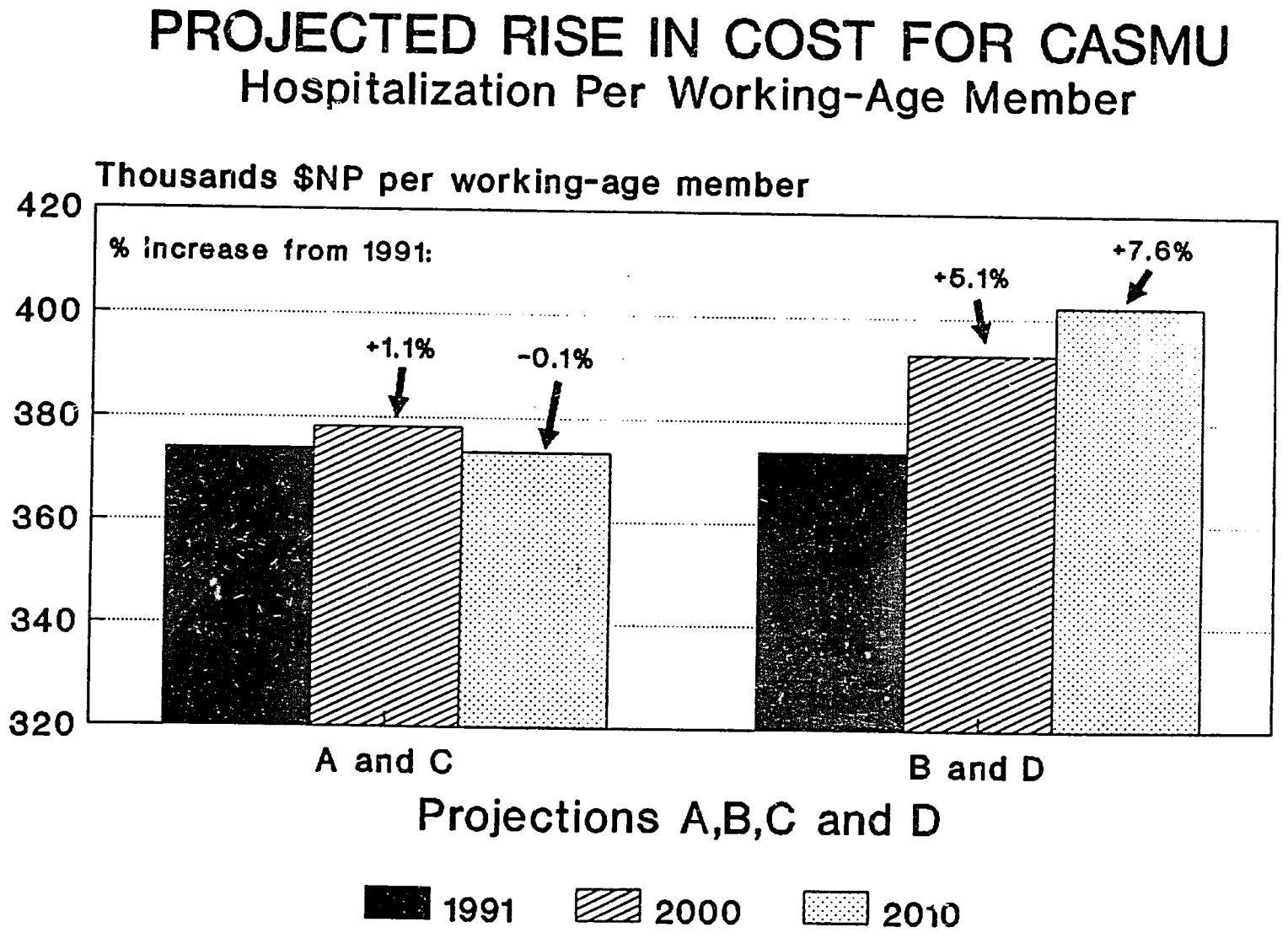
PROJECTED RISE IN COST FOR CASMU
Hospitalization Per Working-Age Member
Thousands $NP per working-age member
420
400
380
360
340
320
% increase from 1991:
+1.1%
-0.1%
+5.1%
+7.6%
A and C
B and D
Projections A,B,C and D
1991
2000
2010

EXHIBIT 29
ESTIMATES OF AGE ELASTICITIES OF COST

Time Period	A % change in proportion of elderly	B % change in total cost per capita	B/A Age Elasticity of Cost
1980 - 1990	10.48%	1.90%	0.18
1980 - 1991	48.57%	13.30%	0.27
1991 - 2000 Projection A	7.24%	1.80%	0.25
Projection B	15.83%	3.90%	0.25
Projection C	7.24%	1.80%	0.25
Projection D	15.83%	3.90%	0.25
1991 - 2010 Projection A	5.71%	2.00%	0.35
Projection B	21.99%	6.20%	0.28
Projection C	5.32%	2.02%	0.38
Projection D	21.99%	6.20%	0.28

The results from the 10 different projections are quite consistent, ranging from 0.18 to 0.38, with most of the estimates concentrating at about 0.25. This figure can be interpreted as follows: for every 10 percent increase in the proportion of the population that is elderly, there would be a 2.5 percent increase in costs of hospitalization per capita. (The 10 percent increase refers not to a percentage point increase, but to a relative increase. For example, if the proportion of the population that is elderly in 1991 was 10 percent, and that proportion increased to 11 percent in 2000, that would be a 10 percent increase in the proportion of the elderly.) The elasticities calculated for the 20-year period are slightly higher than the others. However, the figure for the 1980-1991 period, which compares actual population breakdowns with CASMU membership breakdowns and therefore entails a dramatic increase in the proportion of elderly, is remarkably consistent with all of the other estimates.

Although these results are internally consistent, there are a number of important caveats to bear in mind when interpreting them. First of all, this measure is not a pure elasticity by definition. Elasticities reflect changes that occur when one, and only one variable is changed. In other words, all other variables are held constant, so that the effect of that one variable can be isolated and measured. In this analysis, it was not possible to hold all other variables constant while changing the proportion of elderly in the population. Thus, for example, when the proportion of elderly shifts from 10 percent to 11 percent, the relative mix among the other age groups is also shifting (e.g., the 14-64 age group may increase by two percentage points). Nevertheless, the elasticities developed in this analysis do give an indication of how the overall aging process for the entire population would affect costs.

Second, the projections done as part of this analysis required a number of simplifying assumptions. For example, utilization patterns were assumed to remain constant, as were the relative mix of inputs, medical technology, and other factors affecting both the supply of and demand for health care services. In any real-world situation, of course, those factors will change over time, and will have an influence on the use of costs of services.

Third, this analysis has focused on one country, and more specifically, on one organization. While the age elasticities of cost as developed can be applied to different countries or situations, such application should be done with caution. The results may be unique to Uruguay or to CASMU and the specific circumstances involved in this analysis. On the other hand, they may provide some guidance to policymakers anxious to know the implications of the demographic transition for the financing and provision of health services.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 POLICY IMPLICATIONS FOR CASMU

The results from this study provide guidance to CASMU policymakers in planning for the future. On a per-capita basis, total costs of hospitalization would be expected to increase from two to four percent by the year 2000, based on changing demographics alone. In the following decade, the rate of increase would slow slightly, but would still be positive. While the figures presented in this analysis are based on a number of simplifying assumptions, the relaxing of which will have an impact on the estimates of costs faced by CASMU over the next two decades, these results are still useful for CASMU policymakers. By understanding the impact of demographic changes alone on costs, CASMU has a better framework within which to consider financing or service provision changes that may be required.

Thus, for example, according to the results of this analysis, the cost of all hospitalizations per working age member of CASMU is expected to increase by one to five percent by the year 2000. In order to finance these increased costs, CASMU may wish to consider raising existing premiums and/or co-payments, so that the current working age population will be financing their own use of services in the future. This method of pre-payment might help to avoid the problems which are expected to be faced by the U.S. Social Security System, in which the current working age population is unlikely to be able to receive benefits by the time they reach retirement age. This results from the fact that the population currently of working age is a substantially larger cohort than will exist in the next 20 years; when that cohort reaches retirement age, there will be a relatively small group of working age people making payments into the system, therefore leaving the retirees short of benefits.

CASMU could also consider other options for financing the increase in costs likely to occur from aging, e.g., seeking government general revenues to cover the costs of the retired population. Of course, this and other options may require a more fundamental restructuring of the financing of health services within Uruguay, and might involve subsidies to the IAMCs from the Ministry of Public Health or from other third-party payers.

The results from this study also provide CASMU with insight into where the increase in costs come from, which affords the organization the opportunity to do more than simply seek ways to cover those increases. Because the utilization and cost data are disaggregated by age and gender, the detailed exhibits demonstrate the extent to which the elderly account for increased costs, particularly for neoplasms and cerebro/cardiovascular diseases. Because of the disproportionate burden of these diseases on overall costs, CASMU might consider specific interventions to forestall some of those cost increases. Preventive efforts, particularly through health education measures, could be useful and cost-effective policy responses.

It would also be useful for CASMU to conduct further analyses, based on the data and methodology used in this study. Alternative assumptions regarding hospitalization rates, lengths of stay, and average costs could be used to simulate different utilization and cost scenarios.

6.2 POLICY IMPLICATIONS FOR URUGUAY HEALTH SECTOR DECISION MAKERS

The results from this study also suggest important implications for the Uruguayan health sector as a whole. With a population that continues to age, the effects will be felt both by institutions such as CASMU and by the rest of the health system, including providers and consumers.

One critical point to recognize in this regard is the potential for a shift in the memberships of IAMCs such as CASMU, vis-a-vis other health care providers, including both the private sector and public sector. As noted in this report, over the past several years, the CASMU membership has aged at a more rapid pace than the population as a whole. Importantly, membership has fallen by three percent during the last three years, with the declines concentrated in the under 65 age group, and among males. This may be indicative of a more general trend among IAMCs, which would have disturbing implications for the financing of health services.

Due to the voluntary basis of IAMC membership, there is a degree of self-selection which would tend to encourage "over-use" by the elderly. As costs within the organization rise due to an older membership, premiums would likely increase, and thus younger members (particularly working-age males) would be expected to leave IAMCs if they could. On the other hand, the elderly would stay in order to take advantage of high levels of benefits relative to their out-of-pocket costs. This process could thus spiral into a situation of rising costs and fewer working-age members, with the worst case scenario ending in IAMC bankruptcy.

CASMU and other Uruguayan institutions are already aware of and concerned about such a possibility, and have initiated discussions with the BPS. The results from this study may provide added incentive to efforts to seek possible solutions and remedies.

There are several approaches to be considered, which will be enumerated here, although the scope of this research study does not allow for the detailed analysis of specific alternatives. One possible solution would be compulsory coverage, which would eliminate the adverse selection tendency created by voluntary membership in IAMCs. Another alternative would require working-age members of IAMCs to pay actuarially-determined premiums, which would cover the projected costs of providing them services both during working years and after retirement. Such an approach would have to be coupled with a government subsidy to cover the costs of the current elderly membership, such that payments by working-age members would not be diverted to paying for the elderly now (leaving insufficient funds for the future). Under such a scenario, a rather large-scale effort would be required to redetermine premiums. The size of the government subsidy would be substantial now, but would decrease over time.

Whatever approach is chosen, it is likely that the working age population will face greater financial contributions (either through increased taxes to fund the government subsidy or through higher premiums), particularly in relation to those who are already elderly. However, a financing system can be structured such that institutions like CASMU become sustainable for the long-term, and will be able to continue to provide services within a well-functioning health sector.

6.3 APPLICABILITY OF RESULTS AND METHODOLOGY FOR OTHER COUNTRIES

Although focused on one organization within Uruguay, this study also provides useful results for other countries facing an epidemiologic and demographic transition in the coming decades. First, the methodology used in this study proved to be a feasible means of estimating, with limited time and data, the impact of aging on costs of health care services. This same approach could be used in other countries, including using sensitivity analyses to examine the effect of changing assumptions used in this analysis. Carrying out similar studies in other countries will also provide a broad base of results, from which comparative analyses can be completed.

Second, although Uruguay's pace of aging may differ sharply from other developing countries, the age elasticities of cost developed allow policymakers elsewhere to apply this study's results to their own situations. Thus, for countries such as Bolivia or Brazil, with elderly populations of less than five percent of the total, some guidance on what to expect in the coming decades is possible, despite the fact that Uruguay's situation is significantly different. At the same time, it would be useful to carry out similar analyses in other countries, in order to test the robustness of the estimates of the age elasticities.

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TABLE 1
PROJECTION B: ABBREVIATED AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, 2000 AND 2010 (revised projection)[1]

	Both Sexes		Male		Female	
	N	%	N	%	N	%
2000						
0-14	42,768	16.1	21,796	17.0	20,972	15.3
15-44	106,547	40.2	52,952	41.3	53,595	39.1
45-64	68,023	25.6	33,207	25.9	34,816	25.4
65+	47,947	18.1	20,258	15.8	27,689	20.2
65-69	15,395	5.8	7,308	5.7	8,087	5.9
70-74	13,154	5.0	6,026	4.7	7,128	5.2
75-79	8,406	3.2	3,334	2.6	5,072	3.7
80+	10,855	4.1	3,590	2.8	7,265	5.3
Totals	265,285	100.0	128,212	100.0	137,073	100.00
2010						
0-14	40,518	15.3	20,642	16.1	19,876	14.5
15-44	103,071	38.8	51,669	40.3	51,402	37.5
45-64	71,206	26.8	34,745	27.1	36,461	26.6
65+	50,489	19.0	21,155	16.5	29,334	21.4
65-69	13,428	5.1	6,026	4.7	7,402	5.4
70-74	12,212	4.6	5,770	4.5	6,442	4.7
75-79	9,329	3.5	3,846	3.0	5,483	4.0
80+	15,391	5.8	5,385	4.2	10,006	7.3
Totals	265,285	100.0	128,212	100.0	137,073	100.0

[1]1992 CASMU membership aged in proportion to age distribution changes reflected in the revised national projection, 1990-2000 and 2000-2010. This projection assumes no change in size of CASMU membership over that of 1992.

TABLE 2
PROJECTION C: ABBREVIATED AGE DISTRIBUTION OF CASMU MEMBERSHIP BY SEX, 2000 AND 2010 (official projection)[1]

	Both Sexes		Male		Female	
	N	%	N	%	N	%
2000						
0-14	45,083	16.2	22,690	16.9	22,393	15.6
15-44	112,178	40.4	55,048	41.0	57,130	39.8
45-64	74,072	26.7	37,325	27.8	36,747	25.6
65+	46,473	16.7	19,200	14.3	27,273	19.0
65-69	15,316	5.5	6,847	5.1	8,469	5.9
70-74	12,950	4.7	5,773	4.3	7,177	5.0
75-79	7,968	2.9	3,088	2.3	4,880	3.4
80+	9,960	3.6	3,357	2.5	6,603	4.6
Totals	277,805	100.0	134,263	100.0	143,542	100.0
2010						
0-14	45,327	15.5	22,827	16.1	22,500	14.9
15-44	116,295	39.7	57,705	40.7	58,590	38.8
45-64	83,050	28.4	41,825	29.5	41,225	27.3
65+	48,115	16.4	19,424	13.7	28,691	19.0
65-69	14,676	5.0	6,522	4.6	8,154	5.4
70-74	12,041	4.1	5,246	3.7	6,795	4.5
75-79	8,839	3.0	3,403	2.4	5,436	3.6
80+	12,266	4.2	4,112	2.9	8,154	5.4
Totals	292,787	100.0	141,781	100.0	151,006	100.0

[1]1992 CASMU membership aged in proportion to age distribution changes reflected in the official national projection, 1990-2000 and 2000-2010. This projection also assumes that the size of the CASMU membership increases in proportion to the projected increase of the national population over the periods 1990-2000 and 2000-2010. For the period 1990-2000, the male population would increase by 5.8 percent and the female population by 5.9 percent. For 2000-2010, the male population would increase by 5.6 percent and the female population by 5.2 percent.

TABLE 3
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(all diagnostic categories, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	43,051	5,786	2.8	6,683,730	2,552
15-44	107,122	9,705	3.8	15,214,897	5,809
45-64	70,734	7,271	6.1	18,299,118	6,986
65+	44,378	8,197	8.0	27,052,256	10,328
65-69	14,626	2,087	7.8	6,716,187	2,564
70-74	12,367	2,121	8.0	6,999,984	2,673
75-79	7,609	1,597	8.2	5,402,973	2,063
80+	9,510	2,387	8.0	7,878,126	3,008
All Ages	265,285	30,959	5.2	67,250,001	25,675
Males					
0-14	21,668	3,107	2.7	3,461,069	1,321
15-44	52,567	2,229	5.0	4,597,562	1,755
45-64	35,643	3,586	7.1	10,502,913	4,010
65+	18,334	3,852	8.0	12,713,103	4,854
65-69	6,539	1,091	7.7	3,464,804	1,323
70-74	5,513	1,114	8.5	3,907,086	1,492
75-79	2,949	729	8.3	2,495,201	953
80+	3,205	912	7.6	2,858,916	1,092
All Ages	128,212	12,774	5.8	31,274,647	11,940

TABLE 3 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	21,383	2,671	2.9	3,195,275	1,220
15-44	54,555	7,485	3.5	10,807,759	4,126
45-64	35,091	3,681	5.2	7,896,848	3,015
65+	26,044	4,321	8.0	14,260,107	5,444
65-69	8,087	983	7.8	3,164,424	1,208
70-74	6,854	1,004	7.5	3,106,857	1,186
75-79	4,660	864	8.1	2,885,533	1,102
80+	6,305	1,470	8.3	5,032,520	1,921
All Ages	137,073	18,157	4.7	36,159,989	13,805

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$412,552 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $157.51 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 4
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(Neoplasms, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	43,051	69	2.3	64,877	25
15-44	107,122	611	4.4	1,099,031	419
45-64	70,734	1,047	7.1	3,038,934	1,158
65+	44,378	1,118	8.7	3,976.283	1,515
65-69	14,626	317	7.8	1,010,811	385
70-74	12,367	317	9.4	1,218,157	464
75-79	7,609	216	9.2	812,377	310
80+	9,510	271	8.3	974,918	372
All Ages	265,285	2,845	7.0	8,179,125	3,117
Males					
0-14	21,668	49	2.6	52,082	20
15-44	52,567	158	6.9	445,679	170
45-64	35,643	410	9.3	1,558,773	594
65+	18,334	570	9.2	2,143,773	817
65-69	6,539	173	7.5	530,424	202
70-74	5,513	163	10.4	693,006	264
75-79	2,949	107	10.2	446,170	170
80+	3,205	125	9.2	470,126	179
All Ages	128,212	1,187	8.6	4,200,307	1,601

TABLE 4 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	21,383	24	1.7	16,679	6
15-44	54,555	453	3.5	648,160	247
45-64	35,091	632	5.7	1,472,679	561
65+	26,044	544	8.2	1,823,597	695
65-69	8,087	142	8.0	464,402	177
70-74	6,854	149	8.3	505,569	193
75-79	4,660	108	8.1	357,623	136
80+	6,305	144	8.4	494,490	188
All Ages	137,073	1,653	5.8	3,961,115	1,509

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$408,805 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $155.79 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 5
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(cerebro/cardiovascular disease, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	43,051	13	6.4	22,073	8
15-44	107,122	246	5.9	385,056	147
45-64	70,734	1,089	8.4	2,428,568	925
65+	44,378	2,059	9.2	5,025,525	1,915
65-69	14,626	423	9.9	1,110,997	423
70-74	12,367	490	9.7	1,260,971	481
75-79	7,609	427	9.8	1,110,174	423
80+	9,510	726	7.9	1,521,602	580
All Ages	265,285	3,365	8.6	7,765,914	2,959
Males					
0-14	21,668	4	8.5	9,020	3
15-44	52,567	137	6.0	218,076	83
45-64	35,643	781	8.8	1,823,354	695
65+	18,334	979	9.2	2,389,504	911
65-69	6,539	253	9.1	610,800	233
70-74	5,513	291	10.1	779,743	297
75-79	2,949	193	9.9	506,909	193
80+	3,205	244	7.6	491,972	187
All Ages	128,212	1,901	8.8	4,439,954	1,692

TABLE 5 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	21,383	7	4.3	7,986	3
15-44	54,555	115	5.8	176,955	67
45-64	35,091	319	7.4	626,267	239
65+	26,044	1,073	9.1	2,590,469	987
65-69	8,087	164	11.2	487,303	186
70-74	6,854	198	9.0	472,765	180
75-79	4,660	232	9.7	597,031	228
80+	6,305	482	8.1	1,035,784	395
All Ages	137,073	1,514	8.4	3,401,677	1,296

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$265,300 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $101.10 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 6
SUMMARY OF ESTIMATED COSTS OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES, DIAGNOSIS, AND SEX, 2000[1]
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	2,552	1,321	1,220	25	20	6	8	3	3
15-44	5,809	1,755	4,126	419	170	247	147	83	67
45-64	6,986	4,010	3,015	1,158	594	561	925	695	239
65+	10,328	4,854	5,444	1,515	817	695	1,915	911	987
65-69	2,564	1,323	1,208	385	202	177	423	233	186
70-74	2,673	1,492	1,186	464	264	193	481	297	180
75-79	2,063	953	1,102	310	170	136	423	193	228
80+	3,008	1,092	1,921	372	179	188	580	187	395
All Ages	25,675	11,940	13,805	3,117	1,601	1,509	2,995	1,692	1,296

[1] Thousands of U.S. dollars.

Source: Tables

TABLE 7
PERCENTAGE OF COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 2000
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	9.9	11.1	8.8	0.8	1.2	0.4	0.3	0.2	0.2
15-44	22.6	14.7	29.9	13.4	10.6	16.4	4.9	4.9	5.2
45-64	27.2	33.6	21.8	37.2	37.1	37.1	30.9	41.1	18.4
65+	40.2	40.6	39.4	48.6	51.0	46.1	63.9	53.8	76.2
65-69	10.0	11.1	8.8	12.4	12.6	11.7	14.1	13.8	14.4
70-74	10.4	12.5	8.6	14.9	16.5	12.8	16.1	17.6	13.9
75-79	8.0	8.0	8.0	10.0	10.6	9.0	14.1	11.4	17.6
80+	11.7	9.2	13.9	11.9	11.2	12.5	19.4	11.0	30.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source:

TABLE 8
RATIO OF POPULATION TO HOSPITALIZATION COSTS BY AGE, SEX, AND DIAGNOSIS, CASMU MEMBERSHIP, 2000[1]
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	61	66	56	5	7	2	2	1	1
15-44	56	36	75	33	26	41	12	12	13
45-64	102	121	85	139	133	145	116	148	72
65+	241	284	207	291	357	243	383	283	401
65-69	182	241	149	225	247	198	256	271	244
70-74	221	291	172	317	384	256	343	409	278
75-79	276	348	235	345	461	265	486	496	518
80+	325	368	302	331	448	272	539	440	663

[1] Percentage of costs/percentage of population * 100.

Source: Tables

TABLE 9
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2010[1]
(all diagnostic categories, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	41,039	5,516	2.8	6,370,980	2,433
15-44	105,296	9,540	3.8	14,955,835	5,710
45-64	75,194	7,730	6.1	19,453,064	7,427
65+	43,755	8,082	8.0	26,673,962	10,184
65-69	13,300	1,898	7.8	6,107,585	2,332
70-74	10,912	1,871	8.0	6,175,078	2,358
75-79	8,012	1,682	8.2	5,690,082	2,172
80+	11,120	2,791	8.0	9,211,461	3,517
All Ages	265,285	30,868	5.2	67,387,687	25,754
Males					
0-14	20,642	2,960	2.7	3,297,116	1,259
15-44	52,182	2,212	5.0	4,562,825	1,742
45-64	37,822	3,805	7.1	11,145,299	4,255
65+	17,565	3,690	8.0	12,178,535	4,650
65-69	5,897	984	7.7	3,125,824	1,193
70-74	4,744	959	8.5	3,362,918	1,284
75-79	3,077	760	8.3	2,602,378	994
80+	3,718	1,058	7.6	3,317,248	1,266
All Ages	128,212	12,667	5.8	31,183,775	11,906

TABLE 9 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,397	2,548	2.9	3,048,429	1,164
15-44	53,114	7,287	3.5	10,521,932	4,017
45-64	37,372	3,920	5.2	8,409,460	3,211
65+	26,190	4,345	8.0	14,340,308	5,475
65-69	7,402	900	7.8	2,896,115	1,106
70-74	6,168	904	7.5	2,797,103	1,068
75-79	4,935	914	8.1	3,054,287	1,166
80+	7,402	1,725	8.3	5,906,713	2,255
All Ages	137,073	18,100	4.7	26,269,674	13,867

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$412,552 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $157.51 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 10
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2010[1]
(Neoplasms, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	41,039	66	2.3	62,057	24
15-44	105,296	600	4.4	1,079,245	411
45-64	75,194	1,113	7.1	3,230,500	1,231
65+	43,755	1,103	8.7	3,922,934	1,495
65-69	13,300	289	7.8	921,528	351
70-74	10,912	275	9.4	1,056,761	403
75-79	8,012	228	9.2	857,509	327
80+	11,120	317	8.8	1,140,402	435
All Ages	265,285	2,882	7.0	8,294,736	3,161
Males					
0-14	20,642	47	2.6	49,956	19
15-44	52,182	157	6.9	442,858	169
45-64	37,822	435	9.3	1,653,821	630
65+	17,565	546	9.2	2,053,509	783
65-69	5,897	156	7.5	478,302	182
70-74	4,744	140	10.4	595,220	227
75-79	3,077	112	10.2	467,019	178
80+	3,718	145	9.2	545,346	208
All Ages	128,212	1,185	8.6	4,200,144	1,601

TABLE 10 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,397	22	1.7	15,289	6
15-44	53,114	441	3.5	630,990	240
45-64	37,372	673	5.7	1,568,217	598
65+	26,190	547	8.2	1,833,654	699
65-69	7,402	130	8.0	425,157	162
70-74	6,168	134	8.3	454,673	173
75-79	4,935	114	8.1	377,490	144
80+	7,402	170	8.4	583,774	222
All Ages	137,073	1,683	5.8	4,048,150	1,543

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$408,805 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $155.79 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 11
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 20[illegible]
(cerebro/cardiovascular disease, Projection A)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	4[illegible],066	12	6.4	20,375	8
15-44	105,366	242	5.9	378,795	144
45-64	75,243	1,158	8.4	2,580,626	983
65+	43,608	2,030	9.2	4,954,743	1,888
65-69	13,300	384	9.9	1,008,564	384
70-74	10,912	432	9.7	1,111,713	424
75-79	8,012	449	9.8	1,167,373	445
80+	11,120	848	7.9	1,777,298	677
All Ages	265,285	3,442	8.6	7,934,539	3,023
Males					
0-14	20,642	4	8.5	9,020	3
15-44	52,182	136	6.0	216,485	82
45-64	37,822	828	8.8	1,933,082	737
65+	17,565	938	9.2	2,289,433	872
65-69	5,897	228	9.1	550,444	210
70-74	4,744	250	10.1	669,882	255
75-79	3,077	202	9.9	530,547	202
80+	3,718	283	7.6	570,607	217
All Ages	128,212	1,906	8.8	4,448,020	1,694

TABLE 11 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,424	6	4.3	6,845	3
15-44	53,184	112	5.8	172,339	66
45-64	37,421	340	7.4	667,495	254
65+	26,044	1,079	9.1	2,604,954	993
65-69	7,402	150	11.2	445,704	170
70-74	6,168	178	9.0	425,011	162
75-79	4,935	246	9.7	633,059	241
80+	7,402	566	8.1	1,216,294	464
All Ages	137,073	1,537	8.4	3,451,633	1,316

[1] Based on Projection A which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the official projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$265,300 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $101.10 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 12
SUMMARY OF ESTIMATED COSTS OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGF CATEGORIES, DIAGNOSIS, AND SEX, 2010[1]
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	2,433	1,259	1,164	24	19	6	8	3	3
15-44	5,710	1,742	4,017	411	169	240	144	82	66
45-64	7,427	4,255	3,211	1,231	630	598	983	737	254
65+	10,184	4,650	5,475	1,495	783	699	1,888	872	993
65-69	2,332	1,193	1,106	351	182	162	384	210	170
70-74	2,358	1,284	1,068	403	227	173	424	255	162
75-79	2,172	994	1,166	327	178	144	445	202	241
80+	3,517	1266	2,255	435	208	222	677	217	464
All Ages	25,754	11,906	13,867	3,161	1,601	1,543	3,023	1,694	1,316

[1] Thousands of U.S. dollars.

TABLE 13
PERCENTAGE OF COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 2010
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	9.4	10.6	8.4	0.8	1.2	0.4	0.3	0.2	0.2
15-44	22.2	14.6	29.0	13.0	10.6	15.6	4.8	4.8	5.0
45-64	28.8	35.7	23.2	38.9	39.4	38.8	32.5	43.5	19.3
65+	39.5	39.1	39.5	47.3	48.9	45.3	62.4	51.5	75.5
65-69	9.0	10.0	8.0	11.1	11.4	10.5	12.7	12.4	12.9
70-74	9.2	10.8	7.7	12.8	14.2	11.2	14.0	15.0	12.3
75-79	8.4	8.4	8.4	10.3	11.1	9.3	14.7	11.9	18.3
80+	13.7	10.6	16.3	13.8	13.0	14.4	22.4	12.8	35.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 14
RATIO OF POPULATION TO HOSPITALIZATION COSTS BY AGE, SEX, AND DIAGNOSIS, CASMU MEMBERSHIP, 2010[1]
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	61	66	56	5	7	3	2	1	1
15-44	56	36	75	33	26	40	12	12	13
45-64	102	121	85	137	133	142	115	147	75
65+	239	285	207	287	357	237	380	376	395
65-69	102	217	148	222	248	194	254	270	239
70-74	224	292	171	312	384	249	341	405	273
75-79	280	350	233	343	462	258	490	496	508
80+	326	366	301	329	448	267	533	441	654

[1] Percentage of costs/percentage of population * 100.

TABLE 15
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(all diagnostic categories, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	42,768	5,748	2.8	6,639,777	2,535
15-44	106,547	9,653	3.8	15,132,985	5,778
45-64	68,023	6,993	6.1	17,598,354	6,719
65+	47,947	8,856	8.0	29,228,484	11,159
65-69	15,395	2,197	7.8	7,069,739	2,699
70-74	13,154	2,256	8.0	7,445,738	2,843
75-79	8,406	1,764	8.2	5,967,482	2,278
80+	10,855	2,725	8.0	8,993,634	3,434
All Ages	265,285	31,250	5.2	68,599.600	26,191
Males					
0-14	21,796	3,126	2.7	3,482,021	1,329
15-44	52,952	[illegible],245	5.0	4,630,896	1,768
45-64	33,207	3,341	7.1	9,786,187	3,736
65+	20,258	4,256	8.0	14,046,570	5,363
65-69	7,308	1,219	7.7	3,872,337	1,478
70-74	6,026	1,218	8.5	4,271,151	1,631
75-79	3,334	824	8.3	2,821,526	1,077
80+	3,590	1,021	7.6	3,201,238	1,222
All Ages	128,212	12,968	5.8	31,945,674	12,196

TABLE 15 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,972	2,619	2.9	3,133,374	1,196
15-44	53,595	7,353	3.5	10,617,232	4,054
45-64	34,816	3,652	5.2	7,834,528	2,991
65+	27,689	4,594	8.0	15,162,111	5,789
65-69	8,087	983	7.8	3,163,201	1,208
70-74	7,128	1,044	7.5	3,230,282	1,233
75-79	5,072	940	8.1	3,141,171	1,199
80+	7,265	1,693	8.3	5,797,139	2,213
All Ages	137,073	18,210	4.7	36,747,245	14,030

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$412,552 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $157.51 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 16
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(neoplasms, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	42,768	68	2.3	63,937	24
15-44	106,547	607	4.4	1,091,836	416
45-64	68,023	1,007	7.1	2,922,833	1,114
65+	47,947	1,208	8.7	4,296,377	1,637
65-69	15,395	334	7.8	1,065,019	406
70-74	13,154	331	9.4	1,271,956	485
75-79	8,406	239	9.2	898,880	343
80+	10,855	309	8.8	1,111,623	424
All Ages	265,285	2,890	7.0	8,374,983	3,191
Males					
0-14	21,796	44	2.6	46,767	18
15-44	52,952	159	6.9	448,500	171
45-64	33,207	382	9.3	1,452,321	553
65+	20,258	510	9.2	2,369,434	903
65-69	7,308	193	7.5	591,745	226
70-74	6,026	178	10.4	756,780	288
75-79	3,334	121	10.2	504,547	192
80+	3,590	140	9.2	526,541	201
All Ages	128,212	1,215	8.6	4,317,022	1,645

TABLE 16 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,972	23	1.7	15,984	6
15-44	53,595	445	3.5	636,714	243
45-64	34,816	627	5.7	1,461,028	557
65+	27,689	579	8.2	1,940,924	740
65-69	8,087	142	8.0	464,402	177
70-74	7,128	155	8.3	525,928	200
75-79	5,072	117	8.1	387,424	148
80+	7,265	166	8.4	570,038	217
All Ages	137,073	1,674	5.8	4,054,650	1,546

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$408,805 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $155.79 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 17
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000[1]
(cerebro/cardiovascular disease, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	42,768	13	6.4	22,073	8
15-44	106,547	245	5.9	383,491	146
45-64	68,023	1,048	8.4	2,335,489	890
65+	47,947	2,225	9.2	5,430,691	2,070
65-69	15,395	445	9.9	1,168,779	445
70-74	13,154	521	9.7	1,340,747	511
75-79	8,406	472	9.8	1,227,172	468
80+	10,855	828	7.9	1,735,380	661
All Ages	265,285	3,531	8.6	8,171,744	3,114
Males					
0-14	21,796	4	8.5	9,020	3
15-44	52,952	138	6.0	219,668	84
45-64	33,207	727	8.8	1,697,283	647
65+	20,258	1,082	9.2	2,640,902	1,006
65-69	7,308	283	9.1	683,227	260
70-74	6,026	318	10.1	852,090	325
75-79	3,334	218	9.9	572,570	218
80+	3,590	273	7.6	550,444	210
All Ages	128,212	1,951	8.8	4,566,873	1,740

TABLE 17 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	20,972	6	4.3	6,845	3
15-44	53,595	113	5.8	173,878	66
45-64	34,816	317	7.4	622,341	237
65+	27,689	1,141	9.1	2,754,636	1,050
65-69	8,087	164	11.2	487,303	186
70-74	7,128	206	9.0	491,866	187
75-79	5,072	253	9.7	651,073	248
80+	7,265	555	8.1	1,192,656	454
All Ages	137,073	1,577	8.4	3,557,700	1,356

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 1990-2000.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$265,300 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $101.10 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 18
SUMMARY OF ESTIMATED COSTS OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES, DIAGNOSIS, AND SEX, 2000[1]
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	2,535	1,329	1,196	24	18	6	8	3	3
15-44	5,778	1,768	4,054	416	171	243	146	84	66
45-64	6,719	3,736	2,991	1,114	553	557	890	647	237
65+	11,159	5,363	5,789	1,637	903	740	2,070	1,006	1,050
65-69	2,699	1,478	1,208	406	226	177	445	260	186
70-74	2,843	1,631	1,233	485	288	200	511	325	187
75-79	2,278	1,077	1,199	343	192	148	468	218	248
80+	3,434	1,222	2,213	424	201	217	661	210	454
All Ages	26,191	12,196	14,030	3,191	1,645	1,546	3,114	1,740	1,356

[1] Thousands of U.S. dollars.

TABLE 19
PERCENTAGE OF COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 2000
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	9.7	10.9	8.5	0.8	1.1	0.4	0.3	0.2	0.2
15-44	22.1	14.5	28.9	13.0	10.4	15.7	4.7	4.8	4.9
45-64	25.6	30.6	21.3	34.9	33.6	36.0	28.6	37.2	17.5
65+	42.6	44.0	41.3	51.3	54.9	47.9	66.5	57.8	77.4
65-69	10.3	12.1	8.6	12.7	13.7	11.4	14.3	14.9	13.7
70-74	10.8	13.4	8.8	15.2	17.5	12.9	16.4	18.7	13.8
75-79	8.7	8.8	8.6	10.8	11.7	9.6	15.0	12.5	18.3
80+	13.1	10.0	15.8	13.3	12.2	14.0	21.2	12.1	33.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 20
RATIO OF POPULATION TO HOSPITALIZATION COSTS BY AGE, SEX, AND DIAGNOSIS, CASMU MEMBERSHIP, 2000[1]
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	60	64	56	5	6	3	2	1	1
15-44	55	35	74	32	25	40	12	12	12
45-64	100	118	84	136	130	142	112	144	69
65+	235	278	204	283	347	237	367	366	383
65-69	177	212	159	219	240	193	247	261	232
70-74	216	285	169	304	372	274	328	416	265
75-79	272	338	232	338	450	259	469	481	495
80+	320	357	298	324	436	264	517	432	632

[1] Percentage of costs/percentage of population * 100.

TABLE 21
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2010[1]
(all diagnostic categories, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	40,518	5,446	2.8	6,290,923	2,402
15-44	103,071	9,338	3.8	14,639,160	5,589
45-64	71,206	7,320	6.1	18,421,272	7,033
65+	50,489	9,325	8.0	30,776,379	11,750
65-69	13,428	1,916	7.8	6,165,507	2,354
70-74	12,212	2,094	8.0	6,911,071	2,639
75-79	9,329	1,958	8.2	6,623,770	2,529
80+	15,391	3,863	8.0	12,749,507	4,868
All Ages	265,285	31,429	5.2	70,127,734	26,774
Males					
0-14	20,642	2,960	2.7	3,297,116	1,259
15-44	51,669	2,191	5.0	4,519,507	1,726
45-64	34,745	3,495	7.1	10,237,272	3,908
65+	21,155	4,445	8.0	14,670,349	5,601
65-69	6,026	1,005	7.7	3,192,534	1,219
70-74	5,770	1,166	8.5	4,088,803	1,561
75-79	3,846	950	8.3	3,252,972	1,242
80+	5,385	1,532	7.6	4,803,425	1,834
All Ages	128,212	13,091	5.8	32,724,244	12,494

TABLE 21 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	19,876	2,482	2.9	2,969,467	1,134
15-44	51,402	7,052	3.5	10,182,608	3,888
45-64	36,461	3,825	5.2	8,205,659	3,133
65+	29,334	4,866	8.0	16,059,824	6,132
65-69	7,402	900	7.8	2,896,115	1,106
70-74	6,442	944	7.5	2,920,868	1,115
75-79	5,483	1,016	8.1	3,395,138	1,296
80+	10,006	2,332	8.3	7,985,191	3,049
All Ages	137,073	18,225	4.7	37,417,558	14,287

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$412,552 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $157.51 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 22
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2010[1]
(neoplasms, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	40,518	65	2.3	61,116	23
15-44	103,071	588	4.4	1,057,660	403
45-64	71,206	1,054	7.1	3,059,251	1,166
65+	50,489	1,272	8.7	4,524,000	1,724
65-69	13,428	291	7.8	927,906	354
70-74	12,212	308	9.4	1,183,572	451
75-79	9,329	265	9.2	996,667	380
80+	15,391	439	8.8	1,579,295	602
All Ages	265,285	2,979	7.0	8,702,027	3,316
Males					
0-14	20,642	47	2.6	49,956	19
15-44	51,669	155	6.9	437,217	167
45-64	34,745	400	9.3	1,520,755	580
65+	21,155	658	9.2	2,474,742	943
65-69	6,026	159	7.5	487,500	186
70-74	5,770	170	10.4	722,767	275
75-79	3,846	140	10.2	583,774	222
80+	5,385	210	9.2	789,811	301
All Ages	128,212	1,260	8.6	4,482,670	1,709

TABLE 22 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	19,876	22	1.7	15,289	6
15-44	51,402	427	3.5	610,959	233
45-64	36,461	656	5.7	1,528,604	582
65+	29,334	613	8.2	2,054,899	783
65-69	7,402	130	8.0	425,157	162
70-74	6,442	140	8.3	475,031	181
75-79	5,483	127	8.1	420,538	160
80+	10,006	229	8.4	786,377	300
All Ages	137,073	1,718	5.8	4,209,751	1,604

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$408,805 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $155.79 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 23
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2010[1]
(cerebro/cardiovascular disease, Projection B)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Both Sexes					
0-14	40,518	12	6.4	20,375	8
15-44	103,071	237	5.9	370,969	141
45-64	71,206	1,097	8.4	2,444,686	932
65+	50,489	2,343	9.2	5,718,701	2,179
65-69	13,428	388	9.9	1,019,070	388
70-74	12,212	484	9.7	1,245,530	475
75-79	9,329	523	9.8	1,359,769	518
80+	15,391	1,174	7.9	2,460,551	938
All Ages	265,285	3,689	8.6	8,554,731	3,260
Males					
0-14	20,642	5	8.5	11,275	4
15-44	51,669	134	6.0	213,301	81
45-64	34,745	761	8.8	1,776,661	677
65+	21,155	1,130	9.2	2,758059	1,051
65-69	6,026	233	9.1	562,516	214
70-74	5,770	305	10.1	817,257	311
75-79	3,846	252	9.9	661,870	252
80+	5,385	409	7.6	824,658	314
All Ages	128,212	2,030	8.8	4,759,296	1,813

TABLE 23 (continued)

	No.[2]	No. Hospitalized	Avg. LOS[3]	Total Cost (N$)[4]	Total Cost ($US)[5]
Females					
0-14	19,876	6	4.3	6,845	3
15-44	51,402	108	5.8	166,184	63
45-64	36,461	332	7.4	651,789	248
65+	29,334	1,233	9.1	2,976,746	1,134
65-69	7,402	150	11.2	445,704	170
70-74	6,442	186	9.0	444,112	169
75-79	5,483	274	9.7	705,114	269
80+	10,006	764	8.1	1,641,782	626
All Ages	137,073	1,655	8.4	3,801,564	1,448

[1] Based on Projection B which assumes no change in the size of the CASMU membership over 1992, but a change in the age distribution that reflects the revised projection, 2000-2010.

[2] Number of persons in age category.

[3] Mean number of days of hospital bed-occupancy (length of stay), assuming no change from 1991.

[4] Thousands of N$ (new pesos); calculated at N$265,300 per bed-day, the rate for 1991-92.

[5] Thousands of $US; calculated at $101.10 per bed-day, at the 1991-92 exchange rate of N$2,624 per U.S. dollar.

TABLE 24
SUMMARY OF ESTIMATED COSTS OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES, DIAGNOSIS, AND SEX, 2010[1]
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	2,402	1,259	1,134	23	19	6	8	4	3
15-44	5,589	1,726	3,888	403	167	233	141	81	63
45-64	7,033	3,908	3,133	1,166	580	582	932	677	248
65+	11,750	5,601	6,132	1,724	943	783	2,179	1,051	1,134
65-69	2,354	1,219	1,106	354	186	162	388	214	170
70-74	2,639	1,561	1,115	451	275	181	475	311	169
75-79	2,529	1,242	1,296	380	222	160	518	252	269
80+	4,868	1,834	3,049	602	301	300	938	314	626
All Ages	26,774	12,494	14,287	3,316	1,709	1,604	3,260	1,813	1,448

[1] Thousands of U.S. dollars.

TABLE 25
PERCENTAGE OF COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 2010
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	9.0	10.1	7.9	0.7	1.1	0.4	0.2	0.2	0.2
15-44	20.9	13.8	27.2	12.2	9.8	14.5	4.3	4.5	4.4
45-64	26.3	31.3	21.9	35.2	33.9	36.3	28.6	37.3	17.1
65+	43.9	44.8	42.9	52.0	55.2	48.8	66.8	58.0	78.3
65-69	8.8	9.8	7.8	10.7	10.9	10.1	11.9	11.8	11.7
70-74	9.9	12.5	9.1	13.6	16.1	11.3	14.6	17.2	11.7
75-79	9.4	9.9	9.1	11.5	13.0	10.0	15.9	13.9	18.6
80+	18.2	14.7	21.3	18.2	17.6	18.7	28.8	17.3	43.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 26
RATIO OF POPULATION TO HOSPITALIZATION COSTS BY AGE, SEX AND DIAGNOSIS, CASMU MEMBERSHIP, 2010[1]
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
0-14	59	63	54	5	7	3	1	1	1
15-44	54	34	72	31	24	37	11	11	12
45-64	98	116	82	131	125	136	107	138	64
65+	231	272	200	274	335	228	359	352	366
65-69	173	208	144	210	232	187	233	251	217
70-74	215	278	194	296	358	240	317	382	249
75-79	269	330	228	329	433	250	464	463	465
80+	314	350	292	314	419	256	497	412	592

[1] Percentage of costs/percentage of population * 100.

TABLE 27
PERCENT CHANGE IN COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 1991-2010
(Projection A)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
1991-2000									
0-14	-8.7	-10.0	-7.6	-7.4	5.3	*	*	*	*
15-44	2.1	2.0	2.3	2.0	1.8	2.1	2.1	2.5	1.5
45-64	-1.6	1.8	-4.7	-1.5	2.1	-4.6	-1.4	1.8	-4.8
65+	7.1	4.1	9.3	7.0	4.1	9.3	7.2	4.1	9.4
65-69	0.4	-3.7	4.0	0.3	-3.4	3.5	0.5	-3.7	3.9
70-74	15.5	14.5	16.4	15.5	14.8	16.3	15.6	14.7	16.1
75-79	-1.0	-3.4	0.6	-0.6	-3.4	0.7	-0.9	-3.5	0.4
80+	12.4	8.9	14.4	12.7	8.5	13.9	12.6	8.7	14.5
Total	1.8	1.3	2.3	2.9	3.1	2.4	4.1	2.9	6.1
2000-2010									
0-14	-4.7	-4.7	-4.6	-4.0	-5.0	*	*	*	*
15-44	-1.7	-0.7	-2.6	-1.9	-0.6	-2.8	-2.0	-1.2	-1.5
45-64	6.3	6.1	6.5	6.3	6.1	6.6	6.3	6.0	6.3
65+	-1.4	-4.2	0.6	-1.6	-4.2	0.6	-1.4	-4.3	0.6
65-69	-9.0	-9.8	-8.4	-8.8	-9.9	-8.5	-9.2	-9.9	-8.6
70-74	-10.0	-13.9	-6.8	-13.2	-14.0	-10.4	-11.8	-14.1	-10.0
75-79	5.3	4.3	5.8	5.5	4.7	5.9	5.2	4.7	5.7
80+	16.9	15.9	17.4	16.9	16.2	18.1	16.7	16.0	17.5
Total	0.3	-0.2	0.4	1.4	0.0	2.2	0.9	0.1	1.5

Numbers not large enough to provide stable estimates.

TABLE 28
PERCENT CHANGE IN COSTS OF HOSPITALIZATION BY DIAGNOSIS FOR ABBREVIATED AGE CATEGORIES, CASMU MEMBERSHIP BY SEX, 1991-2010
(Projection B)

	All Diagnoses			Neoplasms			Cerebro/Cardio-vascular Disease		
	Both Sexes	M	F	Both Sexes	M	F	Both Sexes	M	F
1991-2000									
0-14	-9.3	-9.4	-9.4	-11.1	-5.3	*	*	*	*
15-44	1.6	2.8	0.5	1.2	2.4	0.4	1.4	3.7	0.0
45-64	-5.3	-5.2	-5.5	-5.0	-5.0	-5.3	-5.1	-5.3	-5.6
65+	15.8	15.1	16.2	15.6	15.0	16.4	15.8	15.0	16.4
65-69	5.7	7.6	4.0	5.7	8.1	3.5	5.7	7.4	3.9
70-74	22.9	25.2	21.0	22.8	25.2	20.5	22.8	25.5	20.6
75-79	9.4	9.1	9.5	9.9	9.1	9.6	9.6	9.0	9.2
80+	28.4	21.8	31.7	28.5	21.8	31.5	28.4	22.1	31.6
Total	3.8	3.5	3.9	5.3	5.9	5.0	8.2	5.8	11.1
2000-2010									
0-14	-5.3	-5.3	-5.2	-4.2	5.6	*	*	*	*
15-44	-3.3	-2.4	-4.1	-3.1	-2.3	-3.4	-3.4	-3.6	-4.6
45-64	4.7	4.6	4.8	4.7	4.9	4.5	4.7	4.6	4.6
65+	5.3	4.4	5.9	5.3	4.4	5.8	5.3	4.5	8.0
65-69	-12.8	-17.5	-8.4	-12.8	-17.7	-8.5	-12.8	-17.7	-8.6
70-74	-7.2	-4.3	-9.6	-7.0	-4.5	-9.5	-7.1	-4.3	-9.6
75-79	11.0	15.3	8.1	10.8	15.6	8.1	10.7	15.6	8.5
80+	41.8	50.0	37.8	42.0	49.8	38.2	41.9	49.5	37.9
Total	2.2	2.4	1.8	3.9	3.9	3.8	4.7	4.2	6.8

* Numbers not large enough to provide stable estimates.

TABLE 29
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection C, All Diagnoses)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
2000				
0-14	45,083	6,058	2.8	6,997,453
15-44	112,178	10,163	3.8	15,933,112
45-64	74,072	7,618	6.1	19,171,069
65+	46,473	8,584	8.0	28,330,649
Total	277,806	32,423		70,432,283
2010				
0-14	45,327	6,090	2.8	7,035,325
15-44	116,295	10,536	3.8	16,517,867
45-64	83,050	8,541	6.1	21,494,725
65+	48,115	8,887	8.0	29,331,638
Total	292,787	34,055		74,379,554

[1] Number of persons in age category, from Table 2.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at N$412,552 per bed-day.

TABLE 30
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection C, Neoplasms)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
2000				
0-14	45,083	72	2.3	67,389
15-44	112,178	642	4.4	1,154,355
45-64	74,072	1,097	7.2	3,182,696
65+	46,473	1,172	8.7	4,169,859
Total	277,806	2,982		8,574,298
2010				
0-14	45,327	72	2.3	67,754
15-44	116,295	665	4.4	1,196,720
45-64	83,050	1,229	7.1	3,568,459
65+	48,115	1,214	8.7	4,317,190
Total	292,787	3,181		9,150,122

[1] Number of persons in age category, from Table 2.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at $408,805 per bed-day.

TABLE 31
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection C, Cerebro-Cardiovascular Diseases)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
2000				
0-14	45,083	11	6.4	19,471
15-44	112,178	261	5.9	408,506
45-64	74,072	1,139	8.4	2,537,891
65+	46,473	2,155	9.2	5,260,440
Total	277,806	3,567		8,226,307
2010				
0-14	45,327	12	6.4	19,576
15-44	116,295	271	5.9	423,498
45-64	83,050	1,277	8.4	2,845,499
65+	48,115	2,231	9.2	5,446,304
Total	292,787	3,790		8,734,877

[1] Number of persons in age category, from Table 2.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at $265,300 per bed-day.

TABLE 32
PERCENT CHANGE IN COSTS OF HOSPITALIZATION BY DIAGNOSIS
FOR ABBREVIATED AGE CATEGORIES, 1991-2010
(Projection C)

	All Diagnoses	Neoplasms	Cerebro/Cardio-vascular Disease
1991-2000			
0-14	-4.4%	-4.4%	-4.4%
15-44	7.0%	7.0%	7.0%
45-64	3.2%	3.2%	3.2%
65+	12.2%	12.2%	12.2%
Total	6.6%	7.8%	8.9%
2000-2010			
0-14	0.5%	0.5%	0.5%
15-44	3.7%	3.7%	3.7%
45-64	12.1%	12.1%	12.1%
65+	3.5%	3.5%	3.5%
Total	5.6%	6.7%	6.2%

TABLE 33
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection D, All Diagnoses)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
		2000		
0-14	45,437	6,105	2.8	7,052,398
15-44	113,196	10,256	3.8	16,077,703
45-64	72,268	7,432	6.1	18,704,163
65+	50,938	9,409	8.0	31,052,582
Total	281,839	33,202		72,886,846
		2010		
0-14	46,320	6,224	2.8	7,189,451
15-44	117,826	10,675	3.8	16,735,321
45-64	81,394	8,371	6.1	21,066,124
65+	57,690	10,656	8.0	35,168,701
Total	303,230	35,926		80,159,600

[1] Number of persons in age category, from Exhibit 15.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at N$412,552 per bed-day.

TABLE 34
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection D, Neoplasms)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
2000				
0-14	45,437	72	2.3	67,918
15-44	113,196	648	4.4	1,164,830
45-64	72,268	1,070	7.1	3,105,182
65+	50,938	1,285	8.7	4,570,488
Total	281,839	3,075		8,908,418
2010				
0-14	46,320	74	2.3	69,238
15-44	117,826	674	4.4	1,212,475
45-64	81,394	1,205	7.1	3,497,304
65+	57,690	1,455	8.7	5,176,321
Total	303,230	3,408		9,955,338

[1] Number of persons in age category, from Exhibit 15.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at N$408,805 per bed-day.

TABLE 35
PROJECTED COST OF HOSPITALIZATION, CASMU MEMBERSHIP, BY ABBREVIATED AGE CATEGORIES AND SEX, 2000 AND 2010
(Projection D, Cerebro/Cardiovascular Disease)

Age Group	Number[1]	Number Hospitalized[2]	ALOS	Cost (N$)[3]
2000				
0-14	45,437	12	6.4	19,624
15-44	113,196	263	5.9	412,213
45-64	72,268	1,111	8.4	2,476,081
65+	50,938	2,362	9.2	5,765,849
Total	281,839	3,748		8,673,767
2010				
0-14	46,320	12	6.4	20,005
15-44	117,826	274	5.9	429,073
45-64	81,394	1,251	8.4	2,788,760
65+	57,690	2,675	9.2	6,530,131
Total	303,230	4,213		9,767,970

[1] Number of persons in age category, from Exhibit 15.

[2] Using baseline rates of hospitalization from 1991.

[3] Thousands of new pesos, calculated at N$265,300 per bed-day.

TABLE 36
PERCENT CHANGE IN COSTS OF HOSPITALIZATION BY DIAGNOSIS
FOR ABBREVIATED AGE CATEGORIES, 1991-2010
(Projection D)

	All Diagnoses	Neoplasms	Cerebro/Cardio-vascular Disease
1991-2000			
0-14	-3.7%	-3.75%	-3.7%
15-44	7.9%	7.9%	7.9%
45-64	0.6%	0.6%	0.6%
65+	23.0%	23.0%	23.0%
Total	10.3%	12.0%	14.9%
2000-2010			
0-14	1.9%	1.9%	1.9%
15-44	4.1%	4.1%	4.1%
45-64	12.6%	12.6%	12.6%
65+	13.3%	13.3%	13.3%
Total	10.0%	11.8%	12.6%

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