CHAPTER 6

STUDY RESEARCH METHODOLOGY

6.1. Location for the study

The Mexican Institute of Social Security conducted the study in the DF, the Mexican Capital. The DF represents 0.1%[169] of the total Mexican territory (1,964,381.7 km^2);[159] in the north, east and west the DF is adjacent to the State of Mexico and to Morelos in the south. 13% of the DF is agricultural, 5% is grazing land, 19% forest and 63% has other uses. It is divided into 16 political delegations with local government in each one and a total of 499 localities. There are over two million housing units with an average of 4.2 people per household. Over 96% of houses have electricity, water supply and drainage; 3% have two services only and less than 1% have one or none.[169]

According to the last report,[169] nearly 8.5 million people were living in the DF in 1995 (9.3% of the Mexican population), with 48% being male, 9% children four years old or less, 19% were 5-14 years old, 53% 15-44 years old, 11% 45-59 and 8% 60 years or more. The median age was 25 years, the highest in Mexico (national average 21). During 1990-95 the DF had the lowest rate of population growth (0.5)[j] in Mexico and also the lowest proportion of people 15 years old or less. The DF had a population density of 5,663 persons per km^2, while in nearby states it was of 546 and 292 (states of Mexico and Morelos respectively).[170]

A quarter of the residents of DF came from other states or countries. Almost everybody speaks Spanish.[170]

[j] In Mexico the rate of growth was 1.8 during the same period and some states reached 6.5%. INEGI. Perspectiva Estadística del Distrito Federal. Mexico 1997. pp. 1-107.

The most important demographic indicators for 1995 are presented in Table 6.1. The masculinity ratio, general fertility rate, dependency ratio and male/female mortality were lower in the DF than the national average. The general mortality rate, life expectancy, and senile dependency ratio were all higher. The high proportion of elderly people in the DF is reflected in these indicators.

Table 6.1
Some demographic indicators, 1995

Indicator	*National*	*DF*
Masculinity ratio	97.1	92.4
General Fertility rate	2.8	2.2
General Mortality rate	4.7	5.8
Life Expectancy	72.9	74.6
Male/female mortality	129.2	112.7
Dependency ratio	0.7	0.5
Senile dependency ratio	0.1	0.1

Source: INEGI. Population counting database in Mexico, 1995

8% of those living in the DF were 60 years old or over in 1995 (6.6% of men and 8.6% of women). It is the third state with the highest proportion of elderly people in Mexico. During the same year 11% of the elderly people in Mexico were living in the DF, the highest state. The distribution of elderly people by age was similar to that for Mexico (See Table 6.2).

Even though the lowest masculinity ratio has been in the DF since 1970 (68%), it has been increasing and reached 71% in 1995. The ratio decreases with age and beyond 80 years old there is almost one man by each two women (See Table 6.2).

The DF has the highest numbers of physicians, nurses, beds, consulting rooms and general surgeries per person. However, general productivity in the health sector is lower than for the national level (general consultations per person, consultation per physician, hospital occupation and length of stay in hospital). Indicators are presented in Table 6.3.[170]

Table 6.2
Distribution of elderly subjects and male/female ratio by age

	Mexico			*DF*		
Age Group	*n*	*%*	*Male/ Female*	*n*	*%*	*Male/ Female*
60-64	1,941,953	32.1	91.8	212,782	32.7	76.5
65-69	1,425,809	23.5	89.7	158,713	24.4	72.6
70-74	1,079,803	17.8	93.3	119,920	18.4	73.3
75-79	666,196	11.0	91.1	71,291	10.9	69.3
80-84	434,120	7.2	80.7	46,687	7.2	58.6
85-89	252,802	4.2	79.7	26,414	4.1	55.4
90-94	105,150	1.7	74.2	10,508	1.6	49.8
95-99	49764	0.8	71.3	4,126	0.6	44.4
100+	14,046	0.2	57.7	685	0.1	37.3

Source: INEGI. Population counting database in Mexico, 1995.

Table 6.3
Health services indicators in Mexico and DF, 1996

Indicator	*National*	*DF*
Physicians/100,000 population	111.5	276.2
Nurses/100,000 population	184.5	477.9
Beds/100,000 population	84.1	214.5
Consulting rooms/100,000 population	47.9	82.7
General consultation/1000 population	1,376.0	1,709.0
Surgical procedures/1000 population	27.0	52.0
General consultations per physician (day)	8.4	5.5
Hospital occupancy (%)	65.4	61.4
Length of stay (days)	3.8	5.8

IMSS in the DF is divided into four delegations. There are 45 FMUs, 13 HGZs, and two CMNs with 16 hospitals.[k] IMSS´ headquarters and two heads of regions ("La Raza" and "Siglo XXI") are also located in the DF.

[k] The Delegational Co-ordinator of Medical Research in each Delegation provided this information. IMSS, 1998.

One fifth of the IMSS medical units are located in the DF and so are more than 30% of the hospitals as well as 36% of the IMSS medical doctors and 48% of medical encounters with general practitioners. More than a half of the general and emergency consultations and 38% of specialist consultations are also in the DF and 17% of the population covered by IMSS at the national level is registered in the DF. Nearly two thirds of the DF's population are covered by IMSS.[169] According to the last reported information, 581,008 elderly people were registered in the DF IMSS, which represents 89% of the elderly living in the DF, 12% of the registered people in the DF IMSS and nearly one fifth of the total elderly in IMSS at the national level. Thus a high proportion of elderly are living in the DF and most of them are covered by IMSS.

Even though DF is one of the most populated cities in the world, with a very high density and urban poverty, conditions are better than in other Mexican states and the national average. The DF population has seen accelerated demographic and epidemiologic changes, including population ageing.

6.2. OBJECTIVES

The long-term aim of the study was to support the formulation of health policies that would improve the health status of the elderly population in IMSS.

The study objectives were to:

1. Describe their general socio-demographic and family characteristics.
2. Describe self-perceptions of their health status.
3. Define risk factors affecting their health status.
4. Establish their health status by morbidity, disability and mortality.
5. Determine factors affecting utilisation of health services.
6. Estimate the costs of providing services for IMSS elderly insurers.
7. Predict health status needs, services utilisation, and health care costs in the years 2000, 2010 and 2020.
8. To make proposals for establishing policies for the elderly health care in IMSS.

Some of the most important research questions were as follows:

1. What are the self-perceptions of health in this population?
2. To what extent are the elderly population in IMSS exposed to risk factors (smoking, drinking, or sedentary life) that affect their health?
3. What is the frequency for loss of vision and hearing?
4. What is the level of disability in this group of population?
5. What is the frequency of mental depression?
6. What is the incidence of acute conditions and injuries?
7. What are the incidence, prevalence, disability and mortality rates for chronic conditions?
8. What are the patterns of utilisation of health services by the elderly in the IMSS? What are the factors associated with their utilisation?
9. What are the costs of health services delivered to this group of population? What are the factors that determine such costs?
10. How will population ageing process affect the future costs of health services in the IMSS?

6.3. STUDY DESIGN

A cohort design was selected in order to make direct estimates of the incidence of diseases and health services utilisation rates. Although cross-sectional and panel designs have been used for studies in other countries, it has been demonstrated that a cohort was the best design for the project, since it has the following advantages:

1. Help to establish causal relations since the direction of the association between variables can be demonstrated.

2. Determines the speed of becoming ill, disabled, or death by establishing the onset and duration of each new case in the study period.

3. Avoids memory bias in health services utilisation during long periods of observation (more than one year).

4. Improves the certainty in predicting future events.

For this specific research project the selected subjects were interviewed four times from October 1996 to July 1998. Although the initial plan was to follow them up for only one year, because of the available resources, grants from CONACyT and IMSS allowed their observation in the cohort to be continued over a longer period. Other projects have been based on the same group of elderly population.

In order to calculate incidence rates, only periods for subjects free of each specific disease were considered in the denominator population. The observation periods were different per subject and were determined by the following procedures:

1. Subjects who died within two months prior to the first interview: For the two months observation period a proxy respondent was questioned about the deceased person.
2. Subjects who died during the follow-up period: The number of days between the date of the first interview and the date of death.
3. Subjects who refused to be interviewed: The number of days between the date of the first interview and the date of the last one.
4. Subjects who were not present in one interview: The number of days between the date of the first interview and the date of the last one less the period for which the interview had not taken place.
5. Subjects who continued in the cohort: The number of days between the date of the first interview and the date of the fourth one.

6.4. SAMPLING DESIGN

Selection criteria

People aged 60 years and over, both men and women, covered by IMSS in the DF were the reference population. The selected sample of elderly fulfilled the following criteria: Aged 60 years or over; covered by IMSS in one or more types of insurance; registered in a FMU in the DF; and residents in the DF for more than 6 months. The following were excluded from the cohort sample: people staying in another delegation or country; institutionalised, other than in a hospital; unable to answer questions because of his/her mental status and living with somebody else who did not fulfil criteria; died more

than two months before interviewer's visit; and those subjects who refused to answer questions.

Proxy respondent selection

When a person was unable to answer because of his/her mental impairment (according to the MMSE evaluation (see below)), a close proxy respondent was required to be available to answer questions. The proxy was someone who lived in the household and looked after the participant (preferably the spouse, son, or daughter), was 18 years old or over, and who had no mental impairment (the MMSE was also used to evaluate them).

Sample selection

The sample was selected using the following multistage procedure:

1. First stage: FMUs were considered as a cluster or primary sampling unit to be chosen randomly. Each cluster covered different numbers of people according to the number of consulting rooms in each unit.

2. Second stage: Consulting rooms were considered as the second cluster or the secondary sampling unit to be also selected randomly.

3. Third stage: Geographical areas (already defined in IMSS) covered by each consulting room were visited house by house searching for elderly people 60 years or over entitled to receive services in IMSS. Although the whole was visited, a minimum number of people for each unit was established in order to preserve the sampling fraction. This meant that repeat visits were done as many times as possible in order to avoid refusals.

Sampling frames

There were 45 FMUs in the four "Delegations" in the DF and twelve of them were selected randomly using Epi-Info (list of random numbers) under the simple random procedure to preserve the same sample fraction (12/45), or the same likelihood to be chosen, for each FMU.

The list of consulting rooms for each FMU was requested and one room (morning and afternoon shifts) from each unit was selected randomly. The

geographic area covered by the consulting room selected was marked in maps jointly with the unit's authorities.

Sample size

The following parameters were used in order to calculate the sample size:

a) Confidence level = 95%
b) Total population aged 60 years or over in IMSS in DF.
c) Alfa = 0.05
d) Frequency of the most important variable under study =2.7%
e) Precision = 0.7
f) Design Effect = 2.3 and,
g) Non-response rate = 20%.

This resulted in a sample size of 5,500 elderly subjects. The number of subjects to be interviewed was proportionally distributed by the unit according to the number of elderly people. The sample fraction for each consulting room and the sample size by unit (consulting room) are presented in Table 6.4.

Table 6.4
Clusters, fractions and sample size by family medicine unit

FMU	*No. of Consulting Rooms*	*Sample Fraction*	*Sample Size*
6	10	1/58	493
7	34	1/351	273
12	17	1/285	122
13	18	1/69	641
22	18	1/78	566
29	11	1/70	524
33	27	1/166	385
35	27	1/105	484
41	25	1/132	527
42	13	1/58	398
45	14	1/68	484
94	24	1/102	603
Total	12	—	5500

6.5. QUESTIONNAIRES

Questionnaire to evaluate mental status

The Mini-Mental State Evaluation (MMSE) questionnaire was translated, adapted and validated for the Mexican elderly population, as a part of this study. The MMSE evaluates the respondents' orientation (place and time), memory (short and middle term), and concentration/attention. According to the validation process, the cut-off point was a score of 24 for those subjects able to give consent and answer any question within the questionnaire, whereas those scoring 23 or less were not able to do it.

Questionnaire to evaluate health status, utilisation and cost of health services

This instrument was created by the researcher with pre-categorised answers, so that it could be captured with an optical reader (OCR). This was pre-tested and evaluated with another Mexican elderly population in other IMSS delegations. After the evaluation, mistakes detected were corrected and the approved final version for each stage was sent to the printer. The first questionnaire was more comprehensive especially in demographic and family and social support characteristics. The second, third and fourth versions only included those variables in which changes were expected.

To measure variables such as activities of daily living (ADL), instrumental activities of daily living (IADL), depression, and self-perceptions of health, other validated scales (Katz, Lawton and Brody, GDS10, and the Health Perceptions Questionnaire)[171] were used as a proxy indicator of the final variable. The use and adaptation of these scales will be explained below.

6.6. REFERENCE STUDY MANUAL

The researcher elaborated a reference manual to train interviewers to manage questionnaires according to the project's objectives. This included a short introduction to the project with its general objectives, and general methodology and techniques, an explanation about the interviewer's responsibilities

during the fieldwork and the interview technique, and finally instructions on how to fill out the questionnaire with the interpretation of each question.

6.7. INTERVIEWERS

Twenty interviewers were hired during the fieldwork period. A higher number of people were recruited but only those with the best performance were selected during the training course of three weeks. The training course was based on the reference manual, and was divided into three stages: In the first the objectives, concepts and responsibilities (one day) were presented. In the second, each question and its categories were analysed and procedures to fill out the questionnaire were reviewed (four days). Finally, practical training in interviewing was undertaken with colleagues and staff from the National Co-ordination of Research (one week) and elderly people in the CMN "Siglo XXI" (second week).

6.8. QUALITY CONTROL

Professional nurses were trained in order to supervise and guarantee the quality of the information provided by five interviewers working in the field

There were three levels of supervision. In the first level, they were present in 2% of the interviews made by their team. At that moment they were checking the introduction, the way in which the interviewers were asking questions and the way in which they marked the answers in the questionnaire. In the second level, they re-interviewed randomly 5% of those already seen and compared answers in their questionnaire with the interviewer's answers to objective questions (age, gender, occupation, level of education, use of services, diagnosis, etc.). In the third level, they critically reviewed the answers to each questionnaire received and gave feedback to the interviewers, including returning to them the incomplete or low quality questionnaires.

After the supervisor had reviewed personally each questionnaire, they were sent on to professional reviewers who again critically reviewed the information for each question and corrected it if necessary. When mistakes were detected and it was not possible to correct them logically, the questionnaires were sent back to the supervisor and interviewer. After these revisions the questionnaires were arranged consecutively and sent to the computer centre.

6.9. DATA HANDLING AND COMPUTING

Information was captured automatically through the Optical Reader (OCR) OPSCAN 5 by using Scantools for Windows. ASCII archives were obtained and transformed to .DBF databases by using Visual FoxPro 5.0 programming.

Database archives (.dbf) were transformed into .sav archives for SSPS. The final validation (content, structure, logical sequence, categories, interval of categories, and missing values transformation) was completed by using SSPS programmes. Mistakes were corrected using information directly from questionnaires or by making phone calls to the elderly interviewed, when it was considered necessary to guarantee the quality of the information.

Processing of data was made by using SSPS, Excell, Epi-Info and Stata, programmes according to the specific analytical needs.

6.10. DATA ANALYSIS

1. Information was weighted according to sample fractions.

2. Simple relative and absolute frequencies were calculated (variables and indicators) by age and sex.

3. Some important variables were converted into binary variables.

4. Average, median, mode, standard deviation, range and quartiles were calculated according to variables and indicators' scale.

5. Prevalence and incidence rates were calculated for different acute and chronic conditions.

6. Utilisation of health services (in public settings in IMSS or others and in private settings) was measured as the prevalence of utilisation, while the rates of utilisation by level of care and type of service in IMSS were also calculated.

7. Factors associated with utilisation of health services (in public settings in

IMSS or others and in private settings) were calculated by using odds ratio with 95% confidence intervals and logistic regression.

8. Factors influencing the rate of utilisation in IMSS were analysed by using multiple linear regression.

9. Cost per unit per type of services by level of care in IMSS was added to the database. Information about the cost per unit of service was obtained from the Information Systems Department in the Administrative Area in the IMSS. This information was captured directly in the database.

10. Cost of health services per person, average cost, and total cost per type of service and level of care in IMSS were calculated.

11. Variables predicting the average annual cost in each level of care were established by using multiple linear regression.

12. Assuming the projected distribution of the population (demographic projections of the elderly population in IMSS were obtained from the Epidemiology Division in the Public Health Co-ordination in the IMSS), the sample was newly weighted with three different fractions (each one for years, 2000, 2010 and 2020 AD) by age and sex. The same rate observed in the project was assumed for calculating the expected numbers of health conditions, and health services utilisation and cost.

6.11. VARIABLES USED IN ANALYSIS

See Annex 1 for more details.

Demographic characteristics

Age, sex, education, occupation (past and current), place of birth, income (personal and transfers), marital status, type of insurance in IMSS, and other health insurance.

Family characteristics

Type of family, family structure, number of generations, influence in family decisions, and family support.

Health status

Risk factors (physical activity, smoking, and drinking), sensory loss (hearing and vision), incontinence (urinary and faecal), performance indicators (ADL, IADL, modifying activities because of health problems), self-perception of health, mental depression, acute diseases (primary and complications), injuries (including poisonings), chronic diseases (incidence, prevalence, mortality and disability per diagnosis).

Health services utilisation

Level of care, type of services, number of times each service was used, and type of institution.

Cost of health services

Cost per person, average cost, total cost, cost per service, cost per level of care.

6.12. CONSTRUCTION OF INDICATORS

Activities of daily living (ADL)

Information was requested on the six common activities (bathing, dressing, toileting, transferring, feeding, and incontinence) proposed by Katz[171] in 1959 (revised in 1976) in order to evaluate independence in basic self-care.[172] Instead of incontinence, the study used another activity *standing up from the bed,* since the former involves other personal and social issues. Categories for answering each question were “can do it without help”, “can do it with help” or “can not do it”.

The person was considered independent when he/she was able to do the

six activities without help. If he/she needed help in at least one[173] of the activities it was considered a person with disability.

Instrumental activities of daily living (IADL)

It was judged important to considered some of the activities asked about in other research projects and adapt them to the local community in Mexico. It was also decided to include some activities that could measure the ability of subjects to be a functioning member of society and to cope with domestic tasks. Finally, the following 11 activities were asked about: going up stairs, shopping, cooking, doing the housework, going to the laundry, bank or church, making payments, using transport, and managing own drugs or money. Categories for answering each question were the same than for ADL.

The person was considered independent when he/she was able to do at least 8 of the activities listed without help. If he/she needed help in more than three of the activities it was considered a person with disability in IADL.

Mental Depression

The geriatric depression scale with 10 (GDM-10) items was used. This is a shortened version of the GDS30 was used to identify clinical depression according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria.[174] It was proposed by Yesavage[175] in 1983 as a useful first approach to screening for depression in the elderly.

The scale was translated into Spanish and adapted for the Mexican population. This scale validated as a part of this study. The cut-off point, used in this research was three/four. The best condition was zero and the worst was ten. People getting four points or more were considered to be suffering from mental depression.

Self-perceptions of health

This variable was measured using the health perceptions questionnaire (HPQ) proposed by Ware in 1976.[171] This evaluates perceptions of past, present and future health, resistance to illness, and attitudes toward sickness. The original scale had 33 items but it was decided to reduce it to 29 items since some of them were not culturally relevant for the Mexican elderly. The elderly

subjects answered by disagreeing or agreeing. Proxy respondents were not used to answer this section.

Once the information was in the database, scores were reversed in some questions. Instead of calculating the score as proposed by the authors, the qualification was established as follows: If the appreciation of health in a question was positive they received one point; if it was negative they received zero. The number of points per question was added to get the total score. Since the minimum score was zero and the maximum 29, it was decided to divide the score as follows: very poor, 0-7 points; poor 8-14; good, 15-21; and excellent, 22 or more points.

6.13. CONTROL OF BIAS

Validation, pilot testing, interviewers training and supervision controlled bias in instruments. Observer bias was controlled for by stressing training and supervision. Non-response bias was controlled by revisits or call-backs, from the interviewer, supervisor or researcher.

6.14. ETHICAL ASPECTS

Informed consent was required to interview the person or the proxy respondent. The General Directorate of Medical Benefits in IMSS signed a personal letter for each participant (Annex 2). Information about the research project including objectives, survey design, participation, refusals to participate, confidentiality of information, and the importance of the project in helping the elderly was provided in the letter. The initial contact was directly with the elderly participants themselves but if she/he was cognitively impaired, the interviewer asked for the proxy respondent according to the established criteria. Every effort was made to ensure that subjects understood procedures before seeking this consent. Confidentiality was assured and kept, and all kinds of coercion were avoided.