Publicado en: J.J. Shroots, R. Fernández Ballesteros y G. Rudinger (eds.): Aging in Europe. Amsterdam: IOS Press, 1999, pp. 107-121.

9
Spain

Rocío Fernández-Ballesteros[a], Juan Díez-Nicolás[b] and Antonio Ruiz-Torres[a]
[a] *Autónoma University of Madrid. Spain*
[b] *Complutense University. Spain*

The study of age, the aged, and the aging process has been the focus of scientific interest in the last fifty years in Spain. Nevertheless, following Schroots (1995), the study of age and the aged has received much more attention than the study of the aging process. Since this book is devoted to the study of aging in Europe, after presenting the most important demographic data, we are dealing with the effort in studying the process of aging as well as the most representative research of age, in the gerontological field, from a biological, social and psychological point of view. We are therefore not taking into consideration important research conducted about the aged, and other important geriatric research.

Demographics and social structure

The volume of Spain's population estimated for 1995 by the Spanish INE (National Institute of Statistics) is 39,241.5 thousand of inhabitants (19,204.1 men and 20,037.4 women). The distribution of the total population by sex and age groups is shown in Table 1. The population 65 and over is 6,059.2 thousand, or 15.5% of the total population (2,519.8 men and 3,539.4 women). The population of 80 years and over (1,326 thousand, of which 448 thousand were males and 878 thousand were females), represent 21.9 % of the total population 65 years and over (17.6% of the male and 24.9% of the female population, 65 years and over, respectively). It must be taken into account that the proportion of the population 65 years and over was 7.2% in 1950 and 9.7% in 1970, as against 15.0 % in 1995, which means it has doubled in only 45 years. This has been the result of a much higher rate of growth of the elderly population as compared with the total population. In fact, while the annual average rate of growth of the total population of Spain between 1970 and 1995 has been 0.65 %, that of the population 65 years and over during the same period has been 3.06 %.

The aging of the Spanish population has run more or less parallel to that of other Western European countries, and has been the result of two different but complementary demographic processes: the continuous decrease in mortality (and the corresponding increase in life expectancy) and the decrease in fertility. As a result of the decrease in mortality since the beginning of the 20th century, higher and higher proportions of those who are born can survive till higher and higher ages, to the point that Spain in fact enjoys one of the highest life expectancies even among European countries. As it is shown in Table 2, life expectancy at birth in 1992 was 73.7 years for males and 81 years for females, as against 72.5 and 78.6 years in 1980, and 69.2 and 74.8 years in 1970. Another sensitive indicator, infant mortality, confirms Spain as having one of the world's lowest levels of mortality: only 6.9 deaths under one year of age per 1,000 born alive in 1993, as compared

with 28.1 in 1970 (a low, but not one of the lowest, rates among European countries at that time). Furthermore, life expectancy at 65 years of age for males has increased from 14.8 years in 1980 to 15.7 years in 1992, and from 17.9 years to 19.5 years for females during the same period. It is expected that life expectancy at birth will increase to 77.7 years for males and 83.8 years for females in 2020 according to medium projection. Nevertheless, taking into consideration the recently published data on disability-free life expectancy (DFLE), at age of 65, Spanish men and women have, respectively, 6.8 and 6.5 DFLE (Regidor, Rodriguez, & Gutierrez-Fisac, 1995).

As for the decrease in fertility, Spain has experienced a rapid decline over the past twenty years. Still, in 1970, Spain had a total fertility rate of 2.9 births per woman, the highest level in Western Europe with the exception of Ireland (3.93 births per woman). In 1993, with a total fertility rate of 1.26 births per woman, Spain had the second lowest rate in Europe, only higher than Italy. The combined effect of declining fertility and increasing life expectancy results in an aging population both at the base (fewer births) and at the apex (higher proportions of survivors) of the population pyramid.

Other relevant and related demographic data that help to explain the structure and dynamics of Spain's population may be summarized as follows: A very close to 0 population growth rate -exactly 0.13% in 1994, compared to 1.04% in 1970 and even 1.06% in 1980- which results from a very low rate of natural increase (0.11% in 1994) and a positive net migration rate of 0.02% in the same year, compared to a natural increase of 1.13% in 1970 and a negative net migration rate of 0.09% in 1970. This implies that Spain, which has traditionally been a country with negative migration rates, has recently become a 'receiving' country. The low fertility experienced in Spain since the '80s is a result of declining marriage rates, apart from increased use of contraceptive techniques.

Marriage rates have declined, as in other developed countries, on account of many diverse but interacting variables, among which are unemployment among the young, housing difficulties for the young, higher rates of women's participation in the labor force, changing values about the family and about men's and women's roles, etc. In any case, marriage rates have declined from 7.3 marriages per thousand population in 1970 to 5.0 in 1994, and the mean age of women at first marriage has increased from 24.7 years in 1970 to 25.9 in 1992. Divorce rates are very low in Spain: 0.7 divorces per thousand population in 1993 (0.5 in 1985), and extra-marital births are also less frequent than in other European countries: only 10.5 per 100 live births in 1992 (1.4% in 1970).

The size of households has also been very much affected by the aging of the population. The proportion of one-person households increased from 7.5% in 1970 to 13.4% in 1991, mainly due to the increased number of older persons who continue to live independently of relatives (alone or with spouse) until an old age. Thus, of the more than one and a half million one-person households registered in the 1991 Census, 35% were women over 70 years of age and 8% were males of the same age; 26% were women 40 to 69 years of age, and 16% were men of the same age; only 15% of those households, however, corresponded to men or women under 40 years of age.

According to projections elaborated by the Institute of Demography (CSIC,1994) the Spanish population estimated for 1995 (39,329.9 thousands) was 160 thousand inhabitants over the population estimated by the National Institute of Statistics (a difference of 0,4%). The difference, both in absolute and relative figures, is not very important for the reported date (1995), but is very significant to understand the method of projection for successive years. In fact, the populations projected by the ID for 2011 and 2021 are 41,109.9 thousands and 41,142.5 thousands respectively (as medium variants), which imply an

Table 1. Population by age group and sex on 1 January 1995.

Age group	Males	Females	Total	
	%	%	%	(x 1000)
0-19	25.4	23.1	24.3	9519
20-44	39.5	37.1	38.2	15011
45-64	22.0	22.1	22.0	8652
65-79	10.8	13.3	12.1	4733
80+	2.3	4.4	3.4	1326

Source: INE (1996)

Table 2. Life expectancy over time by sex, 1900-2020.

Year	Males	Females
1900	33.8	35.1
1960	67.4	72.2
1970	69.2	74.8
1980	72.5	78.6
1990	73.3	80.4
1992	73.7	81.0
2000	75.8	82.2
2010	76.9	83.1
2020	77.7	83.8

average annual rate of growth of 0.28% and 0.17% for the periods 1995-2011 and 1995-2021 respectively. Though it seems plausible that population growth will be lower in the future than it has been during the period 1970-1995 (0.65%), ID's projections probably are overestimated, due to an overestimation of future fertility. As a matter of fact, ID's medium estimates are based on a decline of the Fertility Index till 1993 (1.308 average births per woman), and slight increases from that date until the year 2008 (1.728 average births per woman). However, the official data for 1994 are lower (1.2 average births per woman), and there are no signs of a reversing trend for the next few years due to changes in the age-specific rates or the composition of the female population. Therefore, it seems appropriate to assume that the total populations projected by ID for Spain in 2011 and 2021 are overestimated, and that, correspondingly, the births and the younger age groups for those years may also be overestimated, and the older age groups underestimated. The population 65 years and older estimated by ID for 2011 represents 17.5%, and that for 2021 represents 19.3%, of the total population of Spain in those two years. (It should be noted that the high and low variants for the year 2021, 19.2% and 19.1%, are not significantly different from the reported medium variant, 19.3%). But, if fertility does not increase, as these three variants imply, the aging of the population will be greater than expected. The proportion that the population 85 years and over will represent over the population 65 years and over, according to the medium variant, in 2011 and 2021, is estimated as 12.0% and 13.9% respectively (compared to 9.1% in 1995).

As maybe noted, population projections are based almost uniquely on changes in fertility, but with little reference to mortality changes. As a matter of fact, projected changes on male life expectancy at birth are almost negligible from 1994 to 2020, and females life expectancy projected changes show an equally important variation. The aging of the Spanish population will then continue as a consequence of the maintenance of low

fertility (well below the replacement level) or even some slight increase, and a rather stable life expectancy for both males and female.

Finally, with regard to the social and health protection system, Spain is a welfare state with public social security system covering about 97% of citizens over 65 years old. In 1994 the total cost of social protection (social and health services, pensions, etc.) for the elderly accounted for 9.7% of the GDP, or 42.6% of the total social protection expenditure (23.6% of the GDP) (Eurostat, 1996).

Gerontological research in Spain

Probably due to the fact that Spain has had a relatively young population until recent times -the so called 'demographic revolution' began in the late seventies- interest in the study of age and aging is relatively new. In 1949, the Spanish Society of Geriatrics and Gerontology (Sociedad Española de Geriatría y Gerontología, SEGG) was founded, and in 1965 the Spanish Journal of Geriatrics and Gerontology (Revista Española de Geriatría y Gerontología, REGG) was first published as the official organ of the SSGG. Today, several scientific organizations[1], numerous scientific journals[2] and several university programs are devoted to Gerontology[3], age and aging are priority research topics for the National Grant Research Agencies. All of this demonstrates the increasing interest in Spain in gerontology as a discipline and in the study of the aged, age, and aging phenomena.

Recently, a bibliographical study in gerontological research was conducted, using three scientific data bases from the fields of health sciences (Indice Médico Español,IME), social sciences and humanities (Instituto de Información y Documentación en Ciencias Sociales y Humanidades, ISOC), and life sciences and technology (Instituto de Ciencia y Tecnología, ICyT) (Fernández-Ballesteros, 1993). The descriptors used were: age (vejez), aging (envejecimiento), elderly (anciano), gerontology (gerontología), geriatrics (geriatría), and third age (tercera edad). With these descriptors, from 1971 to 1991, 2,097 documents were produced (81.2% from the medical data base, 18.1% from the social sciences and humanity data base, and 6.7% from that of life sciences and technology), the majority of them in scientific publications. Although there is a clear progression in publication from 1971 (37) through 1990 (207) there was a strong acceleration of this progression during the 1980's. The contents of these 2,097 documents were classified in five categories: medical, social, psychological, developmental process, and others. 40.3% of the documents deal with medical topics and conditions (illnesses of the nervous system, injuries, etc.); 35.7% deal with social conditions (pensions, social assistance, etc.); 18.6% with psychological topics (psychopathology, personality and behavior, etc.), 2.5% with developmental processes (aging, adulthood, childhood, etc.), while 2.9% deal with other aspects.

Perhaps the most important finding of this bibliographical study is that, up to 1990, Spanish gerontological research had two main characteristics: it was essentially medical and it was mainly applied. It was medical not only in the sense that it was devoted to medical processes and/or conditions and their treatment, but also because when research dealt with other social or psychological topics, these topics were of an abnormal or pathological nature (e.g., marginality, alcoholism). Moreover, under the keyword 'Gerontology' appeared all sorts of typical geriatric topics. Thus, Gerontology seems to be monopolized by Geriatrics in Spain. Also, Spanish research in gerontology is mainly applied in the sense that it deals with practical questions and problems (e.g., social programs, level of care). Very little research has been devoted to basic gerontology, and only 1.6% of the documents examined have dealt with aging.

In summary, Spanish gerontological research has concentrated primarily on studies of age and the aged, while little attention has been paid to the study of aging (Schroots, 1995). However, given that this book is devoted to Aging in Europe, we shall review the attempts that have been made to the study of aging, from both the biological and psychosocial points of view. We shall also present other fields of research on age and the aged (though avoiding those important studies developed from geriatrics), in order to give an overview of age and aging research in Spain.

Biological and experimental research on aging

Basically, the fields of Spanish experimental biological gerontology are the following: free radicals, immunology of aging, molecular biology of neurotransmission, vascular endothelium and smooth muscle cell changes in aging, fat cell physiology during aging, biochemical changes of enzymes and of other proteins due to aging and biological aging of populations and individuals. There are approximately ten main laboratories or institutes in which two or more research groups are working on aging.

In the field of *free radicals*, Barjas' group is working on the study of the protection against oxidative damage related to the life potential of different animal species (Barja, Cadenas, Rojas, López-Torres & Pérez-Campo, 1994). Principal results show that those species which demonstrate longevity normally have a low production of mitochondrial free radicals (Barja, Cadenas, Rojas, Pérez-Campo & López-Torres, 1994). The group of Viña-Rives is also investigating the field of free radicals, here focused on detoxification systems such as those which are glutathione dependent (Viña, Vento, García-Sala, Puertes, Gasco, Sastre, Asensi & Pallardo, 1995). Their experimental design is strongly related to important questions of human pathology. They have recently demonstrated that DNA damage associated with aging is related to oxidation of glutathione, and is due to increased free radical production, not to decreased antioxidant defense (García de la Asunción, Millán, Pla, Bruseghini, Esteras, Pallardo, Sastre & Viña, 1996). Miquel's research group is the most experienced Spanish team in free radical research, and has a long professional tradition as a leader in the field (Miquel, 1995). Their results on the mitochondrial genome are internationally well-known. On the basis of extensive *Drosophila* and mouse experiments, the main accomplishment of the research of this group, which is gaining considerable acceptance, is to show age-related mitochondria degeneration in fixed post-mitotic cells as a consequence of oxygen stress-mitochondria DNA mutation (Miquel, 1992).

All groups working in aging are quite open to collaboration. For instance, the last mentioned group studied the impact of free radical reactions on the immunological capacity of old animals, together with de la Fuente's team. This group has been working for several years in the immunology of aging (Fuente, Fernández, Miquel & Herranz, 1992) and one of its most relevant findings is to have demonstrated that immune cells change their functions with aging, and that corporal activity and antioxidants produce revitalization of these functions (Fuente, Fernández, Muñoz, De Juan & Miquel, 1993).

Biochemical and molecular biology research in aging has also important research teams. Cabezas and his research team is working in protein metabolism as well as in lipid composition of subcellular particles focused on adaptive changes in aging (Cabezas, Andrés, Hueso, Llanillo, Martínez-Zorzano, Rodrigo & Sánchez-Yagüe, 1991). This group has found that aging decreases the serum activity of lysomal enzymes as well as the urine excretion and total kidney content of b-N-acetylglucosaminidase (Sánchez-Bernal, Martin, Pérez-González, Pieretti, Villar & Cabezas, 1991). Machado's group is investigating the

enzymatic activity changes during aging, recently the dopaminergic system (Machado, Ayala, Gordillo, Revilla & Santa María, 1991). A very important finding of this group is the detection of the loss of activity due to oxidative damage in aging of liver enzymes such as 6 phosphogluconate dehydrogenase and malate dehydrogenase, as well as of tyrosine hydroxyls in the *substantia nigra* (Ayala, Parrado, Bougria & Machado, 1996). This last-mentioned result is relevant if we consider the age-related prevalence of Parkinson's disease. Finally, the changes of calcium-dependent neurotransmission, and of the insulin effect due to aging are the main research fields of Satrústegui and her group (Bogoñez, Gómez-Puertas & Satrústegui, 1992). In our opinion, the most important finding of this group is to have demonstrated that brain aging is associated with a marked loss of calcium binding capacity of the cytosol and a reduction of calcium accumulation in synaptic mitochondria (Martínez-Serrano, Blanco & Satrústegui, 1992). All those three groups have been working in basic aging research for many years. Their results are an important reference for medical trials.

The *pharmacology* of aging is very well represented by Spanish researchers. The question of endothelium implications in blood pressure regulation is mainly investigated by the group of Marin and Sánchez-Ferrer. They not only pay attention to relaxation effectors dependent on age, but also study the impact of free radical reactions on the endothelium functions (Marin, 1993). The age-dependent loss of the endothelium factor which inhibits the ouabain-induced contraction and its 'replacement' by release of other endothelium factors but with an opposite action are remarkable results obtained by these investigators (Ponte, Sánchez-Ferrer, Hernández, Alonso & Marin, 1996), as are those on the interactions between glycosilated hemoglobin and endothelium-dependent responses (Rodríguez-Mañas, Arribas, Giron, Villamor, Sánchez-Ferrer & Marin, 1993). Garcia's group is especially working in cell activation with extensive experience in calcium channel modulation (Michelena, Vega, Montiel, López, García-Pérez, Gandía & García, 1995). Here we must point out their very important discovery using a novel pharmacological tool, based on the fact that L-type voltage-dependent Ca^{2+} channels control the release of cathecholamines in adrenal medullary chromafin cells (García, Sala, Reig, Viniegra, Frías, Fontériz & Gandía, 1984). Understandably, both groups are also very interested in those processes which involve atherosclerosis, mainly regarding endothelium damage, foam cell formation and phenotype changes of smooth muscle cells of the arterial wall. This last-mentioned research is also being carried out by the group of Ruiz-Torres which is working in the physiology of human aging, especially on the question of how insulin may act atherogenically, as age normally increases insulin secretion (Ruiz-Torres, Vicent, Sánchez de Paco, Muñoz, Gimeno & Carraro, 1996). They developed a method for measuring aging rates based on a two-compartmental mathematical model from whose results the concept of regulation of aging has been described (Ruiz-Torres, 1994).

This section is not complete, neither regarding the description and findings of the various fields of the groups mentioned here nor regarding other new, but no less important, groups also working in aging. Otherwise, the report of this section would be too long. Here, only the groups with the longest tradition in aging research are mentioned. In relation to this, it is worth underlining those institutions exclusively or strongly linked to aging research. First, we should mention the Institute of Gerontology and Metabolism of the Autónoma University of Madrid which includes eight research groups. Meanwhile, the Cajal Institute of Madrid for Neurosciences and the Anatomic Institute of Salamanca are working in brain aging.

Longitudinal research on aging

Only two studies have focused on the process of aging: the INSERSO-UAM Longitudinal Study on Aging (ELSE) (Fernández-Ballesteros et al., 1990, 1991) and Aging in Leganés (AL) (Beland & Zunzunegui, 1995). These two longitudinal research programs have different levels of implementation: at present, the former has only conducted the pilot study, while the latter has reached two assessment points. We shall summarize both research projects.

INSERSO-UAM Longitudinal Study on Aging (ELSE) (Estudio Longitudinal Sobre Envejecimiento UAM-INSERSO)

ELSE was planned as an age-cohort-period study assessing two cohorts (60 and 70 years old) of people living in Alcobendas (a town close to Madrid, with a sociodemographic distribution fairly representative of the Spanish population) every five years, over fifteen years, taking in each wave a new 60-year-old cohort (Fernández-Ballesteros et al., 1991). It was planned to assess three wide areas: biological, psychological and social.

Within the biological area the following constructs and processes were selected: health status (medical examinations and clinical analyses), anthropometric measures, cardiovascular and respiratory measures, endocrinological indicators, immunological measures, and physiological measures. Within the social area, the following variables were planned to be assessed: sociodemographic variables, quality of housing, quality of the neighborhood, social support, social network, and availability and utilization of social and health services. The psychological area includes the following sub-areas: motor (muscular strength, motor speed, visomotor coordination, spatial orientation), cognitive (verbal comprehension, knowledge, inductive reasoning, mental status), behavioral (functional abilities, ADL, IADL, social abilities, life styles); emotional/motivational (life satisfaction, self-esteem, depression, perceived stress, perceived quality of life); subjective health (mental health and perceived physical health).

Psychological, social and medical assessment were planned to be administered by trained psychologists and physicians in a Senior Citizens' Club over four days (two sessions per day, approximately one-and-a-half hours per session) in one week, while anthropometric and analytical measures were planned to be carried out in a laboratory in a single session. Finally, in order to collect environmental variables, an interview was to take place in subjects' homes. A code book (variable name, variable label, type of variable, variable length, decimal places) and an SPSS data entry protocol were set up (Data entry II).

In order to test the measures and instruments selected, as well as the planned procedure for collecting data, a pilot study was conducted in 1992 (Fernández-Ballesteros et al., 1992). According to the Alcobendas census, the 60 and 70-year-old populations were 483 people born in 1932 (60 year old in 1992) and 266 born in 1922 (70 years old in 1992). A sample of 50% of each population was selected at random (241 60-year-olds and 133 70-year-olds). Contact was made with the selected subjects first by mail, and subsequently in person, at their home. On both occasions subjects were informed about the goals of the study and about the procedure for the administration of the instruments and measures. They were also informed that they would receive the results of the medical examinations, and about the reinforcement ($50.00) they would receive at the end of these evaluations. Only 13.3% of the sample of 60-year-old subjects and 16.5% of the 70-year-old subjects

responded to the call for collaboration, and only 7.9% of the 60-year-old subjects and 8.3% of the 70-year-old subjects agreed to participate in the pilot study.

There was such a low level of participation that the results from this pilot cannot be considered for any generalization. However, several lessons were learnt. First of all, the recruitment system is a very important matter in all longitudinal research, but especially in Spain (and, perhaps, in other Latin and Mediterranean countries). Spanish elders frequently refuse to collaborate even in general surveys. Díez-Nicolás (1996) pointed out that between 47% and 8% (depending on whether they lived in a rural or urban area or a city neigborhood) of over-65's refused to participate in a one-hour in-home interview. These percentages are extremely high in comparison with other longitudinal and cross-sectional gerontological studies showing cultural differences in participation. Reasons for non-collaboration given included "I do not want to participate" (46%) and "I have no time" (11%), among others. Moreover, the extremely high level of refusal to participate in the ELSE pilot seems to be due to the length of the process of collecting data (practically one week). Cultural differences regarding participation in research, as well as the time subjects have to spend in a given study, must be taken into consideration and carefully examined before the study implementation.

A second result that supports the lack of generalizability of the ELSE pilot (due to refusals), as well as pointing out the importance of using a representative sample in aging research, is that very few significant differences between the two age groups considered were found: 70-year-old and 60-year-old subjects were similar for the majority of variables examined. Only two significant differences were found: (1) as predicted, 60-year-old subjects yielded a more psychophysiological arousal profile than 70-year-olds, and (2) contrary to predictions, according to physicians' final evaluations of health (considering all types of analysis and examinations), 70-year-old subjects had better health than 60-year-olds(!)

The ELSE pilot results emphasized cultural differences as regards refusal to participate, and the importance of the balance between benefit and costs (efficiency), between length of assessment and level of participation. Much more modest objectives must be set if a longitudinal study is to be conducted properly, at least in Spain. Finally, it seems that sample representativeness is a necessary condition of aging research.

Aging in Leganés (EL)
(Envejecer en Leganés)

The EL is an age-group-period-cohort study planned to be implemented in Leganés (a 171,400-inhabitant municipality near Madrid) in order to study the process of aging in people over 65. It was begun in 1993, and is planned to continue until 2001, with evaluation every two years. Given that, in 1993, there were 13,679 people in Leganés over 65, in order to guarantee sample representativeness, a sample of 2.000 people, stratified by age (65-66, 67-68, 69-70, 71-72, 73-74, 75-76, 77-78, 79-80, 81-82, 83-84, 85-86, 87-88, 89 and over) and gender (77 subjects per stratum by 2) was selected from the electoral roll of Leganés. Data would be collected every two years in two in-home face-to-face interviews. During the first interview, a social questionnaire is administered, assessing daily living activities and functional abilities, health and life style, use of social and health services, social network and social support and depression. The second interview consists of a medical questionnaire and a physical examination performed by a physician, assessing sensory status, mental status, heart rate and blood pressure (Beland & Zunzunegui, 1995). Up to the present, the authors have reported data about the first cross-sectional study (conducted in 1993), and some longitudinal data have been analyzed and reported from the

second assessment, conducted in 1995. We shall now present a short summary of these results.

The eligibility rate was 77.3% and the response rates were 82.2% and 90%, respectively, for the first and second interviews. The data base contains information on 1,281 subjects. The sample was representative of the 65-plus population of Leganés by age, sex and marital status. With regard to education, 42.9 % have no formal educational qualifications[4].

As regards *activities of daily living* (ADL), subjects were classified in four groups: 84.4% were free of disability, 6.6% needed help in activities with mobility requirements, 6.2% reported needing help in activities without mobility requirements, and 2.2% were unable to perform any ADL. Financial situation, marital status and availability of social resources were strongly associated with ADL.

With respect to *subjective health*, 30% of the subjects reported being in 'very good' or 'good' health, 50% reported fair health, and 20% reported 'bad' or 'very bad' health (Zunzunegui & Béland, 1995). Only 4.3% had no chronic condition, and 50% less than 3 chronic conditions; 73.6% had good long distance vision and about 60% good hearing; 34% had lost all their teeth. Regarding mental status, only 94% had less than 4 errors in the SPSMQ.

With regard to *social network* and *social support*, the elderly of Leganés tend to have extensive family networks and support. Only 11.2% live alone, and 36% live with their husband or wife. 89% have children, 44% live with their children (19% live in their children's home and 24% have children living in their home). Almost 90% live less than 30 minutes from one of their children, while 53% live closer than 5 minutes walk away and meet their children at least once per month. Contact with grandchildren is as frequent as contact with children. 18% receive help from their relatives in relation with ADL, while 91% of males and 85% of females receive help regarding IADL. Wives and daughters and husbands and daughter are the main sources of help, respectively, for males and females. Formal sources of help are rarely reported. Four patterns of help were identified for ADL, and six for IADL. These patterns showed that help was provided daily for more than a year to a large proportion of elderly people receiving help. Patterns of help were identified for ADL and IADL, and living with others was the main predictor of reported help being received.

Over a one-year period, 11% of the elderly refrained from using either *medical* or *social services*; 35% used only one type of service of the seven considered in the study. Elders living alone had more difficulties for receiving health/social services than those living with other family members.

The EL study had its second assessment point in 1995, but only an unpublished report has appeared (Zunzunegui & Beland, 1995). From this report we learnt of 146 deaths of those in the initial sample, while 14 elderly had been institutionalized. The remaining 314 were alive in 1995, but 69 had moved out of the area and 245 were repeatedly absent or refused to participate.

From this second assessment, in order to assess *functional changes*, subjects were classified into 4 functional states: complete function, physical limitations, IADL disability and ADL disability, according to a hierarchical scale. Functional transitions are frequent among the elderly of Leganés; improvements are also relatively frequent (16%). Among the 65 to 74-year-olds with ADL disabilities in 1993, 44% had recovered ADL abilities by 1995. For the 75-plus group, mortality and functional decline increased. Losses to follow-up are related to functional status. Age, education, number of chronic conditions, cognitive deficits and depressive symptoms in 1993 are predictors of transitions among functional states. Taking into account the remaining predictors, women are more likely to acquire

physical limitations and IADL dependency than men, but the two genders are equally likely to enter into states of ADL dependency and to die.

In summary, from longitudinal data, functional transitions in the elderly are very frequent, and occur in both directions: decline and improvement. Gender and education affect access to economic and psychosocial resources that could be useful compensatory mechanisms for the loss of function. Prevention and treatment of chronic diseases may be the most practical route to delaying functional decline, while recovery of function seems to depend on the level of depressive symptomatology.

Cross-sectional portrait of the elderly in Spain

Several cross-sectional studies have been conducted with regard to age and the elderly in Spain. In order to provide an informative overview, we are trying to summarize results from those studies. First of all, results yielded from cross-sectional studies conducted from representative samples of Spanish elders living in the community will be presented (among others: Instituto National de Salud, 1989; CIS, 1989; CIRES, 1993, 1994, 1995; Díez-Nicolás, 1996; Fernández-Ballesteros, Zamarrón y Maciá, 1997; INSERSO, 1995). Also, research on the elderly living in institutions will be discussed (Fernández-Ballesteros, et al., 1991; Frías y Kaufmann, 1992; Izal, 1993; Más & Gárate, 1991; Leturia & Yanguas, 1992).

Senior citizens in the community

Approximately 60% of Spanish elders are married, 35% widows, 5% single and 1% divorced, and they have on average 3.8 children. 40% of them live with their husband or wife, a third live with their children or other relatives (though more than two-thirds living with their children live in their own homes, not in their children's home), around 18% live alone, and no more than 3% of Spanish elders live in residential and/or care institutions. Regarding education, about 10% of Spanish elders (over-65) are illiterate, half of them did not complete their primary school studies (only one 25% did so), and about 5% have university degrees.

Regarding social network and social support, 70% of elders report meeting their neighbors daily. Moreover, 60% report meeting friends, children and grand-children once or more per week. Watching TV and listening to the radio are the most frequent activities conducted by 65-year-olds, while the least frequent are doing exercise, going to the theater, and artistic activities. About 60% of subjects report being satisfied with the activities they perform. Regarding functional abilities, on average, 85% of the over-65's do not need help to carry out any ADL or IADL, though age is strongly related to functional abilities (only 1 in 10 of the 65-year-old subjects needs help in one or more ADL, but this condition rises to 35% for those in their eighties). Of those who need help, two-thirds receive it from their children or from their wife or husband. With respect to the mental status of Spanish over-65's, on the basis of a 10-item adaptation of the SPSMQ by Pfeiffer (1991) tested on two different representative samples of Spanish elders (Díez-Nicolás, 1996; Fernández-Ballesteros, Zamarrón & Maciá, 1997), only around 6% reach the criterion for 'potential dementia' (more than 3 errors). Age, sex, and socio-economic status were strongly related to SPSMQ scores. Other studies, from an epidemiological scope, using other screening for dementia instruments, yielded similar results (Lobo et al., 1991).

Depending on the study, approximately 45% of our elders reported 'good' or 'very good' health (50% through 40%), and around 15% 'bad' or 'very bad' health. Rheumatism

and arthritis are the most common conditions during the last months reported (for more than 60% of the subjects), followed by cardiovascular problems (around 40%). A third of the elderly reported insomnia, hypertension and headaches. Only 1% of our subjects reported no illness, and about 15% reported no pain suffered in the last month. Only 7% reported having to spend time confined to bed in the last month, and 14% reported being admitted to hospital (51% because of surgery, 26% due to chronic conditions). Concerning health life style, 10% of elders smoke, arround 25% do not smoke but have smoked (50% males, 5% females), and two-thirds have never smoked (91% females, 25% males). Approximately 40% of the subjects drink at least a couple of glasses of wine per day. Only approximately 10% perform regular physical activity, while 75% report never performing physical activity at all. Regarding environmental quality of the elders homes, about two-thirds of Spanish elders have their own house/apartment, around 90% have bath/shower and TV, and around 89% have heating and telephone. More than 90% report being satisfied with their apartment/house. With respect to social security coverage, about 97% belong to the public system, 72% receive a retirement pension and 22% a widow's pension. 50% receive between 45,000 and 75,000 pta per month (approximately, $ 400-650) and 40% more than 75,000 pta (approximately $ 650).

Let us conclude this portrait of the elderly in Spain with the feeling of well-being reported by themselves. The Social Reality Research Center (CIRES) has tested every month over the last six years 'feeling of happiness' or of 'well-being' of the Spanish population over 18 years old. Results show a very high stability of this feeling across time. Around 80% of subjects of all ages reported being'rather happy', 10% felt 'very happy' or 'not very happy', and less than 5% 'not at all happy'. No differences were found with respect to age, gender, socio-economic status or education (CIRES, 1993, 1994, 1995). Social desirability, impression management, faking or other self-report response sets may be responsible for these results, but we can state also that Spanish elders can be characterized as family-oriented with frequent and positive social relationships.

Seniors citizens in institutions

A common stereotype is that the majority of old people live in institutions. In Spain, approximately 3% of people under 65 live in public as well as private institutions. In order to assess these institutions several studies have been conducted mainly referring to public residential settings. In an attempt to summarize this research, we can state the following points (see Fernández-Ballesteros et al. 1991; Izal, 1993; Frías y Kaufmann, 1992; Más & Gárate, 1991; Leturia & Yanguas, 1992):

- Regarding physical and architectural features, Spanish facilities have similar standards to those studied by Moos and Lemke (1979) in the USA.
- In relation to the organizational system, tolerance for deviant behavior and less clarity of policy were found in comparison with USA facilities.
- Spanish residential settings have more health services and less socio-recreational activities than their US counterparts.
- Regarding social climate dimensions, elders living in institutions perceived social environment in a much more negative fashion than North Americans living in similar institutions.
- In research conducted in a representative sample of people living in residential settings (public and private), about 89% of the reported be satisfied (Fernández-Ballesteros, Izal, Montorio, Llorente, Hernández, & Guerrero, 1991; Fernández-Ballesteros, Zamarrón and Maciá, 1997).

- Finally, in order to assess personal and environmental relationships, personal as well as environmental variables were studied. A complex interactional model of personal (IADL, health, satisfaction, etc.), physical (e.g., community accessibility, orientation support, etc.), organizational (e.g., tolerance, resident control, organizational choice, etc.), and social climate (conflict, cohesion, independence, etc.) variables was found (Fernández-Ballesteros, Montorio & Izal, 1998).

Of course, this brief summary does not cover all the research conducted on the aged, age and aging in Spain in the last fifty years. An important effort of synthesis has been made in order to present a small sample of the most general topics, in the attempt to introduce 'what is going on' in gerontological research in this part of South-West Europe.

Notes

[1]There are 25 Regional Sections of the SSGG and the Interdisciplinary Association of Gerontology.

[2]Among the most well known: Geriatrika and Journal of Gerontology.

[3]There are Master programs in Gerontology at the Madrid Autónoma University, Barcelona University, and Salamanca University.

[4]This does not necessarily imply illiteracy. In Spain, mandatory primary education began in 1929. Cohorts born before the thirties had very poor formal education, and the level of illiteracy for over-65's is approximaterly 10%.

References

Ayala, A., Parrado, J., Bougria, M. & Machado, A. (1996). Effect of oxidative stress, produced by cumene hydroperoxide, on the various step of protein synthesis. *J. Biol. Chem., 271*. 23105-23110.

Barja, G., Cadenas, S., Rojas, C., Lopez Torres, M. & Perez-Campo, R. (1994). A decrease of free radical production near critical targets as a cause of maximum longevity. *Comp. Biochem. Physiol., 108B*, 501-512.

Barja, G., Cadenas, S., Rojas, C., López-Torres, M. & Pérez-Campo, R. (1994). A decrease of free radical production near critical targets as a cause of maximum longevity. *Comp. Biochem. Physiol., 108B*, 501-512.

Barja, G., Cadenas, S., Rojas, C., Pérez-Campo, R. & López-Torres, M. (1994). Low mitochondrial free radical production per unit O_2 consumption can explain the simultaneous presence of high longevity and high aerobic metabolic rate in birds. *Free Rad. Res., 21*, 317-328.

Beland, F. & Zunzunegui, M.V. (1995). Presentación de 'Envejecer en Leganés'. *Revista de Gerontología, 5*, 207-214 (whole issue).

Bogoñez, E., Gómez-Puertas, P. & Satrústegui, J. (1992). Pyruvate dehydrogenase dephosphorylation in rat brain synaptosomes and mitochondria: Evidence for a calcium-mediated affect in response to depolarization and variations due to ageing. *Neuroscience Letter, 142*, 123-127.

Cabezas, J.A., Andrés, R., Hueso, P., Llanillo, M., Martínez-Zorzano, V.S., Rodrigo, M. & Sánchez-Yagüe, J. (1991). Ganglioside and phospholipid composition of forebrain, cerebellum, and brain stem from adult and newborn rats. *Neurochemical Research, 16*, 781-785.

CIS (1989). *Encuesta sobre la tercera edad* (Third age survey). Madrid: Centro de Investigaciones Sociológicas.

CIRES (1993). *La realidad social en España: 1991-1992* (Social reality in Spain). Madrid: BBK, BBV y Caja Madrid.

CIRES (1994). *La realidad social en España: 1992-1993* (Social reality in Spain). Madrid: BBK, BBV y Caja Madrid.

CIRES (1995). *La realidad social en España: 1993-1994* (Social reality in Spain). Madrid: BBK, BBV y Caja Madrid.

Díez-Nicolás, J. (1989). La población española (Spanish population). In: S. Giner (Ed.), *España*. Madrid: Espasa Calpe.

Díez-Nicolás, J. (Dir)(1996). *Los mayores en Madrid* (The Elderly in Madrid). Madrid: Fundación Caja Madrid.

Eurostat (1996). *Statistiques démographiques 1995*. Brussels: European Union.

Fernández-Ballesteros, R. (1993). *Estudio bibliográfico sobre la investigación gerontológica en España* (Bibliographical study about gerontological research in Spain). Madrid: Fundación Caja Madrid.

Fernández-Ballesteros, R., Izal, M., Montorio, I., Llorente, G., Hernández, J.M. & Guerrero, M.A. (1991). Evaluation of residential programs for the elderly in Spain and United States. *Evaluation Practice, 12*, 159-164.

Fernández-Ballesteros, R., Izal, M., Hernández, J.M., Guerrero, M., Montorio, I. & Llorente, G. (1991). *Longitudinal study on aging UAM-INSERSO*. Madrid: Second European Congress of Gerontology.

Fernández-Ballesteros, R. & Calero, M.D. (1995). Training effects on intelligence of older persons. *Archives of Gerontology and Geriatrics, 20*, 135-148.

Fernández-Ballesteros, R., Zamarrón, M.D. & Maciá, A. (1997). *Calidad de vida en la vejez en distintos contextos* (Quality of life among the elderly in different contexts). Madrid: INSERSO.

Fernández-Ballesteros, R., Montorio, I. & Izal, M. (1998). Personal and environmental relationships among the elderly living in residential settings. *Archives of Gerontology and Geriatrics, 26*, 185-198.

Frías, R. & Kaufmann, A. (1992). Análisis institucional de la atención a los ancianos en establecimientos residenciales (Institutional analysis of the care in residential setting for the elderly). *Rev. de Gerontología, 2*, 30-36.

Fuente, M. de la, Fernández, D., Muñoz, F., De Juan, E. & Miquel, J. (1993). Stimulation by the antioxinat thioproline of the lymphocytes. *Mech. Ageing Dev., 65*, 27-36.

Fuente de la, M., Fernández, M.L., Miquel, J. & Herranz, A. (1992). Changes with aging and physical exercise in ascorbic acid content and prolipherative response of murine lymphocytes. *Mech. Ageing Dev., 65*, 177-186.

García, A.G., Sala, F., Reig, J.A., Viniegra, S., Frías, J., Fontériz, R. & Gandía, L. (1984). Dihydropyridine BAY-K-8644 activates chromaffin cell calcium channels. *Nature, 308*, 69-71.

García, J.G., Millán, A., Pla, R., Bruseghini, L., Esteras, A., Pallardó, FV., Sastre, J. & Viña, J. (1996). Mitochondrial glutathione oxidation correlates with age-associated oxidative damage to mitochondrial DNA. *FASEB. J., 10*, 333-338.

Instituto de Demografía (1994). *Proyeccion de la población española. Vol 1*. Madrid: Consejo Superior de Investigaciones Científicas.

INE (1996). *Censo de Población*. Madrid: Instituto Nacional de Estadística.

Instituto Nacional de Servicios Sociales (1995). *Las personas mayores en España* (The elders in Spain). Madrid: INSERSO.

Izal, M. (1992). Cross-cultural environmental assessment. *European Journal of Psychological Assessment, 8*, 118-134.

Leturia, F.J. & Yanguas, J.J. (1992). Apoyo social en residencias de ancianos (Social support in residential settings for the elderly). *Rev. de Gerontología, 2*, 95-101.

Lobo, A. et al. (1991). Estudios de salud mental de tercera edad en España. In: FIS (Ed.). *Epidemiología del envejecimiento* (Epidemiology of aging). Madrid: Fondo para la Investigación Sanitaria.

Machado, A., Ayala, A., Gordillo, E., Revilla, E. & Santa-María, C.(1991). Relationship between enzymatic activity loss and post-translational protein modification in aging. *Arch. Gerontol. Geriatr., 12*, 187-197.

Marin, J. (1993). Mechanisms involved in the increased vascular resistance in hypertension. *J. Auton. Pharmacol., 13*, 127-176.

Martínez-Serrano, A., Blanco, P., & Satrústegui, J. (1992). Calcium binding to the cytosol and calcium extrusion mechanisms in intact synaptosomes and their alterations with aging. *J. Biol. Chem, 267*, 4672-4679.

Mas, M. & Gárate, M.C. (1991). Condiciones físico-arquitectónicas. Ambiente y calidad de vida en residencias para ancianos (Physical and architectural conditions. Environment and quality of life in residential centers for the elderly). *Revista de Gerontología, 1*, 80-85.

Michelena, P., Vega, T., Montiel, C., López, M.G., García-Pérez, L.E., Gandía, L. & García, A.G. (1995). Effects of tyramine and calcium on the kinetics of secretion in intact and electroplated chromaffin cells superfused at high speed. *Pfugers Eur. J. Physio., 431*, 283-296.

Miquel, J. (1992). An update on the mitochondrial-DNA mutation hypothesis of cell aging. *Mutation Res, 275*, 209-216.

Miquel, J. (1995). Role of mitochondria in cell aging. In: A. Maceiria-Coelho (Ed.), *Molecular basis of aging*. Boca Raton, Fl.: CRC Press.

Moos, R. & Lemke, S. (1980). Assessing the physical and architectural features of sheltered care settings. *Journal of Gerontology, 35*, 571-583.

León, V., Zunzunegui, M.V. & Beland, F. (1995). Envejecer en Leganés (Design and data collection). *Revista de Gerontología, 5*, 215-232.

Pfeiffer, E. (1975). A Short Portable Mental Status Questionnaire for the assessment of organic brain deficit in elderly patients. *Journal of Abnormal Psychology, 92*, 458-467.

Ponte, A, Sánchez-Ferrer, C.F., Hernández, C., Alonso, M.J. & Marin, J. (1996). Effect of ageing and hypertension on endothelial modulation of ouabain-induced contraction and sodium pump activity in the rat aorta. *J. Hypertension, 14*, 705-712.

Regidor, E., Rodriguez, C. & Gutierrez-Fisac, J.L. (1995). *Indicadores de salud* (Health indicators). Madrid: Ministerio de Sanidad y Consumo

Rodríguez-Mañas, L., Arribas, S., Giron, M.C., Villamor, J., Sánchez-Ferrer, C.F. & Marin, J. (1993). Interference of glycosilated hemoglobin with endothelium-dependent responses. *Circulation, 88*, 2111-2116.

Ruiz-Torres, A. (1994). The physiological aging of human populations: Estimation methods for comparative analysis. In: A.K.Balin (Ed), *Practical handbook of human biological age determination*. Boca Raton, Fl.: CRC Press.

Ruiz-Torres, A., Vicent, D., Sánchez de Paco, G., Muñoz, F.J., Gimeno, A. & Carraro, R. (1996). Increase in insulin secretion with age: Its clinical importance in evaluating abnormal secretions focused on diabetes type II and obesity. *Arch. Gerontol. Geriatr., 22*, 39-47.

Sánchez-Bernal, M. A, Pérez-González, N., Pieretti, G., Villar, E., Cabezas, J.A. (1991). Age-related changes of b-N-acetylglucosaminidase and its enzymatic forms from rat urine and kidney. In: K.W.Woodhouse & M.S. O'Mahony (Eds), *Drug metabolism, liver injury and ageing* (pp. 237-243). Leiden: Eurage.

Schroots, J.J.F. (1995). Psychological models of aging. *Canadian Journal on Aging, 14*, 44-67.

Viña, J., Vento, M., García-Sala, F., Puertes, I.R., Gasco, E., Sastre, J., Asensui, M. & Pallardo, F.V. (1995). L-cysteine and glutathione metabolism are impared in premature infants due to cystathionase deficiency. *American J. Clin. Nutr., 61*, 1067-1069.

Zunzunegui, M.V. & Beland, F. (1995). *Predictors of functional change in a population of community dwelling elderly in Spain* (Unpublished manuscript). Granada: Escuela Andaluza de Salud Publica.