European Population Conference
August 31 – September 3, 2016
Mainz, Germany

# Health and functioning in the exceptionally long-lived in Catalonia (Spain)

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**Abstract**

Reaching advanced old age is more common now than ever. Recent growth in the number of adults surviving to advanced ages raises questions about the health and functioning, as well as the quality of life associated with the exceptionally long-lived.

This study uses nationally representative data on elderly Catalans to examine the characteristics of the exceptionally long-lived. Using cross-sectional data in 2006 and in 2012 from the Catalan Health Survey, we examined several health indicators (comorbidities and physical impairment) plus depression and economic resources in order to document different routes of long-life lived.

We expect multiple routes to achieving exceptional longevity and we expect gender differences according to which route is taken. These routes provide direction for future study into the factors that determine exceptional longevity.

## Introduction

Life expectancy is higher today than ever before; and living a long life in good health is a universal aim. The increasing number of adults who reach very old ages raises questions about their health status, functioning and, ultimately, their quality of life associated with the exceptionally long-lived. Therefore, there are two decisive aims for individual life cycles. First, promoting long lives in good quality that would be characterized by autonomy in self-care and integration into familiar and community living. Second, the design and application of national programmes to provide social support and health care that will further these individual aims in an economically feasible manner.

Surviving to become oldest old is now modal in low-mortality countries. Current life tables indicate that the average length of life is approaching 90 years of age for women and 85 years for men (Robine, 2011). As survival within the older ages has increased in recent years, the numbers of this exceptionally long-lived population will continue to rise rapidly in many countries due to increasing survival at all ages, as well as past fertility trends.

Ninety was defined as the minimum age for exceptional longevity because survival to this age is not common; between 1904 and 1922, life expectancy at birth in Catalonia (Spain) was about 42 years of age, while the probability of surviving to age 90 was about 7% for men and about 15% for women according to cohort life tables (Cabré, 1989).

There are several approaches used to classify exceptionally long-lived populations. For this study, our baseline research work is based on a phenotype of healthy aging referred to by a recent National Institute on Aging expert panel as exceptional survival (NIH, 2001). This phenotype is characterized by absence of morbidity and absence of physical/cognitive impairment in persons who survive to an advanced age. It also reflects the heterogeneity in health and functioning.

Existing approaches use a combination of the information on disease or functional status, but not both at the same time. For instance, Evert et al. (2003) used morbidity profiles to classify exceptionally long-lived populations. Others used functional status phenotypes to classify the lifelong healthy aging participants (Gondo et al. 2006).

Our objective is to develop a phenotype for healthy aging in exceptionally long-lived Catalans (Spain). We also expect to clarify how the characteristics of the 90-plus group may be linked to past and future needs and policies (see Solé-Auró and Crimmins (2013), for a similar analysis for the 80-plus population). We aim not only looking at the physical health status, but drawing a multidimensional approach with controls for psychological well-being (measured by the absence of depression/anxiety) and economic resources. Therefore, our approach will include several measures from physical functioning, chronic diseases, mental well-being and economic resources.

## Methodology

### Selection of Exceptionally Long-lived Sample

We used the 2006 and 2012 Catalan Health Survey (ESCA). The ESCA (Generalitat de Catalunya 2013) is the only source of health-related micro data for Catalonia (Spain), a Mediterranian region with more than 7.5 million inhabitants in 2010. Among those, almost 1% where individuals aged 90-plus[1]. The Department of Health in Catalonia is responsible for the technical execution of this official survey which contains wide information on sociodemographic variables, health behaviors and individual's state of health. The sample follows a stratified design, based on age, gender and geographical area. The random collection of the data is performed using personal interviews. The questionnaires of each time-period are designed to be comparable.

[1] http://www.idescat.cat/pub/?id=aec&n=253&t=2010&x=10&y=6

This cross-sectional survey was collected in 2006 and continuously during the period 2010 to 2014 (Alcañiz et al. 2014). In the last time period we combined data of the four year's available (last semester of 2010, 2011, 2012, 2013 and the first semester of 2014) to increase our sample size, and considered 2012 our midpoint year. Hence, we combined both survey years to increase our sample size. As the aim of this study is to examine the health and functioning of the exceptionally long-lived, we focus on respondents who were 90 years of age and older. Our sample is comprised of 417 elderly Catalan non-institutionalized residents (141 individuals in 2006 and 276 individuals in 2012) randomly selected aged 90 years and older.

**Measures**

*Conceptual health framework*

Health is difficult to define and operationalize because it is a multidimensional concept. Mainly, health can be defined in terms of morbidity, functional, and subjective health (Cambois et al. 2011). These various health dimensions describe the disablement process, a pathway from disease to disability and death (Verbrugge and Jette 1994). The disablement process is influenced by the individual's resources (income, double health coverage,…), personal factors (physical, intellectual, social, behavioral,…), and contextual variables (social situation, resources available to individuals,…), that help or hinder the maintenance of personal activity; plus the disablement process exacerbates at the end of the life.

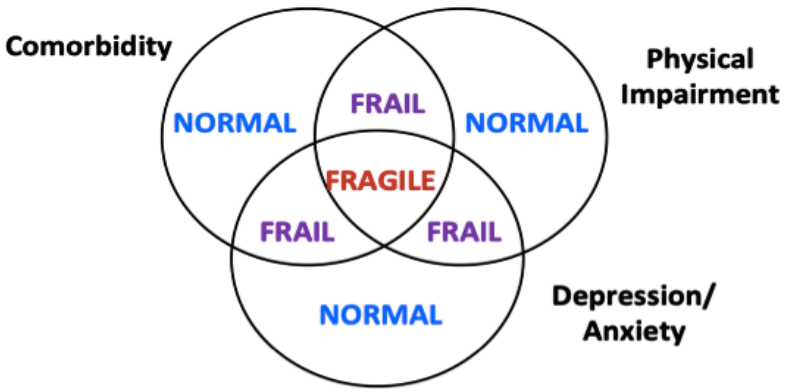
*Indicators*

We use several health measures to construct a phenotype for healthy aging in exceptionally long-lived Catalans (Spain). First, we have chosen an indicator of physical impairment based on a positive answer (yes versus no) to at least one of these three items: (1) mobility problems, such as the inability to move out of the house without receiving help from another person; (2) walking problems, which may require using special equipment; and (3) other important

mobility limitations, such as the difficulty to walk up and down a flight of stairs, and standing, without using special equipment. In addition, information on the presence of potentially fatal chronic diseases (hypertension, diabetes, heart disease, cancer, and chronic bronchitis) is reported in response to similar question wording in 2006 and in 2012: ''Do you have or has a doctor ever told you that you have any of the following conditions…?'', followed by a list of chronic medical disorders including the ones just mentioned. Mental well-being, our third item, is measured by depression or anxiety, and is also reported in the same question wording as the above chronic conditions.

Figure 1 shows the categorization approach used in this work to define exceptionally long-lived. We classified participants into four categories according to their comorbidities, functional status and mental well-being. ''*Exceptional*'' were those participants who had no comorbidities, no physical impairment, and no symptoms of depression/anxiety. *''Normal''* identifies the participants who were somewhat independent with regard to comorbidities, physical impairment or depression/anxiety. The category of *''Frail''* defined participants who had two of the three health items. And finally, those who had the worst health status were categorized as *''Fragile"* and were those who suffered from all health problems: chronic diseases, physical impairment and mental well-being.

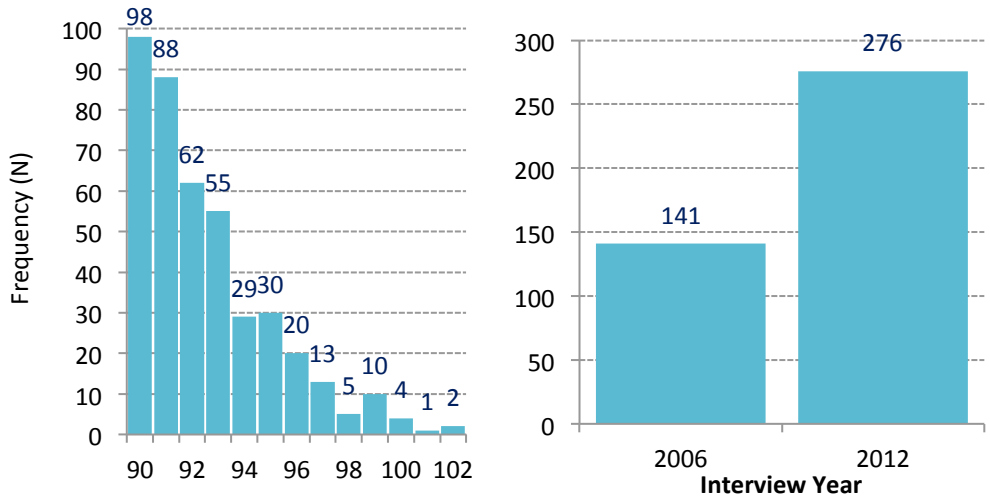
**Figure 1: Categorization Approach**



## Results

Figure 1 shows the distribution of respondents by age and interview year. Most of our respondents are between 90 and 97 years of age. 141 participants were interviewed in the 2006 wave, and 276 participants were interviewed in the 2012 wave.

**Figure 1: Distribution of Respondents by Age and Interview year**




Before we examined the health of the oldest old according to our categorization approach, we looked at how the characteristics of the sample in this age group differ by gender in variables that might be related to health (see Table 1). The average age in the group is 93 years old, the same for males and females. 60 percent are females, meaning that any discussion regarding the oldest old is primarily a discussion about older women. About a third of men aged 90-plus are married; on the other hand, marriage is rare among the women. Among those oldest-old individuals, almost no one has completed high school. For men this pattern is slightly lower than for women. These simple facts indicate that the oldest old are most likely to be unmarried females with relatively low levels of education. Regarding the health problems, the average number of comorbidities is below one out of five for both males (0.8) and females (0.9). Less than half of the women suffer from hypertension (43.9%), while only about a fourth of the males is affected by this condition (23.1%). Heart diseases and diabetes are more prevalent among women than men; while cancer and chronic bronchitis are more prevalent

among men than women. Males aged 90-plus have more functional limitations, but less depressive or anxiety symptoms than females.

Table 1. Demographic and health status Characteristics of Catalan Adults Born Between 1904 and 1922 according to sex

| | Males | | Females | |
|---|---|---|---|---|
| | N | Value | N | Value |
| Age | 166 | 93.1 | 251 | 93.2 |
| Percent married | 166 | 32.5 | 251 | 3.3 |
| Percent with education less than high school | 166 | 94.8 | 250 | 96.0 |
| Physical health | | | | |
| Nª of comorbidities, mean (range:0-5) | 166 | 0.8 | 251 | 0.9 |
| Hypertension, % | 166 | 23.1 | 251 | 43.9 |
| Heart disease, % | 166 | 16.2 | 251 | 23.5 |
| Diabetes, % | 166 | 7.3 | 251 | 10.7 |
| Cancer, % | 166 | 10.0 | 251 | 3.0 |
| Chronic Bronchitis, % | 166 | 21.1 | 251 | 7.7 |
| Functional limitations (range: 0-3) | 166 | 0.91 | 251 | 0.88 |
| Mental Well-being | | | | |
| Depression/anxiety, % | 166 | 16.0 | 251 | 18.5 |

Source: ESCA (2006, 2012)

Table 2 shows the number of individuals classified according to the categorization approach used in this work. Among all 417 individuals aged 90-plus, 15 are *exceptional*, as they don't suffer from any health problem. There are 118 respondents classified as *normal*. A total of 212 respondents are categorized as *frail*, as they suffer from two of the three health items. And finally we have 72 participants who are *fragile*.

Table 2: Categorization and Sample size of each group: Exceptional, Normal, Frail, and Fragile

| Chronic conditions | Physical Impairment | Mental Well-being | Category | N |
|---|---|---|---|---|
| Yes | Yes | YES | Fragile | 72 |
| | | NO | Frail | 187 |
| | No | YES | Frail | 7 |
| | | NO | Normal | 45 |
| No | Yes | YES | Frail | 18 |
| | | NO | Normal | 72 |
| | No | YES | Normal | 1 |
| | | NO | Exceptional | 15 |

Table 3 shows the socio-demographic and health characteristics by our categorization approach. Fragile people are more than a year younger than frail participants; while exceptional are half a year younger than normal participants. More than two thirds of the sample is composed of females for normal, frail and fragile participants, but the sample is more balanced in terms of gender when exceptional participants are taken into account (54.8% are females). Over a third of the exceptional participants are married; around 11% of the normal and frail participants are married, but this percentage goes down to 1.5% for fragile participants. Exceptional participants are the ones with the lowest percentage of low education, while the vast majority of the other groups are low educated. The physical health, the functional autonomy and the well-being of the exceptional survivors are very good, as they do not suffer from any of the health problems examined. On the other hand, fragile participants experience the worse health: more comorbidities than any other group, 67.8% of the sample suffers from hypertension, almost one third of the sample has diabetes, 40% suffer from chronic bronchitis, they report functional limitations (1 out of 3), and the whole sample reports depressive of anxiety symptoms.

Table 3: Social and demographic characteristics of the Exceptional, Normal, Frail, and Fragile

| | Exceptional | Normal | Frail | Fragile |
|---|---|---|---|---|
| N | 15 | 118 | 212 | 72 |
| Age | 92.6 | 93.1 | 93.4 | 92.1 |
| Females, % | 54.8 | 69.0 | 72.7 | 65.8 |
| Percent married | 37.0 | 10.9 | 13.3 | 1.5 |
| Percent with education less than high school | 79.2 | 94.8 | 96.0 | 100.0 |
| Physical health | | | | |
| Nª of comorbidities, mean (range:0-5) | 0 | 0.3 | 1.1 | 1.5 |
| Hypertension, % | 0 | 10.5 | 50.7 | 67.8 |
| Heart disease, % | 0 | 4.8 | 34.4 | 8.6 |
| Diabetes, % | 0 | 8.6 | 7.5 | 28.3 |
| Cancer, % | 0 | 2.6 | 7.6 | 0.2 |
| Chronic Bronchitis, % | 0 | 0 | 14.3 | 40.1 |
| Functional limitations (range: 0-3) | 0 | 0.8 | 1.0 | 1.0 |
| Mental Well-being | | | | |
| Depression/anxiety, % | 0 | 4.2 | 12.6 | 100.0 |

## Discussion

As shown, we find multiple routes to achieving exceptional longevity and significant gender differences according to which route is taken. Further analysis is needed, as these routes provide direction for future study into the factors that determine exceptional longevity.

There are some limitations in the present analysis that could have affected our findings. As we do not consider the nursing home population, our results only reflect the community dwelling individuals, who may be younger than the ones living in nursing homes. The Catalan health authorities reported in 2006 that the institutionalized population was about 0.7% (Generalitat de Catalunya 2006).

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