

Supercentenarians

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This text contains 16 Chapters in three Sections. Within the sixteen chapters are ten nation-specific reports on how the local demographers gather, verify and analyze data on supercentenarians (those aged 110 or more).

The book's focus is very well defined. This text is not designed to be read by persons on the street. It will be of interest only to those who themselves study mortality among the very old. While more interesting books can, and have been written on the topic, this is a very serious and detailed treatise.

As stated in the book's foreword, supercentenarians represent a very diverse group. It is true that they are mostly women, virtually all are non-smokers and a high proportion was never-married or had very few children. While there is a strong family influence (e.g, twins have similar life expectancies) no magic longevity gene has been found. Finally, from the foreword (and supported by data in following chapters), the value of $q(x)$ levels off between ages 110 to 114 at about 0.5. This is most likely because the surviving population at these ages is very robust.

Part I

In Chapter 1 ("On the age validation of supercentenarians") the main theme of the text is presented. That is, data on the age at death of supercentenarians must be carefully verified. These data are prone to errors especially if no efficient civil registration exists in the jurisdiction. People exaggerate their age, especially those who are illiterate (and male).

The author counsels the analyst to be neither too optimistic nor too pessimistic. Obviously, one tries to get the birth record of the person being studied. But substantiating information can come from records of baptism, marriage, military registration, records on siblings and children, and so on. If the person is alive, an

interview can help verify or deny the validity of the age being claimed. The older the person, the more careful your search should be.

It was a common occurrence in times past, that if a child died at a young age, a later sibling would be given the earlier child's name. This can result in an exaggeration of the age of the younger sibling.

Only official verified documents should be depended on. Originals of such documents are strongly preferred. The probability of living beyond age 110 is so small that complete validation is an absolute requisite.

Chapter 2 describes the International Database on Longevity (IDL): Structure and Contents.

The database holds exhaustive information on *validated* supercentenarians from different countries (although 'exhaustive' does not necessarily mean 'complete'). The data set contains 663 entries. IDL data are now being expanded back to age 105. A version of the database is publicly available on the internet (but with no personal information). The age of the person being studied (now alive or dead) is given in days. Finally, it is noted that a failure to include the age of every single supercentenarian does not prevent producing an estimate of death rates that is free of age bias.

The text then moves to explore data gathering, validation and analysis in ten countries. This often shows the ingenuity of the researchers involved and the commonality of issues from jurisdiction to jurisdiction. A short summary of some of the information provided follows.

Part II

U.S.A.

Data exist on 325 persons who lived in the U.S. in the period 1980 to 2003, but were deceased by June 2003, whose ages were given as 110 or more. This represents about half of the IDL data. Obviously, many of the cases presented were excluded for lack of verification. Some who were, in fact, aged 100+ could also have been missed if they were never reported as having achieved age 110.

Data in the U.S. come from the National Centre for Health Statistics (to which all death certificates go), Medicare Part B and the Social Security Administration (mostly NCHS). The NCHS data, once personal information is removed, are public. Because of privacy rules, researchers cannot ask for the date of birth for those still alive (of whom there are nine).

The authors report an attempt to get copies of actual birth and death certificates. They only succeeded to get birth certificates on 52 persons studied so other data (e.g., date of baptism) came in to play. Census data were also used, although the entire 1890 census records were destroyed by fire.

Out of the 325 identified, the oldest female was aged 119 years at death and the oldest male was 115; 294 out of 325 were female, and 15 per cent were black, a higher proportion than in the general population. The "long-lived" tend to be more rural than urban.

The U.S. data supported the contention that mortality rates rise with age at least to age 109 and then appear to level off at about 0.5.

Canada

Census data are not released on individuals due to privacy issues (no data on any subset with fewer than five entry points is released). Twenty-one verified deaths after age 110 have been studied although in 1996, 35 persons were listed as being 110+ and 80 such persons were reported in 2001.

Canada keeps good statistics, but problems still exist. For example, in the census, all those aged 95+ are lumped into one group (i.e., aged 95 and over). Death records are gathered by the provinces which creates ten different administrative systems (although these data are submitted to a federal agency) and ten sets of privacy rules. Quebec has the most complete data. Also, because of Canada's high immigration rates, a large proportion of the very old were not born in Canada.

Of the 25 claims of age at death beyond age 110 in Quebec, eight were immigrants whose birth dates could not be verified and seven were shown to be invalid (leaving 10 verified cases). Of these, eight were women. We know, however, that from the number of those now alive aged 105 to 109, the number of supercentenarians in Canada is set to grow. Eleven other supercentenarians who did not die in Quebec have been validated.

The death of Marie-Louise Chasse-Meilleur at age 117, 7 months (verified) in 1998 was the oldest in the world at the time.

Japan

20,561 centenarians were listed in the government-produced "Zenkoku Kourei-sha Meibo" in 2003. Japan also has a *family* registry (Koseki) with lots of vital data (kept by municipalities) since 1972. For privacy reasons, since 1968, much of this information is sealed and not public (even more so since 1976). There is also a Resident Registry System based on one's current residence which also carries a wide array of vital data. These data can be purged five years after death or change of residence. Anyone can request duplicates of a particular person's records if they have a good reason (e.g., academic research). This has become more difficult since 2005 because of new privacy laws.

There are also census data carried out every five years (but self-reported) but individual ages stop at 99 with the last age-group being 100+. Census ages are often exaggerated. Death statistics are reported to the Ministry of Health, Labor and Welfare.

The number of centenarians has increased rapidly. The authors verified 27 supercentenarians (3 male and 24 female).

Australia

Again, census data are of little help since the last age group is "aged 100 or more." Further, past census data were not stored (until 2001). The 2006 census will collect single ages for all people.

In 2001, there were 2,503 centenarians (784 males and 1719 females). By 2006, there were a total of 15 validated supercentenarians (2 of them alive). Many of these 15 were found through media stories.

Problems include: nursing home records are only kept for seven years; there are limits placed on getting at these data because of privacy legislation. A new National Mortality database will help.

While females dominate among centenarians, male life expectancy appears to be improving faster than for females.

France

An estimated 20,000+ centenarians existed in 2008. There is an IPSEN survey which provides much of the data on these centenarians.

Attention to this area of research intensified because of the case of Jeanne Calment who died at age 122 in 1997 (verified). The question then became: “Who is now our oldest person?”

While England and Wales had identified 41 supercentenarians before 2000, France had identified only 27 (that number is now 37). Why the discrepancy? It would appear that several French supercentenarians are missing.

The INSEE gets all death certificates, and since the 1960’s, these data have been computer recorded. For the period from 1968 to 2003, there were recorded 97 deaths of supercentenarians (74 women and 23 men). 23 men out of 97 deaths seems rather high. But, there are problems:

- the death of Jeanne Calment is not in the record;
- no death over age 110 appears before 1980.

This is at least partly due to the fact that until 1987, INSEE considered all deaths recorded >109 as “unacceptable” (this was pushed to 119 in 1988).

There also exists the RNIPP Registry (since 1945). Persons born outside of France are excluded unless their status warrants it (e.g., they request a Social Security number). Deaths outside of France are only recorded if they are declared at the French consulate.

In 2001, INSEE listed 83 names where the RNIPP found a difference of at least 110 years between the date of birth and the date of death—75 women and 8 men. These were carefully checked and 71 verified. It can be shown that age misreporting was more prevalent among men and those not born in France.

England and Wales

Since 1538, the Church of England has registered all baptisms, weddings and burials, but only for Church of England members. Compulsory civil registration of all births, marriages and deaths started in 1837. These data are available to the public. Further, for censuses including 1841 and beyond, age groups, areas and occupation could be matched with the registry of deaths.

To get around census errors, researchers created extinct cohort tables. Technically, these can’t be created until the cohort is extinct, but very accurate estimates are possible.

By 1991, there were 4,062 centenarians in England and Wales and an estimated 8,513 as of January 2006.

Since 1969, all entries showing deaths at age 110+ have been checked systematically against birth records. This may have excluded some legitimate supercentenarians, especially if foreign born. By 2006, 41 supercentenarians were verified

with only two being male (war deaths may be a cause of the dearth of men). The earliest verified supercentenarian was Katherine Plunket who died in 1932 at age 111. The highest age at death to date is 115. With the rapid increase in centenarians, the author expects the highest attained age to rise.

Other jurisdictions described were Italy, Spain, Germany and the Nordic countries. The themes above repeat themselves in these other jurisdictions (e.g., data errors, privacy legislation, and the need for validation).

Part III

Human mortality beyond age 110

This section starts with a general description of the International Database of Longevity (IDL) and then provides detailed analysis for three jurisdictions: France, the U.S. and England and Wales.

The IDL attempts to estimate human mortality at the most advanced ages with bias free and validated data. We have seen how difficult this can be. Most IDL data entries are by day (so can be considered continuous).

This chapter describes the results from 637 files, of which 573 are female and 64 are male. About half of these supercentenarians die between ages 110 and 111 and 77 per cent die before age 112. The hazard level corresponds to an annual probability of death of 0.5 up to age 114. Beyond that age, data are so sparse that statistical credibility is low and variance high. However, it appears that life expectancy becomes close to constant at 1.4 years.

Death rates at older ages have been declining in recent decades and mortality improvement has been shifting into higher and higher ages. The data say there is no time trend, however. Further, the data do not support a different hazard rate for males versus females above age 110.

Case studies: France

The authors point out the difficulty of getting reliable data and the imperative of verification.

Because of these issues, they move to the extinct cohort method. This method assumes no international migration at advanced ages which is realistic. From the French data previously described, only 19 deaths came from extinct cohorts. If one drops the Jeanne Calment age at death, then you can use 50 deaths from cohorts born between 1866 and 1888.

This method gives a life expectancy of 1.68 years at age 110 (1.46 if Calment is excluded). Given that there are only four males in the dataset, one cannot calculate male life expectancy. If the four males are excluded, then female life expectancy at age 110 (with Calment removed) is 1.52 years.

When the analysis was extended back to age 100 (using vital statistics) life expectancy increased between ages 108 and 110 (not good). The error seems to come from the fact that the INSEE (see previous description) did not accept any deaths beyond age 109. This leads to abnormally high levels of death probabilities at ages 108 and 109. The authors found 12 deaths that were wrongly included at ages 108/109. These were then distributed over older ages in proportion to the

deaths observed after 1987 among the 1868–1888 cohorts. This results in a life expectancy of 1.86 years at age 110 (Calment excluded).

With more deaths expected at advanced ages, future estimates should improve.

Case studies: U.S.

There are currently around 80,000 centenarians in the U.S. Nearly half (8 of 20) of the world's verified instances of supercentenarians aged 115+ come from the U.S. The U.S. has had at least one person alive aged 113+ continuously since 1986 (the only nation for which this is true).

Unfortunately, birth registration in the U.S. was not compulsory until 1933. Where birth registrations are absent, age inflation goes unchecked. So verification is *essential*.

The author then gives details of how verification took place in the files of the 8 people who died at ages 115 and over plus how proof of invalid ages was found in 5 case files where a “false” conclusion was reached.

The author concludes that when non validated claims of death beyond age 115 are removed, the U.S. data fall in line with what you would expect. Further, increased life expectancy and increased cohort size should mean more persons will achieve age 115 (but not a flood).

Jeanne Calment and her successors: biological notes on the longest lived

We have nineteen validated instances of achieving age 115+. The longest lived was Jeanne Calment at age 122 years, 5 months and 14 days. Only two of these nineteen are men. Once again, the chapter spends quite a bit of time showing the work required for validation.

At one time, researchers thought age 115 was the maximum lifespan. But these nineteen seem to provide counter evidence. Regardless, the belief that there is an absolute limit to human lifespan remains.

The life journeys of the nineteen differed widely, with few common characteristics. The majority are: female, non or light smokers, not overweight, powerful, feisty personalities with a will to live, but (mostly) without being domineering. Most had good wit and humour and did not dwell on adversity. Most were hard working. Modern medicine appears to have helped. Half did not develop dementia.

However, they still became frail in their final years (confined to wheel chairs) and were commonly blind and deaf. Despite this observation, this chapter presents a fairly positive story overall. Finally, with a rise in the population ages 110–115, we expect to see more examples of life beyond age 115+.