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Supercentenarians: slower ageing individuals or senile elderly?☆

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Abstract

Although the increase in the number of centenarians is well documented today, at least in some countries, this is still not the case for people having reached the age of 110 years or more: the supercentenarians. The supercentenarians emerged in the mid-1960s. Their numbers have regularly increased since the mid-1970s. The current prevalence of known supercentenarians in countries involved in the database is approximately five to six times more than in the mid-1970s. In roughly 20 years the maximum age observed has increased by about 10 years from 112 to 122 years. The annual probability of death at age 110 is as low as 0.52 with the validated data ($n = 106$) or with the exhaustive and validated data ($n = 73$). The probabilities of death stagnate between 110 and 115 years, and all the computed probabilities fall below the ceiling of 0.6. Our results are compatible with the last extrapolations of mortality trajectories using a logistic or a quadratic model. © 2001 Elsevier Science Inc. All rights reserved.

Keywords: Supercentenarians; Slow aging; Frailty

1. Introduction

Beyond the age of 100 years, death rates fall far below the Gompertz trajectory (Vaupel et al., 1998; Thatcher et al., 1998; Thatcher, 1999b). This paper is a first attempt to answer the question of whether the supercentenarians (110-year olds) are a model of slow ageing or whether, alternatively, they are frail people whose resistance to environmental hazards is very weak thus providing us with a new measure of the quality of the environment that humans are now bringing about (Robine, 2001).

☆ A preliminary analysis of these data was presented by J.-M. Robine, L. Epstein and J. Vaupel, during the Research Workshop on Supercentenarians, Max Planck Institute, Rostock, June 2000. The data on the months of death of the centenarians comes from Allard and Robine (in press).

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Table 1
International database on supercentenarians distribution of the population by age — August 2000

Age	Number	Age	Number
110	65	117	2
111	38	118	0
112	27	119	1
113	14	120	1
114	12	121	0
115	6	122	1
116	2		

The international database on supercentenarians, established in Rostock and Montpellier at the beginning of 2000, is supplied with two types of data: (i) data gathered on the Internet by Louis Epstein and Robert Young from the USA; and (ii) data specifically collected for this project in Canada by Bertrand Desjardins and Robert Bourbeau (University of Montreal), in Belgium and the Netherlands by Dany Chambre and Michel Poulain (University of Louvain), in England and Wales by Roger Thatcher (Thatcher, 2001) in France by France Meslé, Jacques Vallin (INED) and J.-M. Robine (INSERM), in Japan by Yasuhiko Saito (Nihon University), in Italy by Graziella Caselli and Viviana Egidi

Table 2
International database on supercentenarians distribution of the individuals by country of birth — August 2000

Country	Observed number	Expected number	Maximum age observed
Exhaustive and validated data			
Belgium	5	7	111
Denmark	2	4	115
England and Wales	42	40	115
Finland	3	3	112
Netherlands	13	11	111
Norway	5	3	112
Sweden	4	6	112
Subtotal	74	74	115
Incomplete data			
Australia	3	13	112
Canada	6	21	117
France	27	40	122
Ireland	1	3	111
Italy	4	39	112
Japan	12	86	116
South Africa	1	–	111
Spain	4	27	113
Other UK	3	–	113
United States	18	184	119
Subtotal	79	413	122
Total	153		122
Sex-ratio M/F	1:10.8		

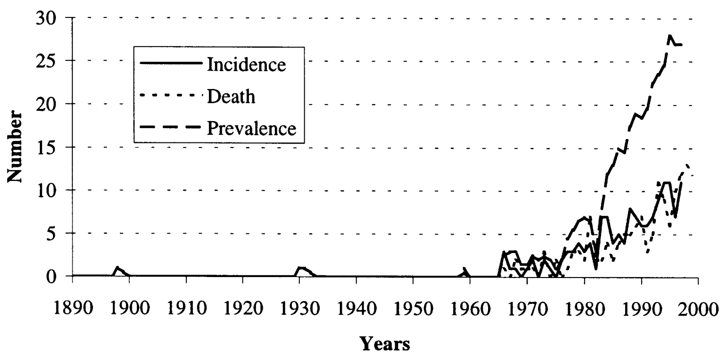

Fig. 1. The emergence of the supercentenarians, full sample ($n = 153$).

(Universita di Roma 'La Sapienza'), and in Denmark, Finland, Norway and Sweden by Bernard Jeune (University of Odense). More details on these data are provided in Appendix A. In August 2000 the data contained 169 records with at least the year of birth and the year of death. Table 1 shows the age distribution of this new segment of the population.

Although the increase in the number of centenarians is well documented today, at least in some countries (Jeune and Vaupel, 1995), this is still not the case for people having reached the age of 110 years or more: the supercentenarians. Case validation is extremely important for these individuals (Jeune and Vaupel, 1999). Most of the data used in this analysis have been carefully validated, especially those concerning the oldest old having reached the age of 115 years or more (Laslett, 1994; Wilmoth et al., 1996; Robine and Allard, 1998; Desjardins, 1999).

Out of the 169 records already collected in the database, we have excluded eight individuals, all allegedly born before 1840 but with poor evidence of the date of birth. We have also excluded eight individuals acknowledged as false cases such as the famous Canadian, Pierre Joubert, born in 1701 (Charbonneau, 1990), or with incomplete data such as the Japanese man, Shigechiyo Izumi, born in 1865 and judged to be a false case by the Japanese scholars (letter to Jacques Vallin), leaving a sample of 153 records with minimal requirements for analysis. Table 2 shows the distribution of the supercentenarians according to their country of birth. The table also indicates the maximum age reached in each country and the total sex ratio. Among the supercentenarians, the sex ratio is one male for 10.8 females. Because there is evidence that the male supercentenarians are better identified and that they are relatively more numerous among false cases the number of females per male may actually be even greater. It is noteworthy that the sex ratio is much lower among the 16 excluded cases, confirming an assumed male specific exaggeration. Working under these minimal criteria, the database is currently gathering data from 17 countries although the degree of completeness varies considerably from one country to another.

Adding up the numbers of supercentenarians in the countries with exhaustive and validated data and dividing the total by the total population in these countries in 1999 (Levy, 1999), we have computed a crude ratio of supercentenarians per million inhabitants in the combined population of the seven countries with exhaustive and validated data. An estimation of the expected cumulative number of known supercentenarians (dead and

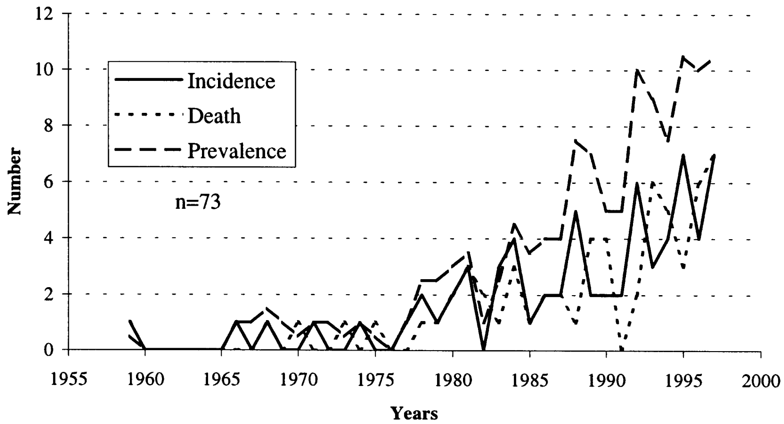

Fig. 2. The emergence of the supercentenarians since 1840 in seven countries with exhaustive and valid data (Belgium, Denmark, England and Wales, Finland, the Netherlands, Norway and Sweden — $n = 73$).

alive) in each country is calculated by multiplying this ratio by the current population in each country. These calculations give an estimation of the degree of completeness of the data for the countries with incomplete data (see Table 2).

2. The emergence of the supercentenarians

Fig. 1 shows the three components of the dynamics of the supercentenarian population: (i) incidence of the 110th birthday; (ii) death; and (iii) prevalence, i.e. the size of the supercentenarian population at the beginning of each year. The three series were stopped before the year 2000 because most of those who became supercentenarians in 1999 or 2000 are still alive today. However, we already know the deaths for 1999. Most supercentenarians are only discovered at the time of their death through obituaries. Often only the oldest old is known and is the subject of an article in the newspapers for each birthday: he or she is, in general, the one recorded by the *Guinness Book of Records* although this is not always the case.

Fig. 2 shows the emergence of the supercentenarians in the mid-1960s with just three cases before 1960: a Dutch man, Geert Adrians Boomgaard, born in 1788 who appears to have reached the age of 110 years in 1898,[1] an Irish woman, Katherine Plunket, born in 1820, who reached the age of 110 years in 1930 (Thatcher, 1999a), and a Dutch woman, Christina Back-Karmebeek, born in 1849, who reached the age of 110 years in 1959. Their numbers have regularly increased since the mid-1970s. The current prevalence of known

[1] Some data on Geert Adrians Boomgaard are provided by Heeres (1976). Dany Chambre and Gert Jan Kuiper have collected his first marriage record (04/03/1818) and his death record (03/02/1899) with many genealogical data on his ancestors on six generations. Several photos and press cuttings on Geert Adrians Boomgaard are available.

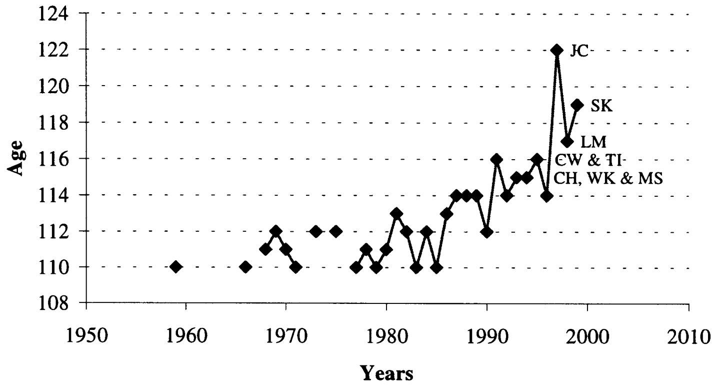

Fig. 3. The maximum age at death observed since 1950, full sample ($n = 151$). JC, Jeanne Calment; SK, Sarah Knauss; LM, Louise Meilleur; CW, Carrie White; TI, Tine Ikai; CH, Charlotte Hughes; WK, Wilhelmina Kott and MS, Margaret Skeete.

supercentenarians in the 17 countries involved in the database is approximately 25 cases, i.e. five to six times more than in the mid-1970s.

In the following analysis Boomgaard and Plunket are excluded, as historical cases, reducing the full sample to 151 records and the exhaustive and validated sample to 73 records. Fig. 2 ($n = 73$), limited to the seven countries with both exhaustive and validated data — Belgium, Denmark, England and Wales, Finland, the Netherlands, Norway and Sweden — confirms, despite fluctuations due to the small size of the sample, not only the trend but also the rate of increase. The current prevalence of supercentenarians in the seven countries with both exhaustive and validated data is about 10 cases, i.e. at least five times more than in the mid-1970s.

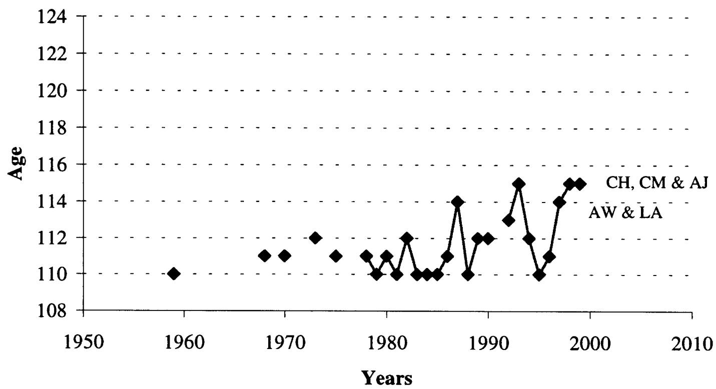

Fig. 4. The maximum age at death observed since 1950, exhaustive and validated sample ($n = 73$). CH, Charlotte Hughes; CM, Christian Mortensen; AJ, Annie Jennings; AW, Anna Williams and LA, Lucy Askew.

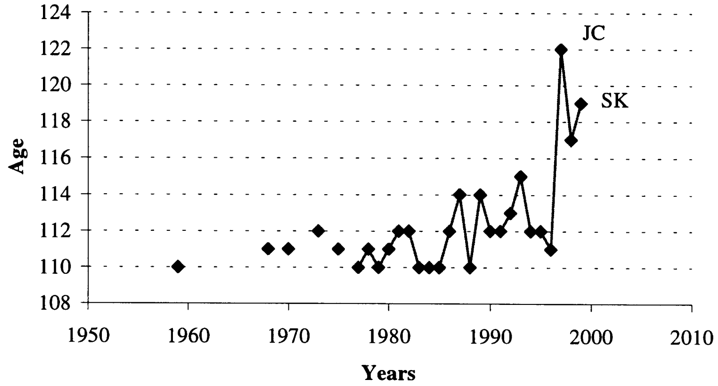

Fig. 5. The maximum age at death observed since 1950, three-star validated data ($n = 106$). JC, Jeanne Calment and SK, Sarah Knauss.

3. Maximum age at death observed

Fig. 3 shows a clear increase in the maximum age at death observed each year since the beginning of the 1980s. In roughly 20 years the maximum age observed has increased by about 10 years from 112 to 122 years. Eleven cases of people reaching their 115th birthday were observed in the 1990s, although all of them are not three-star validated. Three stars indicate that the birth record and the death record (or photocopies) have both been brought together and hand-checked side by side to verify the exceptional reported age. Two stars indicate that age, date of birth and date of death are officially communicated together by the national authorities in charge of the vital statistics of the population but without any particular check for the supercentenarians. One star indicates that there are two different documents in existence on the same person with no ambiguity, one testifying the date of death (a death record) and another one testifying the date of birth and dating a period close to the reported date of birth (a census sheet, for instance, when the person was 19 years old, see below). In addition a four-star category might be used for thoroughly validated cases such as those of Jeanne Calment (Robine and Allard, 1998) and Christian Mortensen (Wilmoth et al., 1996), but here we include these cases in the three-star category.

Fig. 4 confirms this trend for the seven countries ($n = 73$) with both exhaustive and validated data although the change over time is much less spectacular. In about 20 years the maximum age observed has increased by about 3 years from 112 to 115 years. Three cases of people reaching their 115th birthday were observed in the 1990s; by definition they are all three-star validated. These results suggest that the oldest old are known in the 17 countries even if the data are incomplete and poorly validated.

Some countries such as Canada and France have three-star validated data although the data are incomplete. Fig. 5 confirms the general trend in the maximum age at death observed each year since the beginning of the 1980s for the 106 three-star validated cases contained in the database. We have added the 119-year-old American woman, Sarah Knauss, born in 1880, because this one-star validated case seems convincing.[2]

The annual probability of death at age 110 is as low as 0.41 with the full sample ($n = 151$). Limited to the three-star validated ($n = 106$) or to the exhaustive and validated ($n = 73$) samples, the probability of death reaches the level of 0.52, consistent with our doubts as to the quality of the one- and two-star validated data (Fig. 6). We have stopped the series just before the first age with no observed death leading to a probability of death of zero or alternatively just before the age of the last death leading to a probability of death of one. The full sample series is stopped before the age of 118 years, the three-star validated sample series is stopped before the age of 116 years and the exhaustive and validated sample series is stopped before the age of 115 years. Obviously the probabilities of death stagnate between 110 and 115 years and all the computed probabilities fall below the ceiling of 0.6 proposed by Kannisto (1999).[3] Vincent (1951) advocated that the quotients of mortality, the probabilities of death, at very high ages should be calculated by the method of extinct generations. It was difficult to apply this method in this analysis because one of our hypotheses was precisely that there is no natural limit in terms of age to consider that a human generation is extinct.[4] However, even the 73 cases in countries where the data are both exhaustive and validated still include cohorts which are not yet extinct, so it will eventually become possible to improve the estimates as more data become available. But, and that is the important point for this analysis, the discovery of new cases belonging to these generations will decrease the mortality rate at age 110 in comparison with the rates beyond that age.

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[2] The case of Sarah Knauss provides a good example of validation in the absence of a birth record. Sarah De Reemer Clark Knauss was born September 24, 1880, in the village of Hollywood, Hazle township, Luzerne County, Pennsylvania. We do not have any birth documentation for her but she was recorded on June 5, 1900, in the Twelfth Census of the United States as Sadie, daughter, born September 1880, age 19, single living with: Clark Walter, Head, born April 1849, age 51, married since 25 years; Amelia, Wife, born June 1857, age 42, married since 25 years, having 7 children, 4 living; Charles, son, born July 1878, age 21, single; Sadie…; Earl, son, born May 1889, age 11, single; and Emily, daughter, born May 1893, age 7, single. Walter Clark was recorded in the 1880 Federal Census of Hollywood village with his family: Walter Clark, age 31, engineer; wife Emelia, age 23, keeping house; son albert L, age 4; and son Charles H age 2. The age correspondance between the two census is right for Walter Clark, Amelia and Charles. Sarah was born the following September 24, 1880. Sarah De Reemer Clark and Abraham Lincoln Knauss were married by Rev. Dr. Gilbert Henry Sterling on August 28, 1901 (Application for marriage license, Sarah DE R. Clark, 21 years; Marriage record Cathedral Church of the Nativity Bethlehem, Sarah Deremer Clark, age 20; The GLOBE, South Bethlehem, Thursday, August 29, 1901: '…of the contracting couple, Abraham Lincoln Knauss and Miss Sadie De Reemer Clark'). Thus there is no doubt that a daughter of Walter and Amelia Clark, born in September 1880 and named Sarah (Sadie) De Reemer, was 19 years old in September 1900 (Twelfth US Census) and 20 years old (Close to 21 years old) when she married Abraham Lincoln Knauss on August 1901. There is no reason to consider that this person is other than Sarah Clark Knauss who was resident of the Phobe Home in Allentown, Pennsylvania, known to be 118 years old when we have visited her in November 1998. Since her marriage her family history is well documented. This case was documented by Edith Rodgers Mayer (Phoebe Ministries, 1997).

[3] The quotient of mortality or the probability of dying within 12 months is also the same as the quantity given as q_x in life tables.

[4] Most of the supercentenarians included in this analysis were born after 1878 and belong to non extinct generations if we consider the age at death of Jeanne Calment of 122 years as the current empirical age limit.

We can improve the accuracy of the death rate after the age of 111 years if we compute a global rate corresponding to a central death rate above the age of 111 years. The numerator is the number of deaths above the 111th birthday and the denominator is the total person-years of exposure (i.e. person-years lived) above this age.

Table 3 confirms our worries about the effects of the lack of complete data on the calculated rate. When the data are incomplete (Canada and France), it is possible that the older the supercentenarian the greater his chance of being known, leading to an under-estimation of the death rate at 111 years and beyond compared to the death rate at 110 years of age. The exhaustive and validated series shows no trend in the death rate beyond the age of 110 years, suggesting that a plateau of mortality has been reached. In comparison, the French life table of 1995–1997, both sexes together, shows that on the average between the age of 80 and 85 years, the probability of death increases by 1.12 (12%) with each additional year of age.[5]

Figs. 7 and 8 display the mortality trajectory of the supercentenarians (1960–2000) with the observed mortality trajectory of the French centenarians (1980–1990) by Kannisto (1996), with the trajectories observed and extrapolated for France, the Netherlands, Sweden and Switzerland circa 1900–1945 by Vincent (1951) and circa 1945–1970 by Dépoid (1973).[6] Also shown are the trajectories observed and extrapolated for 13 countries (Austria, Denmark, England and Wales, Finland, France, West Germany, Iceland, Italy, Japan, the Netherlands, Norway, Sweden, and Switzerland), for the period 1980–1990 by Vaupel and his collaborators using a logistic model (L) or alternatively a quadratic model (Q) (Vaupel et al., 1998; Thatcher et al., 1998).[7]

Figs. 7 and 8 strongly suggest, in the one hand, a dramatic decrease in the level of mortality for the oldest-old over time and, on the other hand, that the mortality trajectory does not tend towards unity. Our results are compatible with the last extrapolations using a logistic or a quadratic model (Vaupel et al., 1998; Thatcher et al., 1998) and Kannisto's

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[5] As expected the central death rates are much higher than the quotients of mortality, the probabilities of dying within 12 months at each birthday. These central death rates correspond to a life expectancy of 1.96, 1.48, and 1.32 years at age 110, respectively, with the full sample, the three-star sample and the exhaustive and validated sample and to a life expectancy of 2.05, 1.64 and 1.35 years at age 111, respectively, with the full sample, the three-star sample and the exhaustive and validated sample.

[6] Paul Vincent who developed in 1951 the method of the extinct generations which remains today the only method to properly estimate the mortality of the oldest old, applied his method to four countries, France, the Netherlands, Sweden and Switzerland. Pooling the data obtained for the period 1900–1945, Vincent observed regularly increasing crude death rates (quotients) until ages beyond one hundred years and exceeding the value of 0.6. By simple linear extrapolation of the death rates plotted on a semi-logarithmic graph, he found that the mortality trajectory reached one at age 110 for both sexes. He concluded that 'human life is limited with an actual (i.e. corresponding to the period 1900–1945) limit of 110 years' (Vincent, 1951). Continuing, in 1973, Vincent's calculations with more recent data from the period 1945–1970 for the same the four countries, Francoise Dépoid found the limit values of 117.3 years for males and 119.3 years for females but she fixes at 113 and 114 years the practical limits: the probability that a man or a woman become a centenarian will reach the age 113 or 114 years, respectively, being only of 2×10^{-6} (Dépoid, 1973). Surprisingly, there was no questioning or discussion on the eight years which separate the limits found at the 50-year interval or on the 2-year gap which now separates both sexes (Robine, 2000).

[7] In 1998, using also the method of extinct generations and applying it to the data of the 13 countries with the best human mortality data for the period 1960–1990, Thatcher, Kannisto and Vaupel showed that a logistic model is the best model to fit these recent observations (Vaupel et al., 1998; Thatcher et al., 1998).

Table 3
International database on supercentenarians central death rate at age 110 and at age 111 and beyond — August 2000

Completeness and validity	110th year		111th year and beyond		111th + /110th
	Person-years	Mortality rate	Person-years	Mortality rate	Rate of increase
Full list	114	0.55	181	0.49	0.89
Three-star validated data	73	0.76	84	0.60	0.81
Exhaustive and valid	49	0.77	47	0.74	0.96

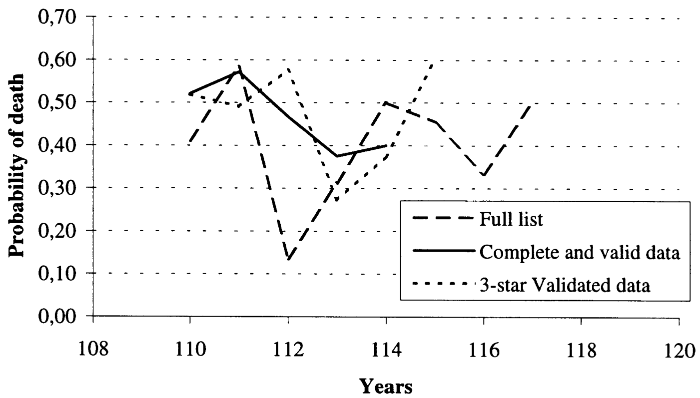

Fig. 6. Death rate beyond the age of 110 years (three samples).

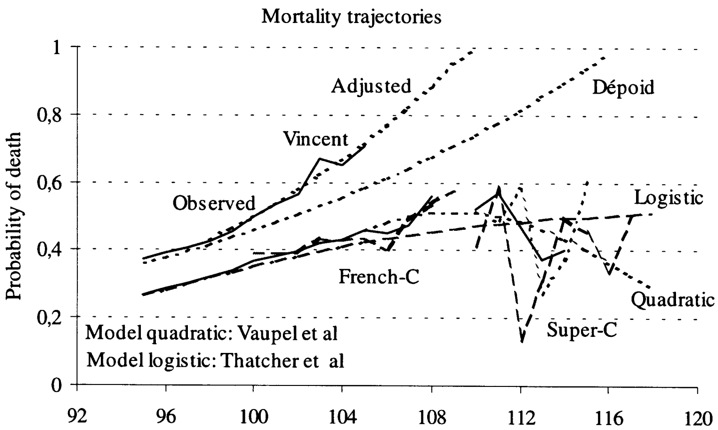

Fig. 7. Mortality trajectories beyond the age of 95 years — arithmetic scale: France, the Netherlands, Sweden and Switzerland (circa 1900–1945 and 1945–1970), 13 countries (1980–1990), French centenarians (1980–1990), Supercentenarians (1960–2000).

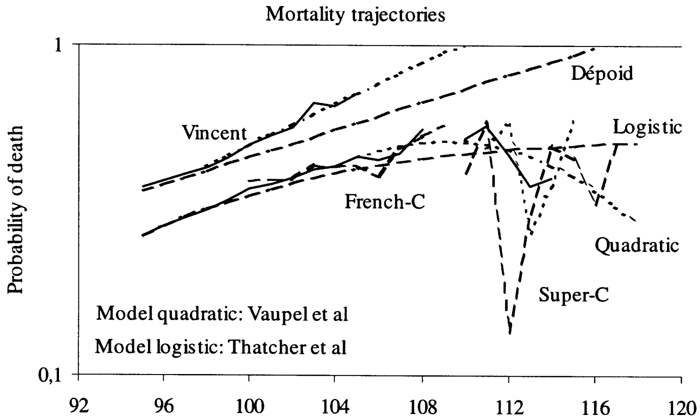

Fig. 8. Mortality trajectories beyond the age of 95 years — logarithmic scale: France, the Netherlands, Sweden and Switzerland (circa 1900–1945 and 1945–1970), 13 countries (1980–1990), French centenarians (1980–1990), Supercentenarians (1960–2000).

hypothesis that the plateau could begin at age 110 with a mortality level below 0.6. Fig. 8 presents the same information on a logarithmic scale.

4. Frailty

Fig. 9 illustrates the suspected frailty among the oldest old. It shows the large fluctuations observed in the distribution of deaths according to the seasons of the year among the supercentenarians as well as that among the centenarians having participated in the French centenarian study (1990–2000).[8]

Such fluctuations suggest a significant reduction in the resistance to the hazards of the environment. Applying demo-epidemiological methods to estimate the background mortality behind the fluctuations, we have estimated a total excess in mortality of 28% with the months of May to August as reference in the French centenarian study (Allard and Robine, in press). The environmental variations due to the seasons explain 28% of the deaths observed among the centenarians. This is substantial. The supercentenarians show a very similar profile. These results support our hypothesis that the supercentenarians are frail people with little resistance to environmental hazard. In that sense, the death rate appears to be more a measure of the quality of the environment brought about by humans than a measure of biological ageing (Robine, 2000). These results also suggest that it could be relatively easy to lower the final plateau of mortality.

Fig. 9 also shows the distribution of deaths according to the season for all the deaths

[8] Researchers have suggested the possibility that major holidays might delay mortality (Phillips and King, 1988) although this is difficult to prove.

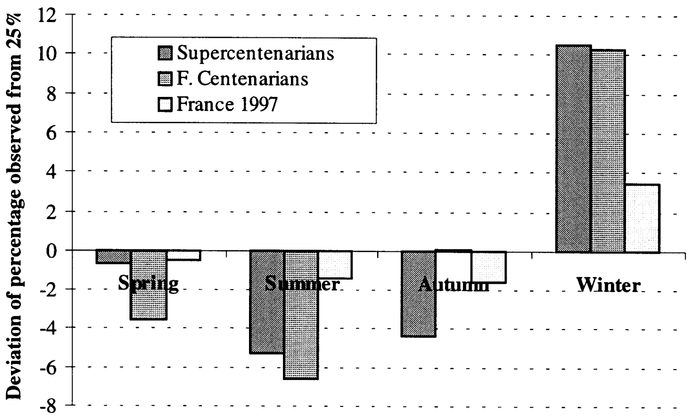

Fig. 9. Distribution of deaths according to season (supercentenarians 1960–2000, French centenarians 1990–2000, French all deaths 1997).

occurring in France in 1997. As predicted, it shows a much smaller excess in mortality in winter for the entire population than for the supercentenarians but it is noteworthy that in a country such as France, the excess of mortality in winter is relatively substantial. In a country such as France, with one of the lowest levels of mortality in the world, deaths are concentrated around the modal age of 83 years for males and to the modal age of 87 years for females in 1997 (INSEE, 1999).[9]

Figs. 10 and 11 show that it is clearly impossible to forecast the future number of supercentenarians from the current figures. The number of centenarians has been growing exponentially, so one might expect the number of supercentenarians to also grow exponentially. A linear fit — leading to about 21 supercentenarians in 2020 — appears, however, to be as good as an exponential one — leading from the same data to about 257 supercentenarians in 2020.

5. Conclusions

Supercentenarians first emerged consistently in the 1960s and their numbers have been expanding dramatically since. From current figures it is impossible to forecast the number of supercentenarians in the future. Only time will tell. There is not only a necessity of building on the new concept of plasticity of ageing or of longevity describing how small modifications in environment or genomes may result in large changes in lifespan, we need also a model to explain the mortality trajectory taking into consideration the protected environment in which we place our frail older people.

[9] The observation of the modal age at death for males is pertubated in 1997 by the first war (1914–1918).

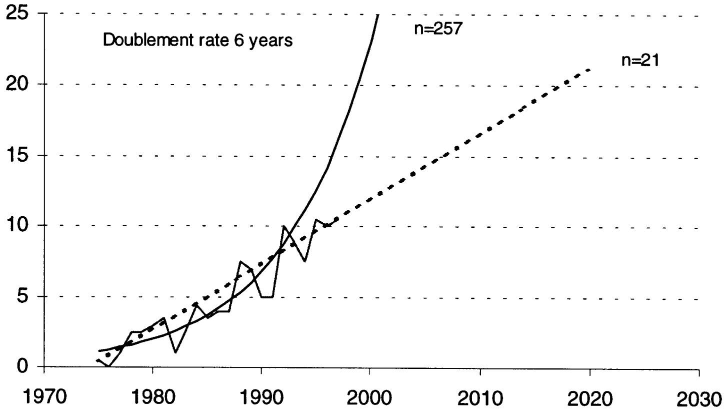

Fig. 10. Forecasting the number of supercentenarians (1975–2020) — arithmetic scale.

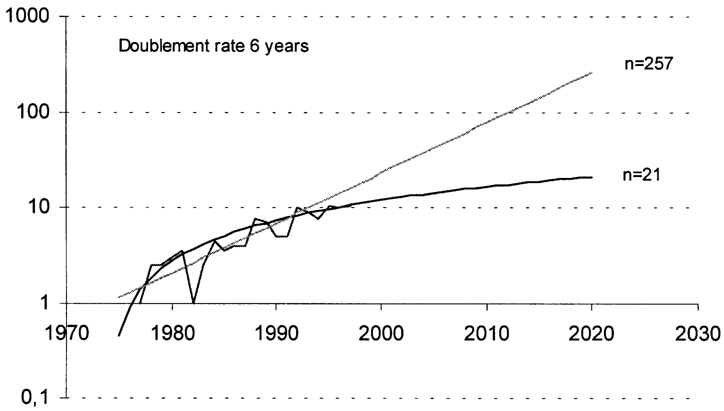

Fig. 11. Forecasting the number of supercentenarians (1975–2020) — logarithmic scale.

Acknowledgements

We thank Roger Thatcher for his remarks and comments on a draft version of this paper.

Appendix A. International Database on Supercentenarians,[10] exhaustive and three-star validated data [INSERM — University of Montpellier 1 and Max Planck Institute, Rostock (August 2000)]

First list: exhaustive and validated data — Belgium (BEL), Denmark (DEN), England and Wales (E&W), Finland (FIN), the Netherlands (NDL), Norway (NOR) and Sweden (SWE).

Given name	Name	Maiden name	Date of birth	Country of birth	Date of death	Age at death
Jan Machiel	Reyskens		11/05/1878	BEL	07/01/1990	111
Maria Ludovica	Van Sprengel	Sister Alberta	30/01/1882	BEL	22/04/1993	111
Maria Irma	Casteur	Vanderhaegen	26/06/1887	BEL	11/11/1997	110
Catharina V.	Ververs	Kestens	27/10/1888	BEL	24/01/1999	110
Louise	De Ruyver		10/02/1889	BEL	14/03/1999	110
Christian	Mortensen		16/08/1882	DEN	25/04/1998	115
Anne Kathrine	Matthiesen		26/11/1884	DEN	19/03/1996	111
John Mosely	Turner		15/06/1856	E&W	21/03/1968	111
Ada	Rowe	Giddings	06/02/1858	E&W	11/01/1970	111
Alice	Stevenson		10/07/1861	E&W	18/08/1973	112
Rose Adelaide	Heeley		25/08/1864	E&W	24/12/1975	111
Sarah Ellen	Morgan	Parkinson	23/01/1867	E&W	12/02/1978	111
Lilias Browning	Williams	Hooper	30/11/1868	E&W	12/02/1979	110
Florence Ada Bethia	Pannell	Neate	26/12/1868	E&W	20/10/1980	111
Jeanetta	Thomas		02/12/1869	E&W	05/01/1982	112
Alice	Empleton	Williams	03/09/1870	E&W	07/01/1981	110
Alice C.S.	Brewster	Tyler	16/09/1871	E&W	09/10/1982	111
Mary E.L.S.	Hammond	Steele	19/01/1871	E&W	19/11/1981	110
Anna Eliza	Williams	Davies	02/06/1873	E&W	27/12/1987	114
Sarah Ann	Raw	Watson	20/12/1873	E&W	10/09/1984	110
Matilda	Elsbury	Foster	28/09/1874	E&W	30/04/1985	110
Charlotte Marion	Hughes	Milburn	01/08/1877	E&W	17/03/1993	115
John	Evans		19/08/1877	E&W	10/06/1990	112
Mary Ann	Fewster	Alder	06/02/1878	E&W	26/12/1989	111
Rose Ellen	Hart	Sturgess	20/03/1878	E&W	05/01/1990	111
Gertrude Emily	Phillipson	Armitage	22/03/1878	E&W	07/05/1988	110
Rosa Ann	Comfort	Dossett	21/01/1879	E&W	06/11/1992	113
Kate	Jones		03/04/1880	E&W	22/12/1990	110
Daisy Irene	Adams	Woodward	28/06/1880	E&W	08/12/1993	113
Ethel	Tuck	Seaman	16/08/1881	E&W	15/05/1992	110
Rebecca	Hewison	Ramsdale	19/01/1881	E&W	22/09/1994	112
Annie	Bannell		12/02/1882	E&W	10/09/1993	111
Florence Mary	Deuchar	Lennox	18/02/1882	E&W	16/08/1993	111
Annie Emily	Townsend	White	20/05/1883	E&W	11/09/1994	111
Lucy Jane	Askew		8/09/1883	E&W	09/12/1997	114
Ethel	Maunder		18/12/1883	E&W	11/02/1994	110
Ann Maria	Schrimshaw		13/03/1884	E&W	29/03/1994	110
Annie	Jennings	Thomas	12/11/1884	E&W	20/11/1999	115
Helen Gertrude	Haward		24/11/1884	E&W	23/10/1996	111
Mabel	Hampshire	Fox	14/09/1885	E&W	19/10/1995	110

[10] The International Database on Supercentenarians established in Rostock (Max Planck Institute) and Montpellier (INSERM — University of Montpellier 1) is supplied with two types of data: data gathered on the Internet and data specifically collected for this project. The specifically collected data are gathered by the INSERM group Démographie et Santé (University of Montpellier 1). These data are limited to validated data following the validation classification presented in this paper. The first list contains data from countries with exhaustive and three-star validated data. The second list contains data from countries with incomplete but three-star validated data. Other lists, not presented here, contain data from countries with two- and one-star validated data.

(*continued*)

Given name	Name	Maiden name	Date of birth	Country of birth	Date of death	Age at death
Ruby	Gilliam		21/09/1885	E&W	22/10/1998	113
Gertrude Elsie	German	Moss	05/10/1885	E&W	18/12/1995	110
Elsie Kate	Day	Merrington	16/12/1885	E&W	26/09/1996	110
Annie Blanche	Price	Poole	12/01/1886	E&W	26/12/1997	111
Florrie	Cleverdon	Colwill	17/04/1886	E&W	13/11/1996	110
Florence T.	Beaumont	Nelson	29/07/1886	E&W	04/01/1997	110
Amy	Carpenter	Bond	08/01/1887	E&W	07/07/1997	110
Mary Ann	Poole	Bowden	31/05/1887	E&W	02/02/1998	110
Winifred Barbara	Pettit	Banner	01/11/1887	E&W	10/09/1998	110
Andrei Akaki	Kuznetsoff		17/10/1873	FIN	31/01/1984	110
Fanny Matilda	Nystrom		30/09/1878	FIN	31/08/1989	110
Lempi M. “Ma.”	Rothovius	Sparfven	02/10/1887	FIN	17/06/2000	112
Christina	Karnebeek	Backs	02/10/1849	NDL	07/10/1959	110
Gerarda	Hurenkamp	Bosgoed	05/01/1870	NDL	25/05/1980	110
Wilhelmina	Cammel		08/01/1871	NDL	24/01/1981	110
Petronella Maria	Ribbens	Verstallen	02/02/1873	NDL	22/07/1983	110
Frederika Louiza	Van Asselt	Benkemper	16/11/1874	NDL	27/12/1984	110
Margaretha	Eijken		12/11/1875	NDL	01/05/1986	110
Christina	Van Druten	Hoogakker	20/11/1876	NDL	08/12/1987	111
Johanna Francina	Zandstra	Giezen	07/09/1882	NDL	16/09/1993	111
Ann Jemimia	Flower		08/07/1885	NDL	09/08/1995	110
Johanna	van Dommelen	Hamer	20/10/1885	NDL	07/05/1996	110
Cornelia L.C.	Hendrikse	Maas	02/12/1885	NDL	15/07/1996	110
Geertje	Roelinga	de Groot	29/06/1887	NDL	14/08/1997	110
Wilhelmine	Sande		24/10/1874	NOR	21/01/1986	111
Maren Bolette	Torp		21/12/1876	NOR	20/02/1989	112
Asne	Hustveit		02/12/1879	NOR	15/12/1989	110
Laura Hansine	Svehaug		19/12/1886	NOR	06/03/1998	111
Karen	Svisdal		16/12/1889	NOR	23/02/2000	110
Hulda Beata	Johansson	Andersson	24/02/1882	SWE	09/06/1994	112
Ellen	Johansson		23/01/1887	SWE	06/07/1997	110
Hilda	Grahn		10/06/1888	SWE	24/06/1998	110
Teresia	Lindahl		10/06/1888	SWE	02/03/1999	110

Second list: incomplete three-star validated data — Canada (CAN) and France (FRA).

Given name	Name	Maiden name	Date of birth	Country of birth	Date of death	Age at death
Flore	Bellerive	dit Couture	06/09/1872	CAN	18/02/1983	110
Marie L.F.	Meilleur	Chasse	29/08/1880	CAN	16/04/1998	117
Marie	Bibeault		30/01/1882	CAN	29/07/1993	111
Anna	Poirier		11/11/1885	CAN	28/01/1996	110
Marie-Louise “Rosea”	Meunier		15/03/1887	CAN	24/10/1998	111

(*continued*)

Given name	Name	Maiden name	Date of birth	Country of birth	Date of death	Age at death
Marie-Rose	Thériault		08/09/1889	CAN	29/02/2000	110
Virginie Marie	Duhem	Mollet	02/08/1866	FRA	25/04/1978	111
Jean	Treillet		06/11/1866	FRA	17/03/1977	110
Caroline	Campistron	Maurette	27/05/1867	FRA	02/03/1978	110
Frédérique	Noel		19/06/1868	FRA	14/04/1979	110
Augustine	Teissier	Sister Julia	02/01/1869	FRA	08/03/1981	112
Annette	Faron		15/02/1869	FRA	12/05/1979	110
Elisa	Esnault	Rogart	10/12/1870	FRA	25/04/1981	110
Eugénie	Roux	Clegnac	24/01/1874	FRA	20/06/1986	112
Jeanne	Calment	Calment	21/02/1875	FRA	04/08/1997	122
Lydie	Vellard		18/03/1875	FRA	17/09/1989	114
Marie-Céline	Lafaye	Maisonniaud	26/10/1876	FRA	17/06/1987	110
Joséphine	Choquet	Lucas	06/06/1878	FRA	14/02/1991	112
Mathilde	Gauchou		19/03/1879	FRA	30/12/1990	111
Henri	Perignon		14/10/1879	FRA	18/06/1990	110
Eva	Jourdan	Aubert	25/03/1880	FRA	06/05/1992	112
Pauline Eugenie	Chabanny	Gauthier	20/08/1881	FRA	13/08/1994	112
Juliette	Baudouin	Merat	19/02/1883	FRA	24/08/1993	110
Marguerite	Petit	Poinsot	02/07/1883	FRA	21/12/1995	112
Nouria	Hutin	Melik-Minassiantz	12/07/1884	FRA	23/08/1994	110
Emile	Fourcade		29/07/1884	FRA	29/12/1995	111
Bernard Victor	Delhom		09/07/1885	FRA	07/02/1996	110
Jeanne Marie	Dumaine	Lagleize	19/03/1886	FRA	03/01/1999	112
Jeanne	Colas	Charlier	09/06/1886	FRA	15/10/1998	112
Mélanie	Dormois	Bernard	08/07/1887	FRA	13/12/1997	110
Alexandrine	Renaud	Maubert	08/09/1887	FRA	18/01/1998	110
Anne-Marie	Hemery		25/07/1889	FRA	06/03/2000	110
Adeline	Soboul		08/02/1890	FRA	06/03/2000	110

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