

Validity of reported age and centenarian prevalence in New England

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Abstract

Introduction: the age reported by or on behalf of centenarians may be suspect unless proven correct. We report the validity of age reports in a population-based sample of centenarians living in New England and the prevalence of centenarians in an area within the North Eastern USA.

Methods: cohort study. All centenarians in a population-based sample detected by local censuses. Ages were confirmed by birth certificate. Type of residence and whether the subject was living independently were also recorded.

Results: from a population of about 450 000 people, 289 potential centenarians were reported by the censuses of the eight towns participating in the study. Of these, 186 (64%) had died at the time centenarian prevalence was determined. Of the 80 still alive, 13 (16%) had incorrect birth years recorded by the censuses. The specificity of the censuses for stating the number of centenarians alive and living in the sample was 28–31%. Using additional sources, only four more centenarians were located, indicating that the sensitivity of the censuses approached 100%. We had an 83% success rate in obtaining proof of age in those families we interviewed. In all instances, age and birth order of children were an important source of corroborative evidence and in no case did we detect inconsistencies with the families' reported ages of the centenarian subjects. Therefore, there were at least 46 centenarians or approximately 1 centenarian per 10 000 people.

Conclusions: age validation can be performed for most centenarians in the North Eastern USA. Self or family reports of those between the ages of 100 and 107 years were dependable.

Keywords: *age validation, centenarians, longevity*

Introduction

Validating age reports is important in studies of the oldest old. In most cases the concern has been exaggeration as opposed to minimization of age [1–3]. The number of centenarians in the 1980 US census was inflated by a factor of two [4, 5]. Factors implicated in a subject's misrepresentation of age include: increasing one's age at the time of immigration to qualify for work, cultural traditions, poor record-keeping at the turn of the century and destruction of records by natural causes or war [6–13]. The USA can be a challenging place to obtain proof of age because of its heterogeneous society, large numbers of immigrants (some from war-torn countries) and poor record-keeping by some states which were still in their infancy at the turn of the century.

The New England Centenarian Study is the first population-based study in the USA which systematically attempts to verify age and to determine accurately centenarian prevalence within a specific region of the

country. Here, we set out to ask: is it possible to verify the ages of centenarians and, if so, what is the validity of their reports?

Methods

Subject ascertainment

The New England Centenarian Study attempts to find all centenarians in a population-defined area of suburban Boston and to minimize selection bias. To locate potential subjects we used the annual censuses of eight towns. We chose towns near the Division on Ageing which our preliminary work indicated had accurate censuses. The censuses are publicly available and list name, address, birth date, occupation and political party affiliation.

We measured the sensitivity of these lists by monitoring other sources which detect centenarians, including local obituary listings, councils on ageing and

features in local newspapers. We regularly contacted nursing homes' social workers to ascertain new centenarian residents and corresponded with physicians and visiting nurses who have large older patient panels. Another valuable resource was the Massachusetts Department of Vital Records, which keeps a computerized list of recent deaths.

Proof of age

On first contact with the subject or family, we asked if they had a birth certificate. If not, we obtained the necessary information to obtain one ourselves. If we were still unable to obtain a birth certificate, then we requested many corroborative pieces of evidence indicating the person's age. These could include: military certificates, an old passport, school report card, family bible and baptismal or other church certificate. In all cases, if the subject had children or siblings, careful note was made of their birth dates and birth order to see if their ages made sense in relation to the centenarian's age.

Centenarian prevalence

After trying to find all the centenarians in our sample area and obtaining their birth certificates, we chose a date to count the centenarians (31 December 1996). During the following 2 days, we telephoned all subjects and their families to verify that the centenarians were alive.

Results

Subject ascertainment

From the censuses, we obtained 285 names of people who had birthdays before 1 January 1897. By other modes of surveillance, we obtained another four

names: one from a nursing-home social worker indicating that they had admitted a centenarian recently (who came from a town outside of our sample area), another from a local newspaper which had a feature article on the birthday of a centenarian previously unknown to us and two names from local newspaper obituaries. Therefore we had a list of 289 potential centenarians in the eight towns.

Figure 1 summarizes our investigation of these 289 names. A total of 186 (64%) were found to have died, many before 1996 who had not been deleted from the censuses. Thirteen (4%) had moved away. At the time of manuscript submission, we had not been able to determine the status of 10 (4%) people listed. Eighty people (28%) were found to be alive with a census record indicating a birth date before 1 January 1897.

Of these 80 people, 13 (16%) had incorrect birth dates listed on the censuses. In these instances, we contacted the potential subject or their proxy and were told that the person was not a centenarian. Several were younger; the birth date was simply incorrectly noted in the census. In about half of the cases, the census had stated an incorrect century of birth, though the month and day were correct.

Forty-two (53%) were enrolled. Another 14 (18%) people were located who themselves (or their proxy) stated that they were centenarians and were willing to participate in the study. Eleven (14%) of the people (or their proxies) refused to participate but also stated that the person listed was indeed 100 years old or older. Therefore, among those with census-recorded birth dates before 1 January 1897, the specificity of the censuses for stating the number of people alive and living in the eight towns was between 28% (80/289) and 31% (90/289 which includes the 10 people we have not been able to locate). Using additional sources, we have found only four centenarians not listed in the censuses and therefore the sensitivity of the censuses approaches 100%.

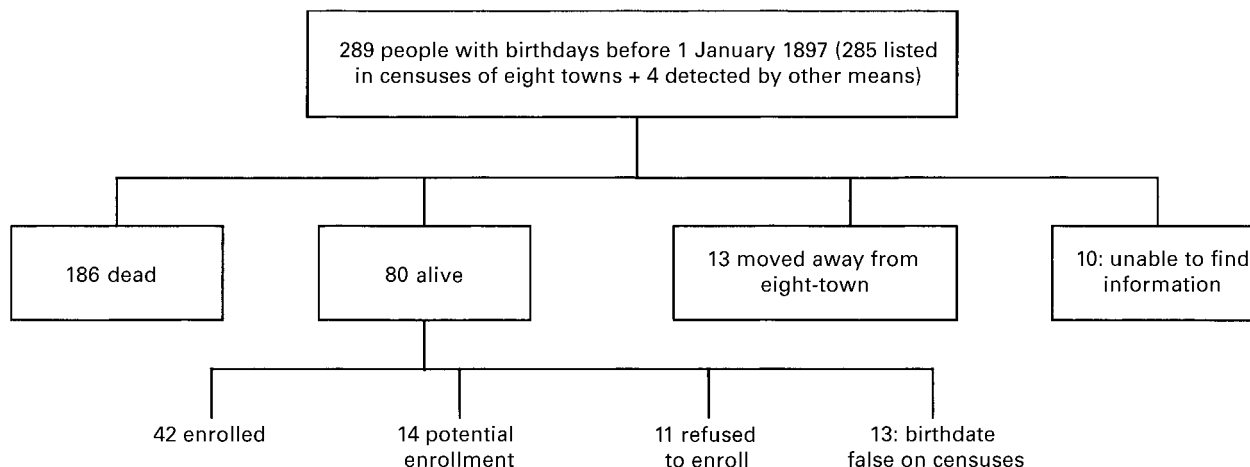


Figure 1. Status of 289 people listed in the censuses as having a birth date prior to 1 January 1997.

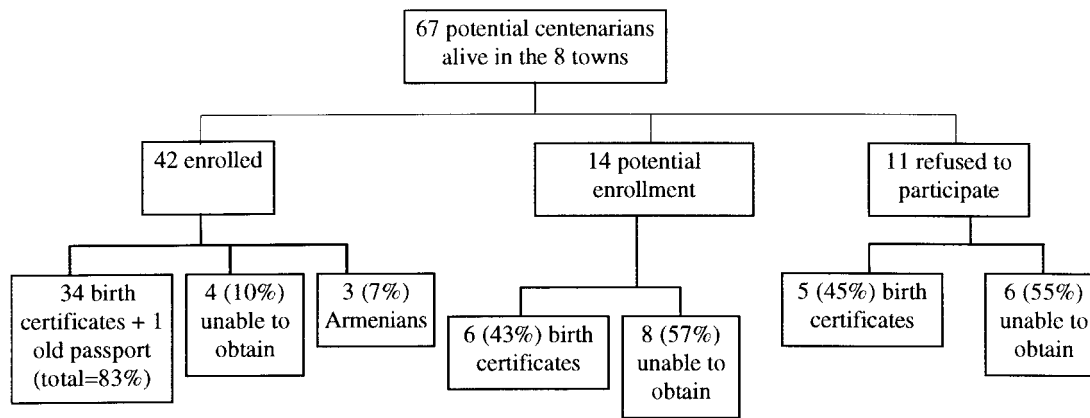


Figure 2. Results of initiative to obtain birth certificates on all people claiming to be centenarians or said to be centenarians by their proxies.

Proof of age

We attempted to obtain proof of birth date for the 67 subjects (42 enrolled subjects plus 14 ‘willing to enrol subjects’ plus the 11 people who refused to participate in the study) who verbally substantiated the census data indicating a birth date before 1 January 1897. This effort is summarized in Figure 2. Our success rate for obtaining proof was highest among those already enrolled (of 42 subjects, 34 birth certificates plus one old passport were obtained). In other words, we had an 83% success rate in obtaining proof if given the opportunity to obtain the necessary information (names of parents including the mother’s maiden name, date and place of birth). Because of the Armenian massacre in 1919, in which all Armenian birth records were destroyed, it was impossible to obtain birth certificates for three potential centenarians who were Armenian.

Seven of the 14 subjects who we were in the process of enrolling live in nursing homes. It is a significant challenge to enroll subjects living in nursing homes because we are at the mercy of the homes’ social workers to forward our correspondence to the proxies and/or to the centenarians. Until permission is obtained from the proxy or centenarian, we are unable to obtain even enough information to search for a birth certificate. We had a 43% success rate ($n = 6$) in obtaining birth certificates for this group. Five people

(and their families) who refused to participate were still willing to give us the information we needed to track down a birth certificate; six (55%) were not willing. Therefore, a total of 45 birth certificates and one old passport (issued in 1950) were obtained as proof of age for 46 centenarians living in our sample area.

Prevalence of centenarians in the eight-town area

There are about 460 800 people in the eight towns and therefore approximately 1 centenarian per 10 000 people. Given the 1990 US census estimate of 6 016 425 people in Massachusetts, our ratio would translate into 601 people for the state.

One must be cautious in applying these ratios to the State as a whole, given urban communities such as the ones in our sample may be different in their number of centenarians compared to rural communities. For instance, we suspected there would be a difference between rural and urban towns in the density of nursing-home beds. This would be important since many (between 25 and 100% and a mean of 61% for the eight towns combined) of the centenarians in each town live in nursing homes. The *per capita* nursing-home bed rate for the state of Massachusetts was about one bed per 102 people. The state’s rate is actually

Table 1. Population totals for the eight towns of the sample also stratified by age groups age 65 years and older

	No. of subjects, by age (years)					% of subjects	
	65-69	70-74	75-79	80-84	≥85	≥65	≥85
Total population	16287	15088	12965	9263	8856	14	2

Total population size according to age group from: Massachusetts cities and towns. Obtained with permission from The Massachusetts Institute for Social and Economic Research, Amherst, MA, USA.

higher than the rate for the eight towns combined, which was one bed per 110 people and thus we do not suspect that our estimation of centenarian prevalence is inflated on the basis of nursing-home bed density in our population-based sample.

Discussion

Finding and enrolling centenarians in New England

Using surveillance methods other than the censuses, we found the sensitivity of the censuses to be close to 100%. Several factors contribute to this exceptional rate, including the requirement to be counted by the census in order to vote (a right which older people take very seriously), nursing-home administrators' participation in the census collection, annual performance of the census, and the procedure of follow-up by census officials when there were missing data in the previous year's results.

However, the specificity of the census was very poor (28–31%). Many of those listed in the census had already died. Although an important reason for this is the high mortality rate among centenarians (about 50% annually), many had died before 1996. One town official admitted being less diligent about following-up on potential deaths since it is to the town's advantage to report as high a prevalence of older people as possible in order to qualify for state programmes for seniors. Therefore, we can rely upon the censuses in these towns to find nearly all of the centenarians. On the other hand, the specificity is so poor that much effort must be made to determine who on the lists are still alive.

Obtaining proof of birth

When we could obtain enough information to obtain a birth certificate, our success rate was 81% for the 42 living subjects enrolled as of 31 December 1996. For one subject we accepted an American passport issued in 1950 as proof of age. This subject also has two living sisters in their mid- and late-nineties who corroborated her claim of being 103.

We accepted birth certificates and old passports (the older the better, but in general, issued before 1963 when Medicare was created) as proof. The age of children and siblings was always helpful as supportive evidence. Military certificates, baptism records and entries into a family bible at the time the person was born were acceptable. For these secondary sources, multiple corroborating pieces of evidence would be preferable to only one supportive document. Potential forms of proof which we did not accept included naturalization certificates and old photographs with details written on the back. In the case of naturalization

certificates, it may have been common for young people to exaggerate their age while immigrating into the USA in order to qualify for work. In the case of the photographs, it would be unclear when the information on the back was actually written.

New England may be special among areas in the United States in terms of our ability to obtain birth certificates. Because it is the oldest settled area of the country, it has a longer history of keeping birth records. Of those centenarians born in Boston, we had a 100% birth certificate retrieval rate. However, according to the 1990 US census, one-third of the current population of Massachusetts is foreign-born: approximately 21% come from Ireland, 14.5% from the UK and 10% from French Canada. In our study, 52% of subjects were foreign-born. Especially in the cases of Ireland and Quebec/Nova Scotia, we still had very high rates of birth certificate retrieval. The experience of obtaining proof-of-age for the oldest old in other parts of the USA has yet to be determined. Our experience has been mainly with Caucasians. In the two cases where we enrolled African Americans, we were able to obtain birth certificates.

Centenarian prevalence

Most centenarians lived in nursing homes (61%), but 12% lived at home alone. The remaining 27% lived with family, one of whom would qualify as living alone since she was functionally independent and was looking after her 75-year-old son.

The centenarian prevalence rate of 1 per 10 000 is twice the rates reported from other industrialized countries, where the estimate is 50 per million [5, 14] but comparable to rates found in the Danish, French and Italian centenarian studies (personal communications from James Vaupel, Michel Allard and Claudio Francheschi respectively). A slightly higher rate could be explained by the higher life expectancy after age 80 in the USA compared with other industrialized nations [15].

Centenarians represent a valuable resource for the study of successful ageing and the factors associated with achieving longevity. Previous studies of centenarians have been faulted for not verifying the ages of their subjects, but in our experience with centenarians aged less than 110 years, we have not encountered subjects who misrepresent their age. Additional studies which include minorities are necessary to determine the validity of age reports in groups where cultural differences may yield different results. The low specificity of the censuses used in this study and the potential for selection bias underscores the importance of performing population-based studies when determining prevalence rates and socio-demographic and medical characteristics of centenarians.

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Key points

- Centenarians are a valuable resource for the study of successful ageing. They are a special group and it is important that they are correctly identified.
 - Although some countries (such as the UK) have had good population-based census, birth and mortality data for over a century, in most other countries it is difficult to obtain reliable data.
 - This study of the validity of age reports in population-based samples in New England found a high sensitivity of the census (nearly 100%).
 - Specificity was poor (about 30%), mainly because of un-notified deaths. This underscores the importance of doing population-based studies and of seeking verification of birth dates in studies of centenarians.
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