Age validation of persons aged 105 and above in Germany

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Abstract. As part of the International Database on Longevity (IDL), this study aimed to gather a list of age-validated persons aged 105+ in Germany, as complete as possible. We proceeded in three steps. In a first step, we asked the Office of the President of the Federal Republic of Germany (*Bundespräsidialamt*, or OGP) for a list of all persons aged 105 and older who received a congratulatory letter on the occasion of their birthday from the Federal President in the period from 1989 to 2002 (N=1,487). Second, the local Residence Registry Office (*Meldebehörde*, or RRO) was asked for the vital status of the person and the person's place of birth. Third, the Office of Vital Records (*Standesamt*, or OVR) at the person's place of birth was asked to confirm the date and place of birth. An individual was considered age-validated if (1) a late-life document was available from the RRO showing that the person had reached age 105 and (2) an early-life document was available from the OVR confirming the person's place and date of birth. 970 cases fulfilled both criteria. We monitored the vital status of this group until the end of the year 2004. Demographic data of these persons were then submitted to the IDL.

1 Introduction

This study aimed to gather an unbiased list of age-validated persons aged 105+ in Germany, as complete as possible, to be submitted to the International Database on Longevity (IDL; Cournil et al., this volume). The objective of the IDL is to gather lists of validated supercentenarians (persons aged 110 and above) and semi-supercentenarians (persons aged 105 to 109) in as many countries as possible. For the sake of simplicity, the term "semi-supercentenarians" is used in this chapter to refer to persons aged 105 to 109 as well as persons aged 110 and above.

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With a population of 82 million, Germany is a big country and it is important that information on German semi-supercentenarians is included in the IDL. Germany maintains a high standard in the documentation of civil events (birth, marriage, divorce and death). Mandatory registration of civil events was introduced in 1875. Consequently we can expect to find birth records for persons who reached age 105 in the year 1980 and later.

The German registry system is divided into two components, the registration of residence and the registration of civil events. The registration of residence is organized by Residence Registry Offices *(Meldebehörden*, or RROs), the registration of civil events by Offices of Vital Records (*Standesämter*, or OVRs). RROs and OVRs are independent administrative units in the municipality of a community. Their geographical area of responsibility may or may not overlap. All citizens are obliged to register with the RRO at their place of residence. Similarly, the registration of civil events with the OVR is mandatory for all citizens.

Data from the Human Mortality Database (HMD)[3] allow us a first glimpse at the number of very old persons in Germany. Figure 1 presents trends in the number of centenarians and semi-supercentenarians in Germany from 1956 to 2006, separately for women and men. Absolute numbers as well as numbers per million population are shown. There was an enormous increase in centenarians and semi-supercentenarians in Germany in the last decades, similar to other European countries (e.g., see Figures 1 and 2 in Skytthe et al., this volume). The upward trend in absolute and relative numbers continues unabated until the end of the data series in 2006. The increase is much more pronounced in women than men. Among semi-supercentenarians

[3] The HMD contains detailed raw data on death and population counts by age, year of birth, and calendar year for 33 countries including Germany. Derived variables such as death rates and life table parameters are also included in this database. A complete description of the methodology of the HMD is available in the methods protocol (`www.mortality.org/Public/Docs/MethodsProtocol.pdf`) for the HMD. The approach of the HMD is guided by the conventional knowledge that age reporting in death registration is typically more reliable than in official population estimates. For this reason, official population estimates at older ages are replaced by estimates calculated from death counts, employing extinct cohort methods. Such methods eliminate some of the biases in old-age population and mortality estimates. For Germany, the HMD currently includes data for all years from 1956 through 2006. For German data in the HMD, all official population estimates for age 90 and above were replaced by estimates obtained by applying the extinct cohort method (Vincent, 1951) and the survivor ratio method (Thatcher, Kannisto, & Andreev, 2002).

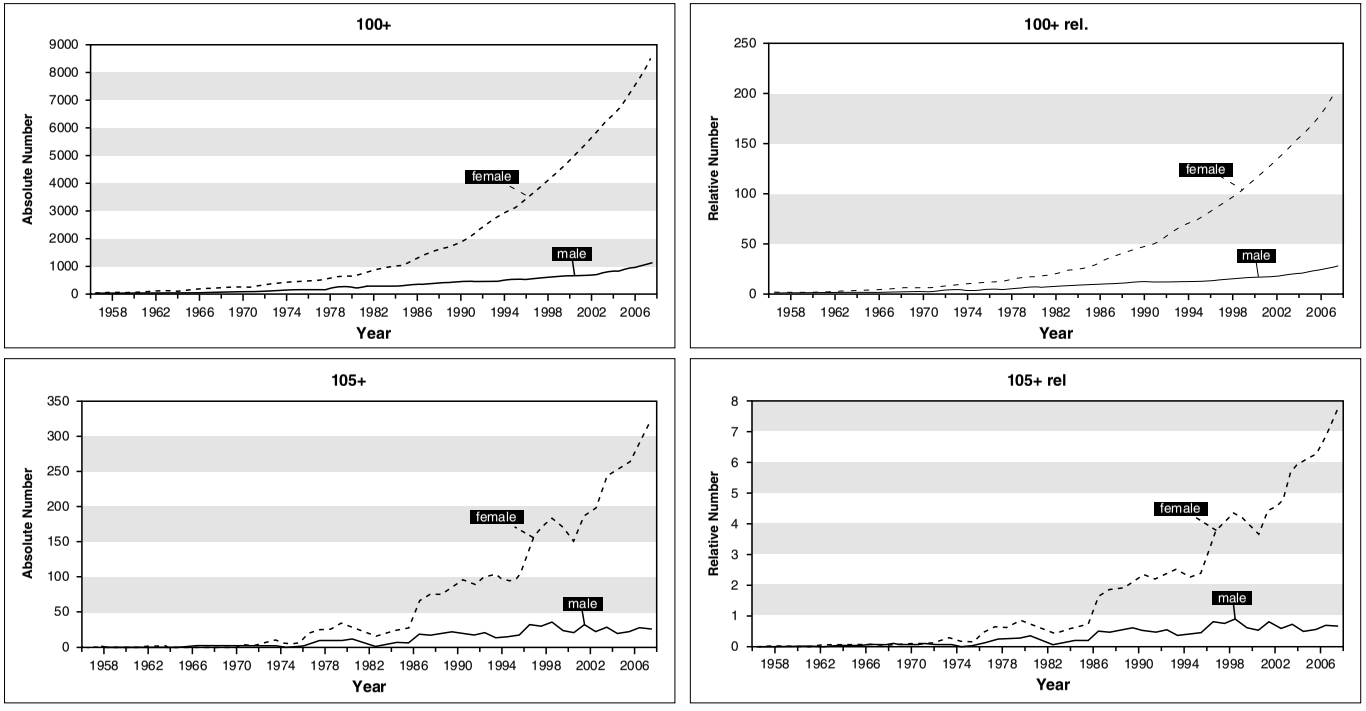
in Germany, women outnumber men by a factor of 8 to10 in recent years.

2 Age validation procedure

The HMD methods eliminate some of the biases in old-age population and mortality estimates. But still, the HMD data are estimates. In contrast, the IDL protocol requires that cases are validated at the level of the individual. When it comes to research on extreme longevity, age validation is very important because many reported instances of exceptional age are incorrect (Jeune and Vaupel, 1999; Poulain, this volume). Age validation at the individual level is challenging in Germany because the country maintains strict data protection laws and has a decentralized registration system. Data on every citizen are stored in the community where he or she lives. It is therefore not possible to extract all individuals with a specific age at a given point in time, e.g., semi-supercentenarians, from one central source. By the end of 1999 there were 8,513 RROs in West Germany including Berlin as one city, and 5,341 in East Germany (Statistisches Bundesamt, 2001). To obtain a first, exhaustive list of alleged semi-supercentenarians, one could ask all RROs for such persons in their community. However, in Germany there were probably only about 350 semi-supercentenarians alive in 2006 (cf. Figure 1), suggesting that more than 97% of the RROs have no such person residing in their local community. Communication with more than 13,000 RROs would have been very expensive, time-consuming, and wasteful.

2.1 First step: Addresses from the Office of the German President

We employed an alternative research plan that is more efficient. An overview of the plan is shown in Table 1. As a starting point, our age validation study utilized a database maintained at the Office of the President of the Federal Republic of Germany (*Bundespräsidialamt*, or OGP). Since 1965 until today the Federal President sends a congratulatory letter to citizens celebrating their 100th or a higher birthday (Franke, 1995). The OGP identifies the centenarians with the help of the RROs. Specifically, the OGP has issued an administrative order (last version July 5, 1995) via the *Staatskanzleien der Bundesländer* requesting that every RRO nominates centenarians in its local community. It is important to note that an RRO cannot freely choose whether to nominate centenarians - it is mandatory for the RRO to nominate.



Source: Human Mortality Database, `http://www.mortality.org`.

Fig. 1. Number of centenarians and semi-supercentenarians in Germany in the period from 1956 to 2006: Absolute number and number per one million inhabitants

Table 1. Research plan of the German age validation study: Sequence of correspondence with three types of offices

Step	Office(s)	Registry system	Information requested	Type of validation document
1	Office of the German President (OGP, *Bundespräsidialamt*)	Database on nominees for congratulatory letters (based on registry of residence)	(1) Name, (2) address, (3) date of birth	List of alleged semi-supercentenarians
2	Residence registry offices (RROs, *Meldebehörden*)	Registry of residence (*Melderegister*)	(1) Confirmation of name, address, sex, and date of birth, (2) birth name, (3) place of birth, (4) vital status	Late-life document
3	Offices of vital records (OVRs, *Standesämter*)	Registry of births, deaths, and marriages (*Personenstandsregister*)	(1) Confirmation of birth name, sex, date of birth, and place of birth	Early-life document

When a centenarian's birthday is near, the local RRO reports this individual to the OGP about one month or so in advance, using a one-page form. The nomination is usually based on a recent update of the local register of residence (*Melderegister*). Based on the nominations from the RROs, the OGP sends the congratulatory letters and retains information about the recipients in a database, including their name, age, and address. Most letters are accompanied by a monetary payment. In the year 2002 the payment amounted to 150 Euro. It was given if the monthly income of the recipient's household did not exceed an upper limit. About 90 percent of all congratulations include the payment. In most instances the OGP sends letter and payment not to the centenarian but to the nominating RRO. The RRO contacts the centenarian prior to his or her birthday and arranges for a visit of the mayor or some other local representative. The local representative visits the centenarian on the day of his or her birthday, congratulates, presents the letter from the president, and gives out the monetary payment. This procedure ensures that the centenarian is alive and can be

found. If a centenarian has died before his or her birthday or cannot be found, the RRO is required to notify the OGP and return the payment.

In West Germany this procedure is in place since 1965. After German unification in 1990 it was also installed in East Germany. Congratulatory letters to East German centenarians were sent starting in 1991. In October 1995 there was a change in the procedure. Because the OGP could no longer manage the ever increasing number of nominations, it stopped sending letters to persons celebrating their 101st to 104th birthday. Thus, from 1995 onwards, letters were sent only to persons who celebrated their 100th birthday and to semi-supercentenarians. The database was computerized in 1999.

In a first step of our validation study, we asked the OGP for a list of all semi-supercentenarians who received a congratulatory letter in the period from 1989 to 2002, with the goal to validate their age. Specifically, we asked for the person's name, address, date of birth, and the calendar year of the congratulatory letter (see Table 1). The OGP approved our request and provided us with a list of 1,487 cases.

2.2 Second step: Late life information from the Residence Registry Offices

In a second step we aimed to obtain late life documents for our 1,487 cases, attesting that a person indeed reached age 105. For this we approached the RROs at the persons' place of residence. Each RRO registers citizens living in its local community with the goal to establish and document their identity and verify their residence. The obligation for all citizens to register with the RRO (*Meldepflicht*) began in the 1800s. A standardization process took place in the 1930s. Today every RRO maintains a local registry of residence (*Melderegister*) with data on citizens living in the community. The registry of residence includes information about a citizen's name, address, place and date of birth, as well as place and date of death (if deceased). If a person dies, the RRO is notified usually within four weeks after the death of the person.

Using the 1,487 addresses supplied by the OGP, in a second step of our age validation study we approached all RROs with a semi-supercentenarian residing in their community. We asked the RRO for the person's birth name and place of birth. We also asked if the person was alive or deceased and requested the date of death for deceased persons (see Table 1). We framed our inquiry as an application for a so-called "extended registry information" (*erweiterte Meldeauskunft*) on the semi-supercentenarian. An "extended registry information" is an official document issued by the RRO including information on the

person's name and place of birth as well as place and date of death (if deceased). An "extended registry information" is granted if an applicant demonstrates a justified interest. Scientific research constitutes a justified interest. Consequently, all RROs co-operated with our study and provided the requested information—if it was available.

2.3 Third step: Early life information from the Offices of Vital Records

In Germany, civil events in a person's life (birth, marriage, divorce, death) are registered with the OVR in the community where the event takes place. For example, all births in a local area are recorded with the OVR at that area. These records of births are part of the register system called register of births, deaths, and marriages (*Personenstandsregister*). Each local OVR maintains such a local register of civil events. The OVR is also in charge of providing official documents (e.g., birth certificates) certifying these events.

The RROs had supplied us with information on the semi-supercentenarians' place of birth. This information enabled us to identify and contact the OVR at the person's place of birth, where birth records are kept. Utilizing the information about the person's birth name and place of birth, we asked the appropriate OVR whether a birth record existed in its register certifying place and date of birth. Specifically, we asked the OVR to confirm the validity of the information received from the RRO concerning the person's birth name, sex, place of birth and date of birth (see Table 1). We did not ask the OVR to issue an official document such as a birth certificate or a so-called *Geburtsschein*. An OVR is authorized to provide these documents (birth certificate or *Geburtsschein*) only when requested by the person him- or herself, by relatives, or by other applicants with a justified legal interest (§61 *Personenstandsgesetz*). Scientific research per se does not constitute a justified legal interest. However, we asked the OVRs to rely on the local register of births, deaths, and marriages in their response to our request. Thus, the legal status of our inquiry was such that we were not legally entitled to receive the information. The OVRs were not obliged to comply with our request. The decision whether to supply the information was entirely at the discretion of the respective public official at the local OVR. At the outset of the age validation study it was uncertain if public officials would co-operate. In practice it turned out that less than two percent of the OVRs refused to co-operate, while more than 98 percent helped us with information.

Our alleged semi-supercentenarian cases included 409 individuals (about 28 percent of all cases) who were born outside the borders of today's Germany. Their birth records, if preserved, are kept at *Standesamt 1 in Berlin* (OVR 1 Berlin), a special office that archives records on persons born in the former German empire and in foreign countries. Due to war and post-war confusion, we expected that records kept at OVR 1 Berlin would be fragmentary and far less complete than those kept at ordinary OVRs.

2.4 Validation criteria

Prior to the data collection we adopted the following set of criteria for age validation of German semi-supercentenarians. Persons who had died were considered age-validated if

(a) information is available from the OGP stating that the person received a congratulatory letter when s/he was 105 years or older, and
(b) late life information (*erweiterte Meldeauskunft*) is available from the RRO certifying the death of the person at an age above 105 years, and
(c) early life information is available from the OVR corroborating the person's place and date of birth.

Semi-supercentenarians who were alive were considered age-validated if

(a) information is available from the OGP stating that the person received a congratulatory letter when s/he was 105 years or older, and
(b) late life information (*erweiterte Meldeauskunft*) is available from the RRO certifying that the person was registered as alive in his or her local community at an age of at least 105 years, and
(c) early life information is available from the OVR corroborating the information about the person's place and date of birth.

2.5 Mortality follow-up

We monitored the vital status of the surviving semi-supercentenarians in yearly intervals up to 1 January 2005. Vital status information was obtained from the RROs.

3 Results

Table 2 summarizes the results of the German age validation study. Applying the criteria listed in section 2.4 above, we succeeded in validating the age of 970 semi-supercentenarians. Age validation was not successful for 517 cases. Uncorroborated cases can be categorized into five broad and mutually exclusive groups.

Table 2. Result of the German age validation study

Status after age validation procedure	Unconfirmed cases	Total
Age-validated semi-supercentenarians		970
RRO unable to confirm		11
"Test case"	2	
Unknown address	5	
Moved to foreign country	2	
Person could not be identified	2	
Place of birth could not be identified	6	6
OVR unable to confirm		85
OVR refused to cooperate	21	
No entry in register of births, deaths and marriages	62	
Last name did not match	2	
OVR 1 Berlin unable to confirm		359
No entry in register of births, deaths and marriages - born in former German empire	252	
No entry in register of births, deaths and marriages - born in foreign country	107	
Died before age 105		56
Died at age 104	50	
Died before age 104	6	
Total	517	1,487

The first group comprises eleven cases that were not validated by the RROs. Two of them were "test" cases, supplied by the OGP, which did not correspond to real persons. There were also five cases that had

moved without leaving an address. Another two persons had moved to a foreign country. Finally, there were two cases that could not be identified because they were not listed in the RRO's registry of residence (*Melderegister*).

The second group of uncorroborated cases consists of persons with unknown place of birth. The RROs supplied information on place of birth for 1,476 cases. We found the place for 1,470 cases. However, we did not succeed in locating the place of birth for six cases, neither in today's Germany nor in other parts of the former German empire.

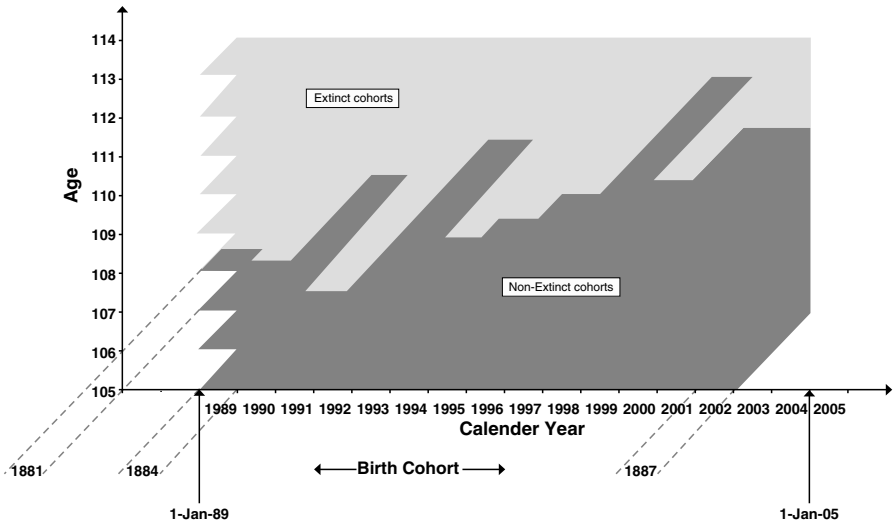
The third group includes a total of 85 cases that were not validated by the OVRs. Although co-operation of the OVRs was much better than we had anticipated, there were still five OVRs that refused to comply with our request and denied us the information (21 cases). Validation of another 62 cases was not successful because the OVR did not find an entry for them in the registry of births, deaths, and marriages (*Personenstandsregister*). In some instances, this was due to the fact that documents (*Personenstandsbücher*) from the year of birth were lost. Finally, two cases were validated by both the RRO and the OVR, but their last name did not match.

The fourth and largest group of uncorroborated cases consists of individuals which could not be validated by OVR 1 Berlin, the special Office of Vital Registration that archives records of persons born outside of today's Germany. Of the 409 cases we submitted to OVR 1 Berlin, only 50 were validated while 359 were not. Validation failed for 252 cases born in other parts of the former German empire and for 107 cases born in a foreign country. The low validation rate at OVR 1 Berlin suggests that only a small fraction of the registers of births, deaths, and marriages were transferred from former German territories to the OVR 1 Berlin.

The fifth group of unsupported cases comprises 56 individuals which died before their 105th birthday. These 56 cases were validated by the RRO and the OVR, but they did not reach age 105. Among them were 50 persons who died at age 104, suggesting that they passed away after nomination by the RRO and while the OGP was already preparing a congratulatory letter for them. The remaining six cases were registered as deceased at an age below 104.

Demographic information on 970 age-validated semi-supercentenarians is presented in Figures 2, 3 and 4. Figure 2 represents the observation period of our study as a Lexis diagram. We monitored semi-supercentenarians in Germany from 1 January 1989 to 31 December 2004. In 1989, the first calendar year of our study, we covered only

semi-supercentenarians surviving to their birthday in that same year, due to our reliance on the congratulatory letters sent by the Federal President. In the time period from 1990 to 2002 we surveyed all semi-supercentenarians in Germany[4]. The vital status of surviving semi-supercentenarians was monitored until the end of the year 2004. Individuals reaching age 105 in 2003 and 2004 were not included in the study[5].



Note: The gray area designates the observation period. Extinct cohorts are shown in light gray and non-extinct cohorts in dark gray (N = 970 age-validated semi-supercentenarians).

Fig. 2. Age validation study in Germany: observation period by age, calendar year, and birth cohort

[4] This is true with the exception of East German semi-supercentenarians in 1990. The procedure of sending congratulatory letters was installed in East Germany only after German unification in 1990. Congratulatory letters to East German centenarians were sent starting in 1991.

[5] There was one exception to this rule. A woman born in 1898 celebrated her 105th birthday on 3 January 2003, three days after the arbitrary deadline imposed by this study. Her age was validated according to our criteria and we retained her as a valid case in the German list.

We monitored birth cohorts 1881-1883 from the day of their birthday in 1989. We surveyed birth cohorts 1884-1897 starting on the day they reached age 105. Based on 970 age-validated cases, Figure 2 represents extinct cohorts in light gray color and non-extinct cohorts in dark gray. Birth cohorts 1881-1892 were extinct at the end of our study in 2005. None of the age-validated German semi-supercentenarians reached age 113 (Figure 2). The maximum age was observed in 2002, when a woman born in 1889 died at an age of 112 years and 362 days.

Figure 3 presents the number of age-validated semi-supercentenarians in Germany from 1989 to 2002, separately for women and men. In the ten-year period from 31 December 1992 to 31 December 2002, the number of female semi-supercentenarians increased by a factor of 2.9, from 55 to 160 cases. The number of male semi-supercentenarians in that same period increased by a factor of 3.2, from 6 cases in 1992 to 19 cases in 2002. By the end of 2002, women outnumbered men by a factor of 8.4.

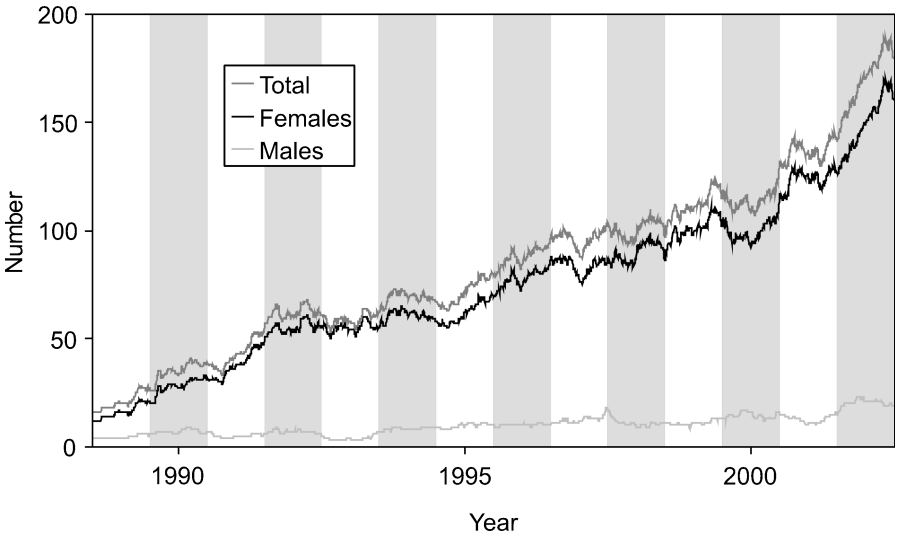


Fig. 3. Number of age-validated semi-supercentenarians alive in Germany, 1989-2002

Figure 4 shows the number of age-validated supercentenarians (aged 110 and above) in Germany from 1989 to 2004. Fourteen women and three men reached age 110. Supercentenarians were rare in the 1990s. Only two individuals surpassed age 110 in the period 1989-1998. Persons aged 110 and above became more prevalent in the period 1999-

2004. In 2003 and 2004, up to five supercentenarians were registered as alive at the same time.

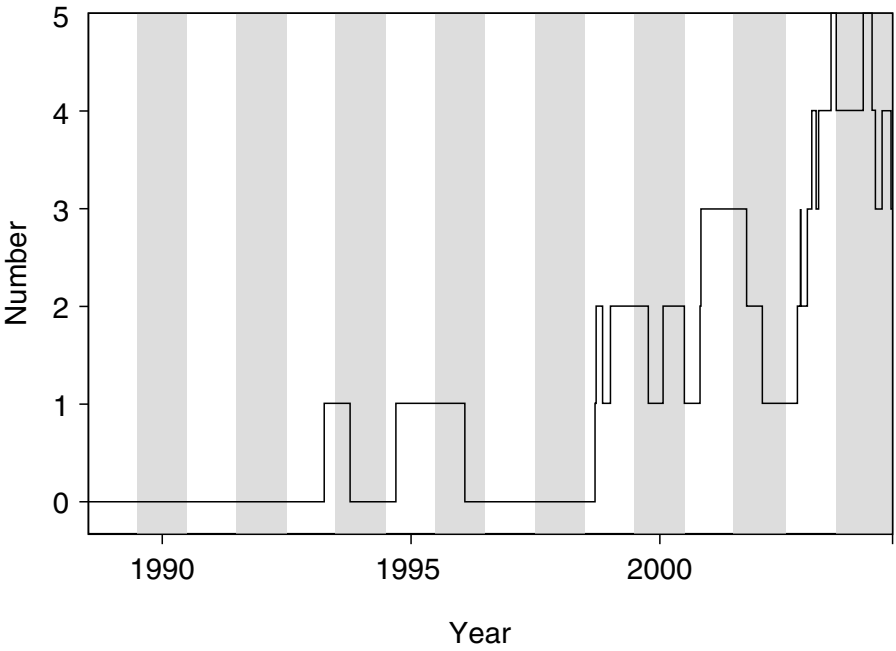


Fig. 4. Number of age-validated supercentenarians (aged 110 and above) alive in Germany, 1989-2004

Demographic data on 970 age-validated semi-supercentenarians were submitted to the IDL. The German list includes 859 women and 111 men. By the end of 2004, 26 semi-supercentenarians were registered as alive and 944 had died. For each person, the German list includes an anonymous case number; sex, country and date of birth, as well as country and date of death (if known). For 26 cases alive by the end of 2004, the German list includes the last known date when they were registered as alive.

4 Discussion

To summarize, the German age validation study followed a distinct procedure (Table 1). In the first step, the office of the German president was asked for a list of all semi-supercentenarians which received a congratulatory letter from the German President between 1989 and

2002. In the second step, the local RRO at the place of residence was asked for information about the vital status of the person and for the person's place of birth. In the third step, the local OVR at the place of birth was asked to corroborate the date and place of birth. 970 semi-supercentenarians were considered age-validated because the RRO confirmed that the person reached age 105 and the OVR verified date and place of birth.

It is essential that lists of semi-supercentenarians submitted to the IDL are free of age ascertainment bias. The IDL aims for an unbiased description of the mortality trajectory at the oldest ages. This description will only be valid if the age of the semi-supercentenarians in a population does not affect their chances of being included in the database. Our research strategy started with all semi-supercentenarians that received a congratulatory letter from the German President on the occasion of their birthday. This strategy minimized age ascertainment bias because the local registries are required by administrative order to report every person reaching the age of 105 in their municipality. However, we cannot completely rule out that the German list is affected by age ascertainment bias. Older semi-supercentenarians (e.g., aged 112) had more opportunities of being included in our list than younger ones, simply because they celebrated more birthdays after age 105. There is the possibility that in some instances the RRO failed to report a semi-supercentenarian to the OGP. If this person died before his or her next birthday, the case would not have come to our attention. On the other hand, if the person survived to the next birthday, it is likely that s/he was then included in the congratulatory procedure and thereby also in our age validation study. But such omissions by the RROs were probably rare. We presume that age ascertainment bias is negligible in the German list.

It is desirable but not essential that lists of semi-supercentenarians submitted to the IDL are complete. The Office of the German President is the only institution in Germany that holds centrally a nearly complete list of all semi-supercentenarians. We compared the OGP's list with population estimates from the Human Mortality Database and found satisfactory agreement (Scholz and Maier, 2005). Nevertheless, the German list of age validated cases is incomplete in several respects. East German semi-supercentenarians are probably underrepresented up to the mid-1990s (Drefahl, 2005; Scholz and Maier, 2005) because the procedure of sending congratulatory letters was installed in East Germany only after German unification in 1990. Foreign-born semi-supercentenarians are probably underrepresented because their birth

records are kept at OVR 1 Berlin where documentation is fragmentary. Some German-born semi-supercentenarians could not be age-validated because the appropriate OVRs refused to co-operate. Other German-born semi-supercentenarians could not be validated because documents (*Personenstandsbücher*) from the year of birth are lost. Depending on the particular research question at hand, some of these biases may have serious implications. However, the fact that the German list is incomplete does not necessarily jeopardize the validity of studies examining the mortality trajectory of German semi-supercentenarians.

A very important and unique feature of the IDL is its focus on persons whose age has been thoroughly validated. For age validation in Germany it was necessary to work with personalized information. For example, the name of the person was needed to retrieve and match documentation on the person's birth and death. The data protection procedures and rules adopted in our study are governed by the general principle that identification of individual persons should not be possible from the information that will eventually be included in the IDL. Among these rules is the regulation that only specially trained validation personnel had access to personalized information. Personalized information is not available for researchers and other persons external to the validation process. Personalized information is not submitted to the IDL.

The German study achieved age validation for 970 cases despite the country's strict data protection laws. Correspondence with the OVRs was the most challenging aspect because birth information from the German register of births, deaths, and marriages (*Personenstandsregister*) is not readily available for scientific research. Birth validation depended on the goodwill of the public official at the OVR. We were gratified to note that almost all public officials chose to co-operate. In our request to the OVRs we emphasized that the German President supported our study. This may have helped to win public officials' participation.

The maximum age observed among age-validated German semi-supercentenarians was 112 years and 362 days. This is surprisingly low, given that numerous supercentenarians with higher ages were found in other countries (e.g., Kestenbaum and Ferguson, Desjardins and Bourbeau, Mesle et al., all in this volume). The total number of supercentenarians in Germany (17; 14 women and 3 men) is also very low. It could be that conditions in Germany, especially the hardships associated with two world wars, are not conducive for survival to extreme ages.

Our results show that age-validation is feasible in Germany, a country that has strict data protection laws and maintains a high standard in the documentation of vital events. We were able to validate the age of 65 percent of alleged semi-supercentenarians. We achieved validation for 85 percent of cases born within the borders of today's Germany. Extending the German study into more recent years could be promising because the number of semi-supercentenarians is rising (Figure 3) and the emergence of supercentenarians is a very recent phenomenon (Figure 4).

List of Abbreviations

HMD - Human Mortality Database, `www.mortality.org`
IDL - International Database on Longevity, `www.supercentenarians.org`
OGP - Office of the President of the Federal Republic of Germany (*Bundespräsidialamt*)
OVR - Office of Vital Records (*Standesamt*)
RRO - Residence Registry Office (*Meldebehörde*)

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