

Validation of exceptional longevity in Martinique

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1 March 2023

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Keywords: Longevity, Centenarian, Blue Zone, Martinique

Foreword

Martinique is one of the overseas departments and regions of France (DROM), known for its bananas, its rum and its heavenly beaches. Its population of 350,000 inhabitants exudes *joie de vivre*, even though it has the highest average age of any French region, largely due to the significant emigration of young people to metropolitan France.

As early as 2017, French demographers highlighted presence of a high proportion of supercentenarians, people aged 110 and over, in Martinique as well as in Guadeloupe, the neighbouring island. Eight supercentenarians were counted in Martinique, whereas statistically only one was expected. In November 2018, Jacques Vallin, a French demographer from INED, conducted a fieldwork in Guadeloupe to verify the documents and collect evidence of these supercentenarians. The results of this mission, supplemented by the information from the website of the Archives d'Outre-Mer ANOM, allowed him to successfully validate the exceptional age at death of these supercentenarians. The results were presented at a meeting of the International Database on Longevity held in Paris, in November 2019.

In the meantime, Michel Poulain and Anne Herm, specialists in the validation of populations with exceptional longevity were approached by an association taking care of centenarians in Martinique. In January 2020, they travelled there and visited 10 of the 34 municipalities of Martinique. In each of these, they recorded all the birth certificates of centenarians on the basis of marginal annotations in the birth registers. Nearly 300 centenarians were identified in the registers for the years 1905 to 1920, which boded well for the future of the project. By dividing the number of centenarians by the total number of births in those years, they were able to estimate the probability of reaching 100 years of age (ELI, the Extreme Longevity Index). It reaches to the level of 10 centenarians per 1000 new born, a level necessary to talk about exceptional longevity.

Data collection

In order to determine the level of longevity of Martinique's population as a whole, the data were collected to identify persons who have died or are alive after age 100 from the

selected generations of new born, as well as the total number of new born in these generations, in each of the 34 communes. The collection of data on deceased centenarians in France was greatly facilitated since all nominative deaths monthly registered in France, including those in Martinique, have been made available in an open access database since the end of 2019. The comparison of the data collected during the fieldwork in the 10 municipalities of Martinique with the data proposed on the website <http://www.data.gouv.fr> has made it possible to ensure the excellent possibility to verify and confirm the completeness of the data that is an essential element for the calculation of the ELI. On the basis of the retrospective data found on this site, it can be stated that exhaustively data collected cover all the deaths of centenarians since 1998 and that, consequently, the study of longevity can be carried out for the generations born in 1898 and later. The table in Appendix 1 shows the number of centenarians who have died since 1998 up to 1 January 2023 by year of birth and by sex. Data on deaths of centenarians who were born in Martinique but died elsewhere in France have also been collected and their numbers are presented in the Appendix 1.

Unlike the number of deaths, the number of alive centenarians and the number of births by commune for the years 1898 to 1922 are more difficult to collect, and even to estimate.

- Statistics on the annual number of births in Martinique are not available for the selected years. To fill this gap, the birth registers for the years 1898 to 1912 were examined on the website of the Archives d'Outre-Mer ANOM but with two obstacles. Firstly, for some communes, data were not available for all the years and, secondly, the births are not always registered distinctly from other civil records, and total number of births are not always distinguished from the total number of registered civil status records, e.g. births, recognitions, marriages and deaths are registered all together in chronological order. For the years 1913 to 1922 and the missing years, it was essential to consult records in the registers themselves with the effective support of the civil registry service of each commune which should be thanked for their collaboration.
- For the identification of alive centenarians, the collection of data was more problematic given the absence of a population register. In order to find as much as possible information, the electoral lists, the files of the CCAS (*Centres Communaux d'Action Sociale*) and the lists of residents of the EHPAD (*Etablissement d'Hébergement pour Personne Agée Dépendante*) and other retirement homes in the communes of Martinique were consulted. However, it is needed to consider these data, particularly from electoral lists, with caution as the electoral lists may include people who have already died but have not been removed from the list. Moreover, married female centenarians are often listed under their husband's family name, which makes difficult the comparison of data from different sources. Furthermore, the problem of the availability of the services in nursing homes, coupled with their

concern for privacy, did not facilitate the task. In the end, limiting the study to centenarians born before 1921, 98 centenarians who were alive on 1 January 2023, were identified and certified. Moreover, the few centenarians born in Martinique but living in France were not included, although they should be considered when calculating the level of extreme longevity. To compensate the missing number of alive centenarians, the estimates were done by using the method of extinct generations and based on the distribution of deaths by year of age within them.

The evolution of the number of centenarians

The data provided by INSEE make it possible to estimate the number of centenarians residing in Martinique at the time of each census from 1999 to 2019. For the year 2019, the numbers presented in Table 1 compare the population of France as a whole and the one of Martinique. This allows the calculation of the prevalence of centenarians, which is the ratio of the number of centenarians per thousands of the number of the total population. The figures reveal that the prevalence of centenarians in Martinique is almost three times higher than in France as a whole. For the same proportion of centenarians as in Martinique in 2019, there should have been 60,000 centenarians in France as a whole.

Table 1. Comparative numbers of centenarians in France and Martinique in the various censuses from 1999 to 2019 and prevalence of centenarians in 2019 (INSEE)

Year	France			Martinique		
	MEN	WOMEN	TOTAL	MEN	WOMEN	TOTAL
1999	1 042	6 823	7 865	14	78	92
2008	2 262	13 259	15 521	37	158	195
2013	3 258	19 077	22 605	68	168	236
2019	3 836	17 522	21 356	49	294	343
Total population 2019	32 112 732	34 248 587	66 361 319	167 546	196 962	364 508
Prevalence (per 1000)	0.12	0.51	0.32	0.29	1.49	0.94

Table 2. Number of centenarians born in Martinique at the time of censuses from 1999 to 2019 and distinction according to their place of residence in Martinique or elsewhere in France (Source: INSEE)

	Born in Martinique			Living in Martinique	Living elsewhere in France
	MEN	WOMEN	TOTAL	TOTAL	TOTAL
1999	10	63	73	63	10
2008	37	164	201	193	8
2013	72	174	246	225	21
2019	49	307	356	332	24

The INSEE data also allows to count the number of centenarians born in Martinique and distinguish those residing in Martinique and those in the rest of France at the time of each census (Table 2). The information on the place of birth is a priori the same at each census, unlike the place of residence, which may change as a result of migration movements. Moreover, the place of birth is an important variable that should be considered when analyzing the longevity of a population. Comparing the number of centenarians by place of residence and by place of birth shows that 24 centenarians born in Martinique live elsewhere in France, while 11 centenarians living in Martinique were not born there.

Estimated number of centenarians in 2023

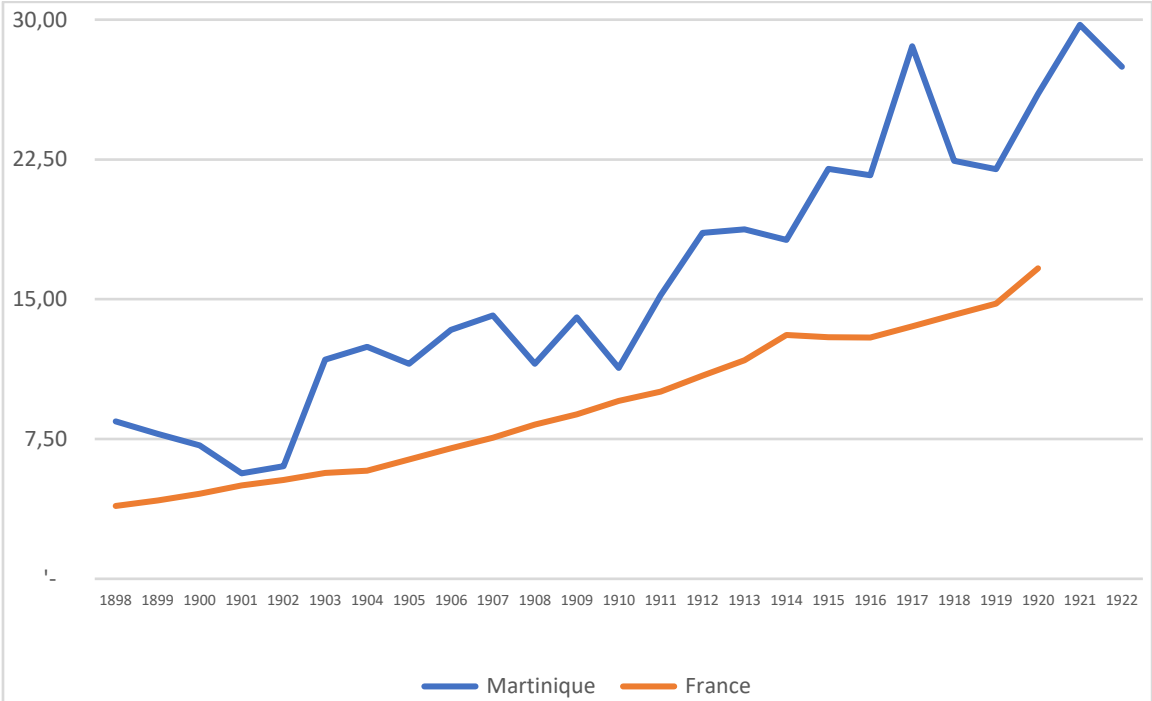
The estimated number of centenarians born in Martinique and alive on 1 January 2023 could be calculated by subtracting the number of deaths in years 2019 to 2022 from the number of newborns in Martinique before 1923 who were enumerated in 2019. Such calculation results in 285 centenarians. This result would mean that the number of centenarians, who were born in Martinique has largely decreased over the last 4 years, this trend is in opposition to the estimation for France as a whole, where the number of centenarians has increased on 1 January 2023 to the estimated number of 29,351 (INED <https://www.ined.fr/fr/tout-savoir-population/chiffres/france/structure-population/centenaires/>).

According to INSEE data and the online database of deceased persons, and considering Martinique-born residing in France, among the 356 centenarians born in Martinique before 1919 and counted alive in 2019, 281 died during the years 2019 to 2022 and 75 persons would survive to 1 January 2023. An estimate of the number of centenarians born in Martinique between 1919 and 1922 who are alive on 1 January 2023 can be done on the basis of number of deaths by age from age 90 years onwards for each generation of newborns, taking into account the regularity and trends in deaths. This estimate gives a number of 492 people who could reach age of centenarians; of them, according to the death data, 211 died, before January, 1 2023. This brings the estimated total number of centenarians as of January, 1 2023 to 356 (75+492-211), a figure equal to that of 2019.

Evolution of the probability to reach 100 years

The longevity of a population can be estimated as the prevalence, called the Extreme Longevity Index (ELI), that is calculated as the probability within a cohort of new born of reaching age 100 years. For Martinique, we divided the number of centenarians born in Martinique both alive and dead, by the total number of new born in the same generation in Martinique. The table in the Appendix 1 and Figure 1 compare the evolution of longevity presented as trend in annual-cohort ELIs in Martinique and the same data for France as a whole taken from the Human Mortality Database (<https://www.mortality.org/>).

Figure 1. Evolution of the probability of reaching 100 years of age (ELI), by generation (1899-1922) for people born in Martinique compared to France (Source: Human Mortality Database and our database for Martinique).

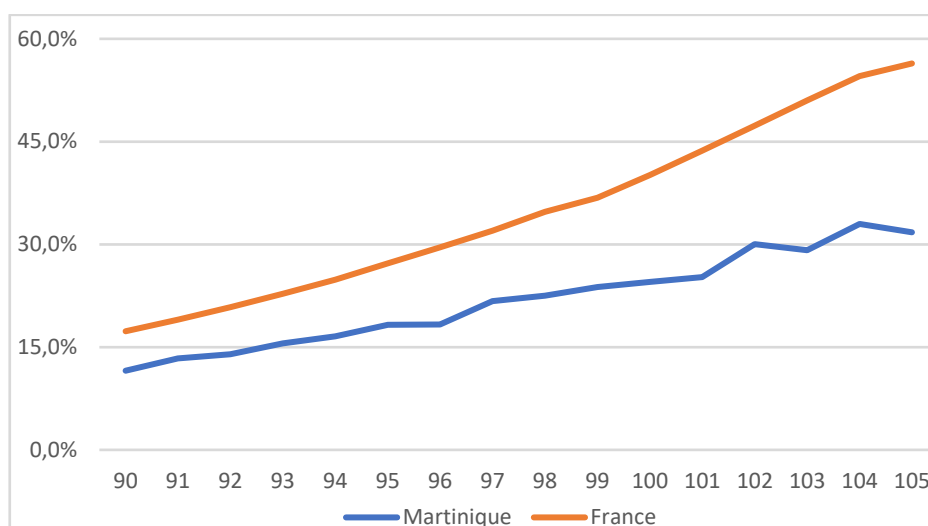


The advantage of people born in Martinique over the French population as a whole is obvious, since it exceeds 50% and this advantage even increases with each younger generation: for those born in 1920, the figures were 24.50 centenarians per thousand births in Martinique compared with 16.66 in France as a whole.

Mortality rates at the age of 90 years and above

For the extinct generations, i.e. those in which almost all new born have died, the mortality rate can be calculated from the distribution of deaths by year of age. These rates computed by year of age and globally for the generations born from 1898 to 1914 are shown for Martinique and France in Figure 2 and in Appendix 2. The difference in survival rates between the two populations is striking. Moreover, the advantage for people born in Martinique increases with age to reach mortality levels that are almost half of that in France for people over 100 years of age.

Figure 2. Annual death rates above 90 years of age for people born in Martinique compared to France (generations 1898-1914) (Source: Human Mortality Database and our database for Martinique)



Conclusion

This detailed demographic analysis of longevity in Martinique, compared to France, leaves no doubt about the exceptional situation observed in Martinique. Whether one looks at the prevalence of centenarians, the probability of reaching 100 years of age within a generation of new born or compares mortality levels at high ages, the advantage of the population born in Martinique is clear. This finding is based on thoroughly verified data. No exaggeration of age nor from a deficiency in the registration of deaths at the civil registry were detected. This conclusion corroborates Jacques Vallin's results on the validity of the age of supercentenarians in Guadeloupe and Martinique. Our work highlights the exceptional survival of the whole population of Martinique and not only of a few privileged individuals - more than 2000 centenarians born in Martinique have been identified over the last two decades. Martinique thus displays a longevity comparable to that of Sardinia and Okinawa, which allows to grant the status of Longevity Blue Zone to this island.

Appendix 1. Extreme Longevity Index for Martinique and France by cohorts of newborns

	Martinique	France
1 898	8.44	3.91
1 899	7.79	4.2
1 900	7.16	4.57
1 901	5.66	5.01
1 902	6.03	5.31
1 903	11.77	5.68
1 904	12.46	5.81
1 905	11.53	6.4
1 906	13.37	7.01
1 907	14.12	7.57
1 908	11.53	8.28
1 909	14.03	8.82
1 910	11.32	9.55
1 911	15.22	10.05
1 912	18.56	10.9
1 913	18.74	11.73
1 914	18.19	13.08
1 915	21.99	12.96
1 916	21.65	12.94
1 917	28.57	13.54
1 918	22.42	14.17
1 919	21.98	14.77
1 920	26.01	16.66
1 921	29.72	
1 922	27.47	

Appendix 2. Death rates by year for the generations born between 1898 and 1914

	Martinique	France
90	11.6%	17.3%
91	13.3%	19.0%
92	14.0%	20.8%
93	15.6%	22.8%
94	16.6%	24.8%
95	18.2%	27.2%
96	18.3%	29.5%
97	21.7%	32.0%
98	22.5%	34.8%
99	23.8%	36.8%
100	24.5%	40.1%
101	25.2%	43.7%
102	30.1%	47.3%
103	29.1%	51.0%
104	33.0%	54.6%
105	31.7%	56.4%