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Why supercentenarians are so frequent in French DOM? The cases of Guadeloupe and Martinique *(first findings of an on-going survey)*

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Short abstract

With regard to the total population, much more cases of supercenteanrians are observed in the French DOM than in the metropole. A first possible explanation was that, the classic French protocol of age validation was not enough for DOM. But, if additional checks tend to confirm that the fact is real it becomes important and quite interesting to make explanatory hypotheses. Thanks to INED research fund, I am investigating in the DOM where the phenomenon is the most acute: Guadeloupe and Martinique. I am close to the term of the project and I would like to summarise here my first returns. They will show that combining several additional checks does not let serious room for really suspecting further the ages of supercentenarians. They also will give some arguments in favour of one main possible explanation: the genetic selection by the extreme severity of the mortality inflicted to their slaves ancestors.

Long Abstract/preliminary full paper

Introduction

In the frame of the forthcoming second international monograph on supercentenarians (Maier et al., forthcoming), the chapter specifically devoted to France (Ouellette et al., forthcoming) is based on a complete list of all cases observed from 1988 to 2016 provided by INSEE. For all cases, age has been checked according to the validation process used in France before inclusion in the IDL (International Database of Longevity). However, for this chapter, only cases observed in Metropolitan France were considered, since the number of cases observed in the overseas territories proved to be relatively too high to not be suspected for age overestimation. In particular, in the French DOM (Départements d'Outre-Mer), in spite of the fact that they benefit from an high quality civil registration system since more than one and half century, the number of supercentenarians was three times higher than in Metropolitan France relatively to their population. Even more, for two of these overseas territories, Guadeloupe and Martinique, it was 7 and 8 times higher[1], respectively.

However, suspicion is not evidence. And if the suspicion could be removed, it would be quite interesting to find explanation for such astonishing fact.

[1] The ratio of supercentenarian deaths observed from 1980 to 2016 to the total population of the Metropolitan France was 2.98 per one million inhabitant while it was 20.9 in Guadeloupe and 24.7 in Martinique. More precisely, these two Caribbean DOM was far above the range of variations observed between Metropolitan French *départements* (from 0 in a dozen of *départements* to 13 in the very specific one of Paris).

Since for all the cases of the French list, age has been validated by a strict comparison between the death certificate and the birth certificate, the only possible suspicion is based on the hypothesis that, at some point in his/her life, the alleged supercentenarian took the identity of another individual to some extent older. While in metropolitan France the probability of such a substitution is quite negligible, the socioeconomic context of French DOM at the end of the 19th century or at the beginning of the 20th century could open the door for suspicion. In particular, at the time, in these regions, reaching the civil registration bureau could be costly (both in term of money and of working time loss) for families living in poor remote rural places. Consequently, it could have happened hat, like in some to-day developing countries, when a young child dies while the mother is pregnant, neither the death nor the coming birth was declared, the new child receiving the identity of the dead one. Other types of substitution could also be imagined at older ages but much more rarely. The first step in this research was thus to confirm as much as possible the initial validation process by checking that no such substitution can be suspected actually.

The second step is to start discussing possible explanation for a really greater frequency of supercentenarians in Guadeloupe and Martinique than anywhere else in France.

I. Data and methods

The basic data for this study is the nominative list of supercentenarians dead in Guadeloupe and Martinique from 1988 to 2016 given by INSEE and already validated by the French IDL team by matching birth and death certificates: 8 deaths occurred in Guadeloupe, all born in Guadeloupe, and 9 deaths occurred in Martinique, 8 of which being born in Martinique and 1 in Guadeloupe.

Two types of investigation were undertaken to remove the suspicion of age substitution as far as possible. A very efficient way to eliminate the risk of substitution in the infancy is to look at the birth history of the mother of the supercentenarian. It allows to compute the birth intervals. We can then check that the intervals are enough small to remove any risk of identity exchange. In fact the most important is to check that the interval between the supercentenarian birth and the birth of the next child is enough low to think that no other child can be born in-between. It is also quite useful to check the interval with the previous child, and finally, to rebuild all the mother's birth history to make the proof even stronger since it will gives a precise view on the regularity of the successive birth intervals. Naturally, the source for doing that is the civil registration system. On one hand, a very convenient tool for this work is the Website ANOM (*Archives numérisées d'Outre-Mer*) that is publicly accessible, allowing everybody to investigate the marriage, birth and death registration books. However, this is possible for events that occurred before the early 1900s only[2]. After that limit it is necessary to go physically to the civil registration bureaus. On the other hand, a great difficulty of the work is related to a socio-cultural context specific to French Antillas where many women have children from different men, out of marriage. That makes often very difficult to set the complete list of children bearing various unknown patronyms. The work requires a lot of patience.

Of course, at the end, we cannot demand that all supercentenarians fit with the requirement of a short birth interval. Then, when it is not the case, enough strong additional arguments explaining longer intervals have to be found before rejecting the substitution hypothesis.

To remove the second type of possible substitution, the method is to identify as many as possible facts occurred during the whole life of the supercentenarian with as exact as possible dating. The way to do that is double. First, once again, the consultation of civil registration books allows to follow marriages and birth histories of the supercentenarians themselves (all of them are women). But this must obviously be completed by other sources for the post fertile period. Unfortunately, routine administrative sources are largely missing (especially censuses). The main basis was here to find one

[2] The limit varies from 1900 to 1907 according to the *commune*.

or several alive individuals having enough knew the supercentenarian to recount her whole life (or at least the post fertile part of it), and to check as much as possible all concrete reported events.

To now, all this work was done systematically in Guadeloupe during two successive campaigns on the field. For Martinique, only what could be done through ANOM has been performed and the fieldwork is still ahead.

However, at this stage, no real suspicion remains on the completely reviewed cases and it seems quite improbable that strong doubt subsists for enough of the other cases to divide the total number of cases by 7 or 8! Thus it is already time to think of a convincing explanatory hypothesis. In my view, only a genetic hypothesis could explain such an over prevalence of supercentenarians: the tremendous health selection effect of slavery, as explained here below. Of course it is very difficult to bring evidence form the current survey. At least, one step can be completed here: to check how many observed cases have slave origins actually. To do that, once again the ANOM website was used and the work consisted in reconstructing ascendant genealogies of each of the 17 validated supercentenarians. More specifically, this source was here completed by the Anchoukaj website devoted to the special registration made at the time of the slavery abolition.

II. Assessing the actual age of supercentenarians

1. Checking birth intervals

Table 1 gives as an example the detail of the birth history of Louise Francius, the mother of one of the Guadeloupean supercentenarians, Marie Cayol. Once the necessary pieces of information gathered it appears to be a remarkably conclusive case. Indeed, gathering data was facilitaded by the fact that Louise Francius got married to Joseph Cayol on February 17, 1887 and that both of them legitimated their two first children by their marriage. It was then quite easy to find the following children, all born on the same place before the end of accessibility of ANOM. Indeed, the couple got children very regularly, almost always each two years exactly, sometime a bit less, with a mean interval of 1.89 year. In particular the interval between Marie and her immediate follower Lucain was 2.03 years. It is very clear that no room exists at all for suspecting any identity substitution in the infancy.

Table 1: Birth history of Louise Francius, the mother of Marie Cayol

Birth rank	Surname	Birth date	Interval in days	Interval in years
1	Joséphine	22 9 1883	726	1.99
2	Théophane	18 9 1885	672	1.84
3	Marguerite	20 7 1887	727	1.99
4	Benoisine	17 7 1889	708	1.94
5	Jeanne	25 6 1891	691	1.89
6	Honoré	16 5 1893	686	1.88
7	François	2 4 1895	604	1.65
8	**Marie**	1 12 1896	**742**	**2.03**
9	Lucain	13 12 1898	646	1.77
10	Luciana	19 9 1900	699	1.92
11	Hélène	18 8 1902		
Mean interval				1.89

Of course, not all case are so simple. Table 2 give a summary for all cases, first for Guadeloupe where the field word is almost completed and then for Martinique in the second part of the table.

In Guadeloupe, results are quite similar to those of the examplary case of Marie Cayol for 5 of the 8 studied supercentenarians, with “following” intervals of very close to 2 years in four cases and even much less for the fifth one. However three cases need more attention for two different reasons: a much too large following interval for Ismène Jean-Charles and the absence of following interval for Mathilde Tafna and Ferdeline Vergelas due to their last birth rank position.

Table 2: Mother’s births of each supercentenarian and some indicators of interval length

Name of the supercentenarian	Number of mother's births	Birth order	Mean interval	Previous interval	Following interval
Guadeloupe					
Marie CAYOL	11	8	1.89	1.65	2.03
Annoncia CYRIL	7	4	2.50	3.72	2.31
Marceline FAVIERE	10	6	2.67	2.19	2.01
Ismène JEAN-CHARLES	9	8	2.70	2.05	7.46
Julie MOYSAN	10	5	2.47	2.40	2.23
Camille REPIR	9	8	2.25	5.93	1.59
Mathilde TAFNA	2	2	2.42	2.42	-
Ferdeline VERGELAS	5	5	3.04	4.20	-
Martinique					
Félicité AJAX	8	1	2055		2.64
Véronique BERNADINE	(2)*	1	4.22		4.22
Marelle CELICA	5	1	2.19		2.19
Irénise LERMAIN	(1)*	1			
Luce MACED	7	2	3.33	5.23	2.91
Angèle MARC	6	5	3.58	2.39	7.44
Angèle NITHARUM	(1)*	1			
Louise PICRODE	(4)*	2	5.03	8.01	2.53
Marie RAMY	(4)*	1	2.07		1.87
* The last birth observed is very close to the last year available on ANOM and the birth history is incomplete.					

The birth interval between Ismène Jean-Charles and his young brother Stephane is of seven and half years, much longer than the usual intervals observed before. It let enough room to open the door for the death of another girl who could have died without registration and given her identity to her younger sister born 2 or 3 years later. However several arguments call for another interpretation of this large interval. First of all, it must be underlined that Isméne is the 8th child of a 9-children family. At the time of her birth her mother was already 35 years old, an age when fertility start to decline and when the risk of miscarriage is increasing. Biologically, the occurrence of longer birth intervals is quite plausible and this is coherent with the fact that Stephane is the last birth from the couple. But there is also a social reason to think that the non-registration of a death and then of a birth is very improbable. I interviewed a daughter of Ismène Jean-Charles. Born in 1937, this daughter knew her maternal grand-mother who died in 1937. All the family lived close to each other. She told me a lot of various stories about the family. In particular I learnt that both her mother and father worked at the city hall. His father was even responsible for the civil registration bureau and, more important yet, her grandfather Saint-Eloi Jean-Charles, the father of Ismène, has been himself the chief of the civil registration Bureau. How to imagine that he could omit declaring the death of her daughter and the birth of a successive one?

The cases of Mathilde Tafna and that of Ferdeline Vergelas are different. The problem there is that they had no younger brother or sister.

Brice Tafna and Noémie Soleil, the parents of Mathilde Tafna, seem rather clearly to have had two children only together (Mathilde in 1895 and her older brother Frumence in 1892). Indeed, Brice got another girl, Eclariste, in 1905, but from another women, Marie Gravillon, and he even married in 1906, but with third women, Clothilde Guinga. Such events make quite sure that the relation between Noémie Soleil and Brice Tafna stopped quite soon after the birth of Mathilde. In spite of systematic searches in the civil registration books I was unable to find any marriage of Noémie Soleil nor any birth that Noémie could have declared under her own name. It remains possible that she got additional children from other men. Unfortunately, the only family member I could meet was Fritz Tafna a great-nephew of Mathilde. Born in 1968 he was much too young to know many things on Mathilde's mother. However, he never heard anything about the existence of additional Mathilde's brothers or sisters. My conclusion is that quite probably, Noémie Soleil got two children only. No strong suspicion of early indentity substitution actually exists.

Emilienne Tamarin was 37 old when she gave birth to Ferdeline Vergelas in 1903 and Auguste Vergelas the father of Ferdeline, got two additional children in 1906 and 1908 but from another mother, Foransia Rubens. Previously, Emilienne Tamarin had had 4 children but from her first partner, Casimir Tassot who abandoned her soon after the 4th. Finally, it is very plausible that Emilienne, almost 40 and already leaved by two men did not have any further partner nor children. The absence of new child after Ferdeline does not let room to an identity substitution.

For the Martiniquan supercentenarians investigations are not still completed. Fieldwork is necessary to get entire birth histories of the mothers of Véronique Bernadine, Irénise Lermain and Angèle Nitharum while complementary investigation would allow understanding the large interval between Angèle Marc and her young brother Isidore. However, for the 5 other cases, data available on ANOM were enough to check all birth intervals and to conclude that there is no room for identity substitution. This is true for the cases of Louise Picrodé and Marie Ramy in spite of the still incomplete birth histories of their mother since they are early birth with short intervals with the next one..

In the total, from the 17 cases, small intervals with the next child give the evidence that identity substitution in the infancy was impossible for 5 Guadeloupeans and 5 Martiniquans. For the three other Guadeloupeans either the too large interval observed or the absence of younger child can be explained by specific circumstances, while for the remaining 4 Martiniquans further fieldwork is still necessary before concluding. Finally no evidence of early identity substitution exists and it is very probable that the forthcoming fieldwork will not change that conclusion. What about the risk of substitution at older ages?

2. *Interviewing proxies*

It was not an easy task to find for each supercentenarian some people able to recount her whole life. Fortunately, either thanks to the funeral director's services, or to someone from the civil registration bureau or some indication given by the death certificate, it has been possible to convince at least one proxy for an interview for each of the 8 supercentenrians dead in Guadeloupe. Doing the same in Martinique will be the main task of the forthcoming fieldwork.

Table 3: supercentenarian's proxies interviewed in Guadeloupe

Supercentenarian	Proxy interviewed
Marie CAYOL	1. The director of the "Accueil familial Cherini-Laaland 2. A grand-daughter of the SC 3. A grand-son of the SC
Annoncia CYRIL	1. Two great-nieces of the SC (interviewed together) 2. A third great-niece of the SC (who took care of her at the end of her life)
Marceline FAVIERE	1. Two great-nieces of the SC (interviewed together)

Ismène JEAN-CHARLES	1. A daughter of the SC
Julie MOYSAN	1. A niece of the SC 1. A great-niece the SC, city councillor in the place of birth of the SC
Camille REPIR	1. Daughter-in-law of the SC
Mathilde TAFNA	1. The former director of the Geriatric Hospital of Pointe-à-Pitre 2. A great-nephew of the SC
Ferdeline VERGELAS	1. A daughter of the SC

Marriages and childbirths are proofs of existence at very precise dates since they can be check in the civil registration books. Consequently the genesic histories of each supercentenarian have been investigated systematically in Guadeloupe and this will be done in Martinique too. This work gives solid reference points at least along the fertile time. Unfortunately, marriages are not so frequent and supercentenarians proved to have rather low fertility. Proxies interviews cover better the later part of life, providing a lot of information on various aspects. However these additional reference points are rarely dated with a great precision and often difficult to check. Nevertheless, altogether these different pieces of information appear to be enough coherent to prevent maintaining solid hypothesis of age overestimation for the studied supercentenarians.

III. Side-findings from the checks

Collecting data for the above checks resulted in some interesting side findings, at least in Guadeloupe where the fieldwork has been completed..

1. *Fertility is very high in supercentenrians' mothers but surprisingly low in supercentenrians themselves*

The numberof children ever born from mothers of supercentenarians appears quite high: at the only exception of Mathilde Tafna's mother who had two children only, the number of children varies from 5 to 11 (Table 4). The mean total fertility rate is thus almost 8 children per women for the 8 supercentenarians. Yet it must be admitted that this is a minimum since it is not impossible that some births escaped to our investigation in the ANOM website and/or the more recent civil registration books.

Unfortunately, it does not exist any fertility statistics for the corresponding cohorts at the level of the whole Guadeloupe, and cross-sectional computation are only available for the recent last decades. However, in a study of the fertility transition in Martinique, which was certainly not very different from in Guadeloupe, Henri Leridon (1970), showed that before it begun to decline from the years 1960s, fertility was not very high. In 1948-49 the first period for which TFR has been computed, TFR was 5.6. In fact, about the same as in France in the late 18th century, before the fertility decline start. In Guadeloupe, according to Jean-Louis Rallu (1997), TFR was 5.3 in 1967.

Obviously, supercentenarians' mothers should have higher fertility than the mean, since they necessary had at least one child, excluding all unfertile women. But the gap between 5.6 and 8 is perhaps too large to be fully explained that way.

Table 4: Children ever born from mothers of Guadeloupean supercentenarians and from supercentenarians themselves.

Name of the Supercentenarian	Number of births of the supercentenarian's mother				Number of births of the supercentenarian			
	Males	Females	Total		Males	Females	Total	
Marie CAYOL	4	7	11		5	0	5	
Annoncia CYRIL	3	4	7		1	1	2	
Marceline FAVIERE	5	5	10		0	0	0	
Ismène JEAN-CHARLES	5	4	9		3	4	7	
Julie MOYSAN	8	2	10		0	1	1	
Camille RÉPIR	5	4	9		1		1	
Mathilde TAFNA	1	1	2		0	0	0	
Ferdeline VERGELAS	4	1	5		3	5	8	
Total births	35	28	63		13	11	24	
TFR			7.9				3	

It is even more striking that supercentenrains themselves had much lower fertility than expected. Indeed they got children at a time when fertility decline had not yet started. Two supercentenarians only had large families (7 for Ismène Jean-Charles' mother and 8 for Ferdeline Vergelas' mother) while 5 of them got only I or 2 children or even none. On average their TFR is only 3. This is much less than the pre-transitional fertility level of 5.6 in spite of the fact that all these birth occurred before the 1960s. Could it be due to an underestimation of the numbers of births observed? It is not impossible that some births escaped to my investigations but this is much less probable than for the mothers' fertility since researches in civil registration books were made more efficient by the interviews of proxies that knew better the supercentenarians than their mothers. Very probably, the low fertility of supercentenarians is a real fact and the contrast with the mothers' fertility is quite surprising. It implies complex biological and/or sociological relations between fertility and longevity that would deserve deeper investigation.

2. *Supercentenarians siblings live longer than the mean*

An observation less surprising but quite important to think of a genetic explanation of the high prevalence of supercentenarians is that, in Guadeloupe, the children of supercentenarians' mothers seem to live longer than the general population. Table 5 give the example of the Ismène Jean-Charles" siblings. By chance, it has been possible to gather precise birth and death dates for all the family. We see that not only Ismène became supercentenarian but one of her sisters, Savinie, overpassed age 100 and two other siblings lived more than 80 years. On the other side, only one sibling died at less than one. The mean age at death of the whole brotherhood is 66.3.

Table 5: Life lengths of children born from the Ismène Jean-Charles' mother.

	Name	Birth date	Death date	Length of life
1	Fabius	24 8 1884	5 6 1967	82.78
2	Victor	3 2 1887	10 4 1946	59.18
3	Cassius	1 12 1888	5 5 1960	71.44
4	Savinie	8 12 1890	26 1 1994	103.15
5	Thélignie	17 9 1892	28 5 1893	0.70
6	Prudencine	2 7 1894	11 6 1982	87.94
7	Gaston	4 10 1896	16 12 1901	5.20
8	**Ismène**	**24 10 1898**	**4 3 2009**	**110.37**
9	Stéphane	6 4 1906	6 8 1980	74.33

Mean age at death of the full brotherhood	66.12
Mea nage of Ismène's siblings	60.59

The full information is also available for another supercentenarian, Annoncia Cyril, but, unfortunately, it has not yet been possible to gather it completely for the six others cases. While all birth dates are available, death date is missing for one or two siblings in each of the other brotherhoods. It is then possible to obtain the mean age at death only on the basis of those for which age at death is known. Table 6 summarises the situation through several indicators of longevity.

In the total, out of 63 siblings, death date is missing for 10. Mean age at death computation was made on the basis of 52 people. According to the brotherhood, mean live length varies from 61.6 among Repir's brotherhood to 88.9 among Favière's brotherhood (leaving apart Tafna's brotherhood for which only the age of Mathilde is known). The range varies from 51.8 to 85.7, when the supercentenrian herself is excluded.

Table 6: Life length indicators in the brotherhood of the 8 Guadeloupean Supercentenarians

Supercentenarian	Number of siblings	Missing death date	Mean age at death		Number of siblings aged	
			All	The SC excluded	100-109	90-99
Marie CAYOL	11	1	67.68	62.87		3
Annoncia CYRIL	7	0	61.82	53.66		
Marceline FAVIERE	10	2	88.88	85.71	2	2
Ismène JEAN-CHARLES	9	0	66.12	60.59	1	
Julie MOYSAN	10	2	78.08	73.51		3
Camille REPIR	9	3	61.62	51.79	1	
Mathilde TAFNA	2	1	112.12			
Ferdeline VERGELAS	5	1	69.62	56.09		
Total	63	10			4	8
Mea nage at death			63.51	56.37		

To compare the durations of life to that of the general population, it would be necessary to look at cohort data. They do not exist for Guadeloupe. Hoever it is possible to compare with Metropolitan French data, admitting that life expectancy was certainly not higher in Guadeloupe than un the Metropole and even very probably lower. According to their birth dates all siblings belong to cohorts born from 1880 to 1914. Using French cohort life tables (Vallin and Meslé, 2001, updated) the life expectancies at birth of these cohorts, weighted by the number of siblings born the same year, is used here as the reference. This average life expectancy is 48.85 years. That is 14 years less than the 63.5 years observed in the 8 brotherhoods here studied, and even if the supercentenarians themselves are excluded, the mean duration of life of their siblings is still 7 years higher. Clearly, supercentenarian siblings have an higher longevity than the general population.

Another interesting fact is that among supercentenarian brotherhoods it is rather frequent to find several other very long lives: 4 siblings lived between 100 and 110 years and another 8 between 90 and 99 ans. A very impressive case is that of Germaine Favière: one supercentenarian with two centenarian siblings and another two aged more than 98! How not thinking of longevity genes? And of a selection of these genes by the slavery?

IV. The slavery selection

The hypothesis

The validation work is not yet completed. It still can be improved in Guadeloupe and the fieldwork is still to be made in Martinique. However, it is already sure that additional investigations will not be able to bridge the gap between 3 supercentenarians per one million people observed in Metropolitan France and 21 in Guadeloupe or 24 in Martinique. No doubt that there is a real over-prevalence of supercentenarians in the two French Caribbean islands. It is not too soon to try to explain it. This is a huge task that obviously cannot be completed here. At least some hypotheses have to be discussed.

When talking with people on the field it appears that many one think of either climatic circumstances or diet habits. Indeed this type of explanation is often mentioned for other cases like Okinawa in Japan or Crete in Greece, as well as for the so-called "blue zone" recognized by Michel Poulain in various other places. Sometimes, however, genetics reasons are also suspected like in Sardigna, for example. It seems to me that in the case of Guadeloupe and Martinique, a particular attention has to be focussed on genetics causes. First of all, the over prevalence is much higher than in any other case and it seems difficult to imagine that only environmental factors could explain such a gap with "normal" situation. But also, the settlement history of these territories open the door to a reasonable hypothesis for a strong genetic factor. Current populations in Guadeloupe and Martinique are largely coming from ancient slaves. Indeed, at the time of the abolition (in 1848) the proportion of slaves or freedmen was more than 90% against less than 10% "whites". To-day proportions of descendants of these two populations is unknown but very likely it has not much changed, since in-migration was low while fertility was higher among black people than among white. Thus, it can be assumed that the major part of the population has inherited the genetic characteristics of former populations strongly selected by the very severe over-mortality undergone by their slave ancestors. In particular, the time of the capture, that of the confinement before the deportation and that of crossing Atlantic were extremely deadly. And, when arrived in Antilles, these usually quite young people were submitted to forced work and bad treatments. Many of them still die before having children. All the process produced a severe selection of the strongest individuals and only these very strong individuals achieved to get children. If there is a link between robustness and longevity, that could be enough to explain the to-day over-prevalence of supercentenarians.

A first argument for such an explanation is given by the comparison with La Réunion. La Réunion is another DOM but situated in the Indian Ocean, close to Madagascar. In this island of 870,000 inhabitants one supercentarian only has died between 1988 and 2016, that is 1.15 per one million inhabitants, much less than the 21 or 24 of Guadeloupe and Martinique and even less than the Metropolitan France ratio of 3. Such low rate can be related to the small number hazard, but it could also be due less healthy conditions of life, much more probable than the sometime supposed better healthy conditions of Antilles.

Certainly, La Réunion practised slavery in the past as did Guadeloupe and Martinique, but at least three main differences can explain the contrasting results in terms of longevity. Firstly, slavery was much more massive in Antilles than in La Réunion. In the latter only 60% of the population was slave at the time of abolition Insfrad of 90%. Secondly, while in Guadeloupe and Martinique all the slaves came from Africa, in La Réunion, they came mainly from Madagascar and they did not endured the terrible Atlanfic crossing. Thirdly, for two centuries, Antilles practiced a quasi-monoculture of sugar cane that make slaves working in awful conditions. This type of work lasted less long and was never so massive in La Reunion. Furthermore, slave emancipation was more frequent, while immigration of non-slave workers from India or other countries was rather important. In the total, not only over-slave mortality was lighter and applied to less people but it lasted less long. It is very possible that the late consequences on to-day populations are not discernible.

Of course, that argument is not enough to make a proof. Only genetic studies could provide definitive evidence, which is not possible in the frame of this study. At least it is possible to question past civil registration books to verify at what extent observed supercentenarians come from slave ancestors. This has been done as far as possible for le 8 supecentenarians dead in Guadeloupe through Internet and complementary fieldwork. It is also almost achieved for Martinique through Internet.

Side bar 1 summarises as an example the Marie Cayol's genealogy until her first slave ancestors. In that case the genealogical work was rather easy since her parents and grandparents get married and we meet slavery as soon as the grandparents generation.

Side bar 1: Marie Cayol's ancestors

Marie Françoise CAYOL was born on December 1, 1896 at Pointe-Noire, from Joseph Isidore CAYOL and Marie Louise FRANCIUS ; she dsIDEied on novembre 11, 2007 at Le Gosier.

Parents

Father: Joseph Isidore CAYOL was born at Pointe-Noire on May 15, 1859 from Joseph Célicourt CAYOL and Rosélie DAMINER.

Mother: Marie Louise FRANCIUS, born RADJOUKI at Pointe-Noire on December 8, 1863, and recognised later by her father, from Sainte-Luce Déodate FRANCIUS and Julie RADJOUKI.

Joseph Isidore CAYOL and Marie Louise FRANCIUS married at Pointe-Noire on February 19, 1887

Grandparents

Paternal Grandfather: Joseph Célicourt CAYOL, born on about 1830 « *d'après un extrait de l'arrêté du gouverneur du premier septembre 1832 qu'il nous a présenté* » (bill of marriage, n°14), natural son of Francillette CAYOL; died on November 22, 1885 at Pointe-Noire. (NB: the mention of the gouverneur's act indicates that he was born slave)

Paternal Grandmother: Rosélie DAMINER born on about 1839 (according to her « *acte d'inscription à l'état civil n° 355 du 6 11 1848* ») from Athanase Petit-Frère DAMINER and Rose AMIREILLE. (NB: the mention of the inscription bill indicates that she was born slave)

Joseph Célicourt CAYOL and Rosalie DAMINER married on May 18, 1858 at Pointe Noire.

Maternal grandfather: Sainte-Luce Déodate FRANCIUS, was born on about 1841, natural son of Euranie FRANCIUS and unknown father (probably Jacques DEBLAINE of whom she was slave, according to Pierre Gautier on Geneanet). (NB, he was born slave since his bill of marriage refers to his "acte de liberté" delivered in 1849)

Maternal grandmother: Julie RADJOUKI, was born about 1846 ou 1847 (24 ans à son mariage en 1971 et 17 ans à la naissance de sa fille Marie-Louise), décédée le 5 9 1881 à Pointe Noire. Fille naturelle de Anicet Séverin RADJOUKI and Jeannette ZABETH. (NB, she was born slave since her bill of marriage refers to his "acte de liberté" delivered in 1849)

Sainte-Luce Francius and Julie Radjouki get married on April 25, 1871 at Pointe-Noire.

Great-Grandparents

Great-Grandfather 1: unknown

Great-Grandmother 1: Francillette CAYOL

Great-Grandfather 2: Athanase Petit-Frère DAMINER

Great-Grandmother 2: Rose AMIREILLE

Great-Grandfather 3: Unknown

Great-Grandmother 3: Euranie FRANCIUS was born on about 1819 at Pointe-Noire, natural daughter of Rosiette FRANCIUS (source Anchoukaj, from slave registers)

Great-Grandfather 4: Anicet Séverin RADJOUKI

Great-Grandmother 4: Jeannette ZABETH was probably born slave, since several slave women called ZABETH are listed by Anchoukaj as living in the GOSSE DEBLAINE & PIERRE habitation

From such a example, the slave origine is exhaustive since all the four grandparents were born slaves. This is not exlusive of interbriding. Even in that case we can suspect interbriding at the next generation since several great-grandfathers are unknown and one of them is perhaps the owner of the great-grandmother.

Doing the same investigation on ANOM and Anchoukage, sometimes with the help of field work, genealogical trees were built for all the seven other Guadeloupean cases but also the nine Martiniquan cases. Table 7 summarises the results with regard to slavery.

Table 7: Slave origins of the Supercentenarians

Supercentenarian	Gandparents status	Remarks
Guadeloupe		
Marie CAYOL	All grandparents born slaves	
Annoncia CYRIL	PGF born slave, PGM's parents born slaves, MGF « *mestive* » origines MGM unknown origines	« *Mestive* » is interbriding of black with native population Survey still on-going
Marceline FAVIERE	PGF, PGM, MGM born slaves MGF probably born slave	Survey still on-going
Ismène JEAN-CHARLES	2 MGP born slaves 2 PGP	
Julie MOYSAN	All grandparents born slaves	
Camille REPIR	All grandparents born slaves	
Mathilde TAFNA	All grandparents born slaves	4 great-grandmothers born slaves 2 great-grandfathers unknown
Ferdeline VERGELAS	2 MGP born slaves 2 PGP unknown	Survey still on-going
Martinique		
Félicité AJAX	2 PGP unknow 2 MGP born slaves	Father unknown Survey still on-going
Véronique BERNADINE	2 PGP unknow 2 MGP born slaves	Father unknown Survey still on-going
Marelle CELICA	PGF unknown PGM born slave MGF unknown MGM's origine unknown	Survey still on-going
Irénise LERMAIN	2 PGP unknow 2 MGP born slaves	
Luce MACED	2 PGP unknow 2 MGP born slaves	The father himself was born slave, the reason why his father is unknow
Angèle MARC	Information not available	Survey still on-going
Angèle NITHARUM	2 PGP unknow 2 MGP born slaves	
Louise PICRODE	MGM born slave	All Great-Grandparents born slaves or unknown
Marie RAMY	MGM born slave	All Great-Grandparents born slaves or unknown
PGF = Paternal grandfather; PGM = Paternal grandmother; MGF = Maternal grandfather; MGM = Maternal grandmother; PGP = Paternal grandparents; MGP = Maternal grandparents		

Further investigations are still necessary to fulfil the table especially in Martinique, but it is already clear that all supecentenarians at the only exception of 2 Martiniquans have slave origins. Sometimes we have proofs that all the four grandparents were born slaves and for the other cases it is true for at least the maternal grandparents. In two cases however it is necessary to go up to the great-

grandparents to find the slave origins. No doubt that further investigation will complete the table. But Tale 7 already gives a strong impression: that each time slaves origins are not proved it is only because origins are not known. Most often unknown origins are due to the fact that a birth was not recognised by the father. The most probable is that the latter be on the same status as the mother, but it could also happened sometimes that the father be someone of the family of the owner of the slave mother or even the owner himself. Such cases are perhaps not exceptional but certainly rare. In any case, genetically, supercentenarians are massively the hairs of genes selected by the slave over mortality.

Conclusion

The very high prevalence of supercentenarian deaths observed in Guadeloupe and Martinique between 1988 and 2016, 7 and 8 times higher than in Metropolitan France respectively, made necessary a deeper check of alleged age, beyond the classical comparison of birth and death certificates. This is the objective of an on-going research project, completed to-day for Guadeloupe and in progress for Martinique. First results tend to confirm ages at death as they were admitted for their inclusion in the IDL database. In particular, birth histories of each supercentenarian has been reconstructed in order to check all birth intervals and especially the interval between the supercentenarian and the next birth. This alollowed to remove the main source of suspicion. Furthermore, investigations in the civil registration services and a series of interviews of various proxies of the supercentenarians gave a strong impression of coherence between all the reported events.

This deep validation work was an opportunity to look at several demographic characteristics more or less surprising. On one side, supercentenarians belong to large families and the fertility of their mothers seems to be higher than in the general population. On the contrary, fertility of supercentenarians themselves (all are women) is much lower than in the general population. On the other side, mean age at death of all supercentenarians' siblings is much higher than mean life expectancy in the general population for the same birth cohorts.

The last observation could fit quite well with our main explanatory hypothesis: the high prevalence of supercentenarians can be a to-day consequence of the strong health selection effect of the very high mortality that slavery inflicted to their ancestors. If evidence could come only from a genetic research program, it is, at least, possible to bring here as a solid preliminary element: all the observed Guadeloupean and Martiniquan supercentenarians have attested slave ancestors and no one has proved non-slave ancestors born before the slave abolition..

Certainly, this study relies on a quite small number of cases (17) but its finding are enough not only to validate the very high prevalence of supercentenarians observed in French Antiiles but also to motivate deeper researches on the proposed explanatory hypothesis. It can also be an argument in favour of the great number of supercentenarians observed in the East-Southern states of the USA, in spite of the lack of civil registration proof for many birth dates.

Naturally it is also a strong requirement of completing the current fieldwork as soon as possible.

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