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► **To cite this version:**

Michel Signoli. History of the plague of 1720-1722, in Marseille. La Presse Médicale, 2022, 51 (3), pp.104138. 10.1016/j.lpm.2022.104138 . hal-03851161

**HAL Id: hal-03851161**

**<https://hal.science/hal-03851161>**

Submitted on 22 Mar 2024

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Title: History of the plague of 1720-1722, in Marseille

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## Summary

The plague epidemic of 1720-1722 had a profound effect on the history of the city of Marseille.

A subject of numerous scientific studies and a source of inspiration for novels, one of the last great European epidemics is well-documented. In this article, we have sought to draw on the numerous documents left by the administrative services of the time or by the writings of survivors recounting their vision of the situation. We have completed this historical approach by referring to the study of mass graves of plague victims and will show how the simultaneous reading of two types of archives (historical and biological) can provide better anthropological knowledge of epidemic phenomena. The perspectives of interdisciplinary approaches to past infectious diseases are numerous, notably with the contributions of paleomicrobiology and genomics, and are particularly relevant today's health context.

## Introduction

Like most Mediterranean ports, Marseille has been afflicted with numerous epidemics. As sites for the trade of goods and crossroads for cultural exchange, ports are privileged venues for the arrival and spread of pathogens.

Already during the first pandemic, Marseille was contaminated by the plague. Gregory of Tours left a detailed description of the epidemic of 588, and its course is strikingly similar to that of the epidemic of 1720-1722: arrival of an infected ship, contamination by the goods, a decimated house and family, followed by a general conflagration, a respite and, finally, a relapse.

In 1347, Genoese ships, contaminated by the plague, docked in Marseille. The epidemic ravaged the city and spread all the way from Marseille to the Rhone valley.

Records show that Marseille was hit by the plague at least 25, and perhaps 34 times. Some of the epidemics were particularly deadly and have left lastingly gloomy memories: 1580, 1630.

However, it was the epidemic of 1720-1722 that left the most durable memory. There are three reasons for this: (a) The high mortality rate among the inhabitants of Marseille, even though the epidemics of 1347-1348, 1579-1580 and 1630-1631 were similarly deadly; (b) the anachronistic character of this plague, which was one of the last great European epidemics and should not have happened in the first place; (c) Due to its chronology, the administrative services left numerous documents on its course and management.

Many studies have been carried out on the plague of 1720 in Marseille and Provence. In this article, while citing several of these works, we will favour contemporary sources by citing archival documents and texts written by the survivors. In a final section, we will refer to the biological archives, i.e. the discovery and study of the mass graves where the plague victims were buried.

## Chronology of events

The city of Marseille and its management of epidemics prior to 1720

At the beginning of the 18<sup>th</sup> century, Marseille was home to around 100,000 people. The 1716 census<sup>1</sup> attributed 88,645 inhabitants to the city, plus the officers, soldiers and prisoners of the *Arsenal des galères*: about 10,000 additional persons (1).

In 1720, Marseille was one of the largest ports in the Mediterranean and the first in the kingdom of France. Its ships traded mainly with North Africa and the eastern Mediterranean. Due to its commercial prominence, Marseille was accustomed to living with contagious diseases. Since the epidemic of 1649-1650, the municipal authorities had set up a complex and efficient sanitary system to protect the city and avoid epidemics, particularly the plague (2,3).

In the early 18<sup>th</sup> century, the Marseille sanitary complex was considered one of the best organized in Europe. Between 1650 and 1720, 25 ships had been contaminated by the plague when they arrived in Marseille. In all cases (except that of the *Grand-Saint-Antoine*), the sanitary system made it possible to limit the plague to the hermetically sealed framework of the infirmaries.

The sanitary complex was divided into four distinct sites: the sanitary office, the lazaretto (quarantine station), the port of Pomègue, and the island of Jarre. The sanitary office was located at the entrance to the port. It was directed by sixteen health stewards. The outlying lazaretto, known as "*Grandes Infirmeries*", located north of the city and, was very large: nearly 18 hectares. It was surrounded by walls, reinforced with towers, and consisted of seven separate sectors. The port of Pomègue was used to receive ships and to manage the quarantine period. If the health situation was serious, the ship and its cargo were isolated on the small island of Jarre with a high likelihood of the contaminated goods being destroyed by wind and spray.

When a ship arrived, the captain approached the quartermaster's office in a dinghy. From a distance, the stewards on duty would ask: name of the ship, name of the captain, nationality, origin, cargo, passengers, state of health of the crew and passengers, encounters and incidents during the crossing... The ship's papers were then seized by the stewards with long tongs and soaked in vinegar. For them, the key document was the health patent, of which the contents determined the conditions and duration of the quarantine. Establishment of a quarantine depended on five factors (3) : the point of departure of the ship, the nature of its patent, the health status of the ship, incidents during the voyage, and the nature of the cargo.

Suspicious goods were unpacked, stirred and turned to windward by the porters to see if they carried contagion.

#### The arrival of the *Grand Saint-Antoine* and the plague

In July 1719, the *Grand Saint-Antoine*, commanded by Jean-Baptiste Chataud, left Marseille and set sail for the Levant. For nearly a year, it called at several ports in the eastern Mediterranean: Smyrna, Seyde, Tripoli of Syria, Cyprus...

The ship left Cyprus on 18 April 1720 with a clean bill of health, i.e., without any suspicion of plague in the region. On 25 May 1720, the *Grand Saint-Antoine* arrived back in Marseille with a cargo worth about 100,000 ecus, which was to be partially sold at the Beaucaire fair in early July. During this return voyage, several sailors and Joseph Saste de Salle, the ship's surgeon, died suddenly (4). The number and rapidity of the deaths explain why, when the *Grand Saint-Antoine* called at Livorno, the local health authorities forbade the ship to dock.

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<sup>1</sup> Bibliothèque Nationale, mss fond fr 8906

And yet, on arrival in Marseille, contrarily to the sanitary regulations for a ship with so many deaths on board, the conditions of quarantine were highly lenient; notwithstanding the regulations, it was authorised to be quarantined a few leagues from the city walls. Should we suspect in this "arrangement" the influence of the owners of the ship's cargo (particularly the aldermen J.-B. Estelle, B. Dieudé, J.-B. Audimar), who may have been in an undue hurry to sell the goods at the Beaucaire fair? Or was it caused by negligence on the part of the stewards of health? This decision was all the more surprising given that "*three other ships that came from the same places suspected of plague arrived on the last of May ... all with a gross patent, that is, bearing the suspicion of plague in the place of their departure*" (5).

In any event, the ship was isolated in the port of Pomègue and its crew, passengers and goods were quarantined in the infirmaries of Arenc. In view of the situation, the ship and its goods should rather have been sent to the island of Jarre.

Even more surprisingly, on 14 June the passengers of the *Grand Saint-Antoine* were allowed to leave their quarantine. This decision was all the more perplexing as there were other deaths during the period of isolation. On 27 May a sailor on the *Grand Saint-Antoine* died suddenly. The infirmary surgeon who examined his body did not observe any signs of contagion. On 12 June, a health guard on Captain Chataud's ship died. Once again, the surgeon Guérard saw no sign of contagion.

If this sequence of events leaves little doubt as to how the plague entered the infirmaries (as a result of administrative malfunctions in the management of the *Grand Saint-Antoine* and its goods), how could the contagion have left the infirmaries and infected the city? The city's infirmaries, and this is their primary function, are a closed space. Between 1650 (the date of the previous plague epidemic in Marseille) and the tragedy of 1720, several contaminated ships arrived in Marseille, but the disease had never exited from the lazaretto.

Many contemporaries of the epidemic suggested that goods were stolen from the infirmaries and brought into the city. This hypothesis is supported by the fact that the first victims were tailors and clothiers living near, or even on, *rue de l'Echelle*, which was known at the time to be home for smugglers (5). Other contemporaries put forward explanations that did not rule out smuggling, but hinted at different modes of diffusion: "*Mr Guérard entered the infirmaries, left them freely, slept in his house, communicated with his relatives and friends, and visited his patients in the city. He continued this manoeuvre until 12 July...*" (6).

### The plague is in the city

It was on 20 June that the plague claimed its first victim, on *rue Belle-Table*, when Marie Dauplan died suddenly (7). The arrival of the epidemic was nonetheless very discreet, as nothing happened over the following days.

On 28 June, a tailor died suddenly. The next day, his wife died in an equally unexplained manner. On 1 July, two women, Eygazière and Tanouse, both died on the street of Echelle. One of them had buboes!

Having occurred a few days and a few streets apart, these deaths drew little attention. After all, the victims were destitute, and their fate was unlikely to bother the political decision-makers or the competent health authorities; by the time they reacted, in early July, it was undoubtedly too late (1).

In the infirmaries, where the goods from the *Grand Saint-Antoine* were stored, the health situation was no better.

At the end of June, a cabin boy of the *Grand Saint-Antoine* and three porters from the infirmaries fell ill and rapidly died. The health stewards had the corpses buried in quicklime (8).

Between 27 June and 7 July, the infirmary surgeon, Guérard, visited eight patients (and then some corpses) and concluded that they were victims of an ordinary disease. Finally, on 8 July, faced with new cases, the aldermen and the stewards of health, who were beginning to distrust Guérard's diagnoses, asked for the opinions of two other town surgeons, Croiser and Bouzon, but no doctor was invited to participate in the consultation. The surgeons visited the patients in the infirmaries and concluded that three of them had the plague (8). However, in their report to the stewards of health, they affirmed that the patients were suffering from pestilential fever (5), and their vocabulary bespoke an attempt to hide the true nature of the disease. That said, precautions were taken with the corpses: "*On the 9<sup>th</sup>, these three porters died, they were thrown into lime and their clothes were burnt*" (6).

The same day, the doctors Peyssonnel (father and son) were called to the bedside of a young boy living near the square of Lenche. After examining the teenager, their verdict was clear: it was the plague! On 10 July, he died and his sister fell ill. During the night, the aldermen evacuated the deceased and dispatched the sick girl to the infirmary; the house was walled up. Over the ensuing days, other members of the family died in the infirmaries (5). On 11 July, a similar scenario occurred in another neighbourhood house: a new patient, a new death, and a new night-time evacuation of the corpse.

On 15 July, the city's aldermen refused to accord health patents to ships wishing to leave Marseille. But to reduce this decision's impact on trade, they wrote to foreign health officers that while the contagion was affecting the infirmaries of Marseille, the city itself was spared. This illustrates the eternal difficulty of safeguarding public health while maintaining trade.

On 21 July, after no untoward event had occurred for ten days, inhabitants insulted the doctors and surgeons for having unnecessarily alarmed the population. However, the plague had not become as "silent" as might have been thought. For J.-B. Bertrand, other deaths during this period could be attributed to the plague: those of the families of (a) the second-hand clothes dealer Joli and (b) an unnamed tailor. Bertrand also noted that a colleague, Doctor Sicard fils, reported to him that in the hospital, he had examined several patients with buboes. They had resided on the aforementioned street of Echelle, and some of them died. On 18 July, Sicard informed the aldermen, who asked the surgeon Bouzon to visit the patients and look into the bodies of the dead. Bouzon "diagnosed" verminous fevers (5).

The 23<sup>rd</sup> of July marked a turning point in the progress of the epidemic, as the disease became more widespread, and health professionals were coming to grips with the gravity of the situation. On the street of Echelle, fifteen more people fell ill, and "*The doctors and surgeons, after having visited these patients, did not agree unanimously on the nature of the disease which ravaged this street. Some reported that it was malignant fever, others that it was worms, and still others maintained that it was contagious pestilential fever caused by bad food which the poor of this district had fed on*" (6).

During the last days of July, showing that they harbored no illusions about the nature of the disease, the town aldermen adopted a series of measures: the obligation to remove all manure; the obligation to wash the streets; the appointment of a doctor for each district, who would be tasked with visiting the sick and reporting on them every day; and the appointment of a doctor for the infirmaries.

On the 30<sup>th</sup>, the aldermen wrote to M. Le Peletier des Forts, asking him to intercede with the Regent to obtain help, as the town's finances were all but non-existent and the reserves of provisions very low.

On 31 July, an ordinance pronounced the exclusion of all foreign beggars and the confinement of those from Marseille in the Charity Hospital. And on the same day, the Chamber of Vacations of the Parliament of Aix issued a decree forbidding the people of Marseille to leave the limits of their territory, and forbidding the inhabitants of the towns and places of Provence to communicate with them. In both cases, non-compliant persons would be severely punished.

Those with the means to leave the city promptly did: "*The first of August, ... Today it is counted that more than 40,000 souls have left the city to flee the contagion*" (9). Gentlemen, burghers, notables, canons, merchants, lawyers, notaries, district commissioners and some doctors fled or retired to their nearby homes. Only a handful of officials remained at their posts.

### Marseille, a dead city

On 1 August, the Sicard doctors announced to the aldermen that the disease in the city was indeed the plague.

On 2 August, on their advice, the municipality decided to carry out a general burning of the ramparts, streets and squares for three consecutive days. To purify the air, inhabitants were called upon to burn an ounce of sulphur in each room of their flats. At 9 P.M. the fires were lit: "*it is a spectacle which seems magnificent to see, a circuit of wall so large, so vast, so extended, all illuminated, and if the City were healed by this it would certainly heal in a very joyful and pleasant manner*" (8). In the aftermath of this gigantic and useless medical auto-da-fé, a shortage of wood led to additional difficulties, for bakers in particular. To calm things down, the aldermen were forced to limit the price of bread (10). Popular unrest nonetheless aggravated the epidemic, and the number of deaths, which was about fifty per day on 1 August, had reached almost a hundred by the 5<sup>th</sup>.

At that time the street of Echelle, considered to be the focus of the epidemic, was closed ... with the inhabitants left inside. Father Millet, a Jesuit, remained with the recluses on that street, where he died after a month, on 2 September. Men were enlisted to bury the dead and transport the sick, while doctors and surgeons were recruited by the city.

Out of work due to shop closures, citizens were reduced to begging. One hundred and fifty commissioners were sent to the districts to see to the provisioning of the poorest.

By 8 August, several corpse collectors, the "corbels", were missing, and beggars had to replace them. No longer sufficient, stretchers were supplemented by dumpers. As the cemeteries were full, thirty mass graves were dug in the town, or just outside the walls.

On 15 August, a medical commission sent by the Regent arrived from Montpellier to determine the nature of the disease that was ravaging Marseille; after twenty-four hours of tests and autopsies, their diagnosis was clear: the plague. Three days later, wishing to reassure terrified inhabitants, they posted a notice incriminating "contagious malignant fever". On 20 August, as the "corbels" were becoming increasingly scarce (a "burier" worked for an average of two days; by the third day he was dead), the Arsenal agreed to "lend" twenty-six galley slaves to help out; by 23 August, all of them were ill or deceased. By the end of the month, seven hundred people were dying every day. But it was only in early September that the plague reached its peak, with the number of deaths exceeding a

thousand a day (5). Numerous proposals to eliminate the decomposing corpses were discussed:

- burning the bodies (but the cremation of Christians was dogmatically difficult, if not impossible in the 18<sup>th</sup> century),
- using vessels which, once loaded with pestilential remains, would be sunk -- but the return of the bodies via the currents was dreaded, as was the future consumption of fish,
- opening pits in the middle of each street (but the risk of perforation and of infection of the water supply networks was too great).

In the end, only one of these projects, the opening and use of church vaults, was put into practice, notwithstanding the stalwart opposition of the Bishop De Belsunce of Marseille.

As for the installation of pits outside the walls, it did not lead to expeditious burial of the hundreds of bodies from the central blocks of popular dwellings: "*This remoteness of the pits meant that the district of St Jean, the farthest away, and which, being inhabited only by the common people, suffered the greatest mortality, was also the most overwhelmed by corpses...*" (11). In the streets of the old city, seven to eight thousand corpses were soon piling up "*I saw all at once the streets of this vast city lined on all sides with half-rotten dead, so full, with furniture and pestiferous clothes thrown out of the windows that I knew not where to put my feet, all the public squares, all the doors of the churches crossed with corpses piled up, and in several places eaten by the dogs, without it being possible to provide them with burial for a very considerable number of days*" (12).

As the sequence of events and these testimonies show, the management of the dead was of considerable importance. However, the living and the survivors had as a matter of urgent priority to be taken care of. The children's hospital was in a catastrophic state. The situation was no better in the convent of Notre-Dame de Lorette, where orphaned babies were taken in. Both hospitals had a high mortality rate. On 22 May 1721, Father Giraud noted in his diary that of the 6000 children and newborns taken in, only about 50 had survived (6).

Medical personnel were sorely lacking. In spite of the call to order by the aldermen, who pronounced exclusions and disqualifications, three of the twelve accredited Marseille physicians had fled at the beginning of the contagion, and of those who remained, five contracted the plague (two of whom recovered). Out of the thirty surgeons practicing in Marseille prior to the plague, twenty-five died. Practitioners from outside were called in. Seventeen doctors and surgeons were sent by the government, often belatedly or for only for a few months; seven were hired by contract. Two doctors, Gayon father and son, came voluntarily, without contract, as early as 13 August, but both of them died, the father on 30 August and the son on 12 September. Within one month, Marseille had become a huge mass grave!

With the month of September and the appointment of the Marquis De Langeron, i.e. a centralized authority with increased powers, the plague began to recede and public order was restored (13). But the decline was slow: 400 deaths per day at the end of September, and another hundred or so per day in October. On 27 October 1720, a plague hospital was closed. From 6 to 15 November, a resurgence of the disease took away another 50 people a day, after which a single bier sufficed to remove the two to six daily victims from the town. On 1<sup>st</sup> of December, another hospital was closed. By the end of the year, there were only two or three new patients a day.

The cleaning of the town began at the end of September with the removal of rubbish, the incineration of the belongings and clothing of the plague victims, and finally the disinfection

of the contaminated houses; on 13 December, they were first marked with a red cross, and then perfumed and whitewashed.

In 1721, as the disease continued to recede, the hospitals were closed or used for patients other than plague victims. From January 1721, hearses were back in use. In February, only 54 people were counted as plague patients. Our examination of the parish registers of Marseille for the year 1721 does not mention any deaths attributed to the plague. Finally, on 19 August the last patient was hospitalized. On 20 August 1721, the churches were reopened and on 29 September, after forty days without a new patient, a solemn *Te Deum* was celebrated. A second quarantine followed immediately, from 1 October to 9 November, during which time no incidents occurred and the town was completely deconsecrated.

### Spread of the epidemic in Provence

Soon after Marseille, other communities were affected by the plague. The epidemic spread as far east as the foothills of the Alps and as far west as those of Massif Central. Just after having exited from Marseille, on 21 July the plague reached Cassis, and by 1 August, it was in Aix-en-Provence and Apt. By 15 August, there were already a dozen affected localities, some of them quite far from the original source of the infection. The flight of many inhabitants from Marseille, and then from other communities as the epidemic progressed, contributed to the spread of the disease.

Very quickly, news of the Marseille plague spread throughout Europe. It was through the Daily Courant of 10 August 1720 that English readers learned the news. And in the 12 August 1720 editions of the Daily Post, Daniel Defoe did not fail to note the length of time taken by the Marseille authorities to officially admit the presence of the plague in their city (14).

Inexorably, the plague continued to spread. In October and November 1720, as the outbreaks in Aix-en-Provence, Marseille and Apt widened their scope, the plague was confirmed in Saint-Rémy-de-Provence, Arles and at a greater distance, in Corrèjac (Gévaudan). Cases were reported so far from the Rhône river sanitary line that people refused to believe that it could be the disease. Cases were nonetheless also reported in La Canourgue, the town closest to Corrèjac, and by January 1721, the Bandol outbreak had spread to Toulon and its surroundings; the town of La Valette, which was stricken in February 1721, lost 1068 out of its 1598 pre-epidemic inhabitants (15).

In spring 1721, in many parishes where it seemed to have died out, the plague returned. In Corrèjac, for example, inhabitants had closed their infected houses and then, thinking that winter had purged them of the disease, reopened them in the spring; anyone who entered promptly died of buboes, as attested by a doctor sent from Rodez (10). In May 1721, new villages were hit in Gévaudan, and the contagion spread to the Camargue. Fear of the contagion spread to the other provinces, throughout the kingdom. In Paris, two doctors were consulted to decide whether or not the king should leave the city.

In July 1721, the disease continued to progress in Provence, only to weaken in August and end in September. However, it was in August that the plague hit the communities of the Comtat: Bédarrides and Avignon (16). In Gévaudan, it was also in mid-August that the dioceses of Mende, Viviers, Uzès and Alais were infected. Only with the first cold of winter did the outbreak relent (10).

While some communities were ravaged only once, in others the plague returned following an initial attack and a few weeks of respite; that's what happened in Marseille in the spring. On 4 May 1722, on the Rue de la Croix d'Or, a man suddenly died. Three other deaths occurred in a neighboring house. A woman also died precipitately near the Hôtel de Ville, as

did two other persons, one in the Grand Rue and the other in the Augustins district. It was widely believed that the plague had returned. As in 1720, the abbey of Saint-Victor, the citadel of Saint-Nicolas and Fort Saint-Jean were immediately isolated. The galleys withdrew from the port and shut themselves up in the arsenal. Schools, churches, convents and shops closed their doors. On 11 May, Alderman Moustiers called a meeting of the City Council, explaining that the sudden deaths of the last few days could lead to fears of a return of the contagion, from which Marseille had believed itself free.

The chain of events of 1720 was repeated: the street of the Gold Cross, now isolated, became part of the history of the plague, as had the street of Echelle, two years earlier (1). On 9 May 1722, Marquis De Brancas, military commander of Provence, wrote to Marquis De Pilles in Marseille: *"No one must be allowed to leave Marseille and its territory. I have ordered all the villages to forbid them to go to Marseille"*. The Hospital of Charity and the Convent of the Observance were once again requisitioned. In the gardens of the Observance convent, a large grave was hastily dug to bury the victims.

But finally, the outbreak never came! At most, there were twenty to thirty victims per week. From the beginning of July onwards, cases became rare. The archivist Marc Capus summarizes the epidemic relapse as follows: *"The renewal of the contagious disease did not make any progress in the town, even though it lasted from the month of May 1722 to the 16th of the following month of August... "*

### The demographic toll

All in all, the epidemic that hit Marseille in early summer of 1720 lasted 31 months, affected 240 communities and led to the death of almost 120,000 out of the 400,000 inhabitants of the towns and villages before the contagion. The demographic impact varied greatly from one community to another: 35.6% of the communities affected lost 'less than' 10% of their inhabitants; 32.2% lost between 10 and 29%; 19.5% lost between 30 and 49%; 12.7% of these communities lost more than 50% of their inhabitants (up to almost 70% in La Valette, Le Revest or Néoules). Some communities, despite being located in the heart of the infected regions, were scarcely touched.

For most of the communes, precise information on the victims (name, age...) is lacking; due to the chaotic state of affairs, the registration of the dead could not be altogether accurate. On several occasions, the intendant of Provence asked the aldermen of Marseille to keep lists of the victims. But this was only partially realizable, depending on the neighborhoods and the survival of those in charge. On this point, the work of today's historian is complicated by the fact that most of the municipal archives from this period disappeared following a fire in 1941. We are therefore obliged to retain the estimates made by contemporaries. Giraud reports: *"On 18 August 1721, a general printed list was given of the people who died of the contagious disease in the city and in the area of Marseille. The total came to 39,115"*, he then specifies that this figure, calculated by the aldermen, omitted not only foreigners, but also those who died in the garrisons, in the galley arsenal and in the children's hospitals. Jean-Baptiste Bertrand's sum total came to 50,000 (5).

Due to the lack of detailed archives in Marseille, it is difficult to accurately measure plague mortality. Regarding other communities however, documents dating back to before the plague inform us on the composition of the population, and recording of deaths during the epidemic fills us in on the identity of many of the victims.

### Mortality according to age

This is notably the case for Martigues, which conserved in its municipal collection the census taken in January 1702 (17). This enumeration is an exceptional document due to the detailed information it contains. Street by street, house by house, flat by flat, for each family it mentions the name, age and profession of the head of the family, the name and age of his wife, the number of children and their first names and ages, as well as their possible professional activities. At times the names and ages of relatives (siblings, father or mother of one of the spouses) or servants living in the same household are likewise mentioned. It is easy to understand the interest of such a document for research on the impact of past demographic crises, particularly the 1720-1722 plague. Moreover, the 1716 census provided relevant data, not only on Martigues, but also for all the communities under the authority of the Intendant of Provence. On the basis of this census and daily registration of births and deaths, the population of Martigues on 31 January 1702 could be estimated at 5666. In Martigues the plague started in early November 1720 and ended in June 1721. All in all, 2150 people perished (De Villeneuve, 1826) and we have found the death certificates of 2114 persons in the parish registers. All told, 1101 of the victims were female, 950 were male, and for 63, gender remains unknown. Age at death is specified for only 1853 people. Based on this data, comparison of the pre- and post-epidemic populations shows, in addition to the quantitative consequences of the disaster, a specific distribution of victims by age group (Figure 1). In fact, plague mortality presents a profile similar to that of the pre-plague population. In other words, the plague did not select its victims according to age, and the demographic sample of plague victims is a true snapshot of the previous population.

Figure 1

The distribution of plague deaths by age shows a similar pattern in other communities other than Martigues that we were able to study: Aubagne, Salon de Provence<sup>2</sup> (19,20). Distributions in decadal age groups show strong similarity with the results of studies on other communes: Mende, Cucuron and Néoules<sup>3</sup> (Figure 2, (22)).

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<sup>2</sup> Between August 1720 and October 1721, 2114 of Aubagne's 3980 inhabitants died of the plague (18). The list of plague victims mentions the identity of 1798 victims: 956 were women, 836 were men, and the gender of the 6 others is unknown. The age at death is given for only 1758 people.

Prior to the epidemic, Salon-de-Provence had 4185 inhabitants; between early November 1720 and 26 October 1721, the plague killed 912 (10). In the archives on the period under consideration, we were able to examine 960 burial certificates; 526 of the deceased were female, 433 were male and the gender of one is unknown. Age at death is specified for 914 persons.

<sup>3</sup> Prior to the epidemic, Mende had 4083 inhabitants, from 4 September 1721 to 30 June 1722, the plague killed 1093 (21). The archives show 1031 burial certificates; 514 of the deceased were female, 485 were male, and the gender of the 32 others remains unknown. Age at death is specified for only 426 people, in 184 cases, information on family status (wife, husband, widow, widower, etc.) provably pertains to an adult, and on 87 certificates, there is evidence that it a child died. In 335 of these records, the victim's age remains unknown.

Prior to the epidemic, 2700 people lived in Cucuron. Between the 1<sup>st</sup> of June and the 23<sup>rd</sup> of September 1721, 832 inhabitants succumbed to the plague (10). In the registers, only 796 death certificates are present for this period: 430 concern females, 362 pertain to, and the gender of four is not specified. Age at death is indicated for 749 people.

Between 17 July and 25 November 1721, 313 of the 450 inhabitants of Néoules succumbed to the plague (10). In view of the available figures, it bears mentioning that Néoules was the community most affected by the 1720-1722 epidemic, with a mortality rate of 69.55%. The list of plague victims mentions the names of the 313 victims, and gender and age are indicated for each.

Figure 2

### Plague mortality by gender

Concerning plague mortality by gender, we were able to study the same communities (Figure 3). Our work shows that in the adult population (20 years and older) of plague victims in Aubagne, Salon-de-Provence and Martigues, women were slightly but systematically more represented than men (17).

Recent work on the communities of Mende, Cucuron and Néoules supports this observation (22).

Figure 3

However, this observation should be put into perspective, as it does not reflect a biological selection for *Yersinia pestis*, or even a general trend. Why not?

- 1) In several Provençal communities, the same slight sex ratio imbalance is found when analyzing adults having died in non-plague contexts. In La Ciotat between 1690 and 1750, 52.19% of the deceased at least 20 years old were women and 47.81% were men<sup>4</sup>, in Martigues (1700-1750: 55.93% women vs. 44.07% men; and in Cucuron (1700-1719: 52.93% women vs. 47.07% men). A similar trend was reported in the census of Martigues, carried out in 1702: 51.21% women and 48.78% men aged at least 20 years (17).
- 2) That said, some studies have shown a slight excess of male mortality during the plague. For the 1720-1722 epidemic, this was the case in Saint-Rémy-de-Provence: 50.71% men vs. 49.29% women (10). A similar trend was observed for the parish of St. Botolph in London (23).

However, if we agree that the mortality caused by *Yersinia pestis* reflects the composition of the population prior to the epidemic, our assumption that the age distribution of victims is a true snapshot of the living population is also valid for gender distribution. It can consequently be assumed that women were more affected by the plague insofar as they were more numerous in the pre-epidemic population.

### Plague mortality by social group

From these different studies, it seems that the plague was peculiarly egalitarian in the choice of its victims according to gender and age, and this is a major difference compared to other epidemics, notably smallpox. But what about the influence of social background? Were the rich and the poor affected similarly? To answer this question, we needed sufficiently details. Here again, information from the 1702 census and the lists of victims from the three parishes of Martigues enabled us to proceed.

We demonstrated the existence of a density-mortality relationship (Figure 4). While average citywide epidemic mortality was 32%, the proportions markedly varied according to neighborhood and population density prior to the epidemic. The Ferrières district, which had a pre-epidemic density of 300h/km<sup>2</sup>, suffered a demographic drain of about 20%. The Jonquières district, of which the density was twice as high, lost 36% of its inhabitants. Finally, the Ile district, where the density was the highest (700h/km<sup>2</sup>), saw 42% of its inhabitants

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<sup>4</sup> The commune of La Ciotat was not affected by the 1720-1722 plague epidemic.

disappear, and was therefore the most affected district. Several factors seem to explain this high demographic drain:

- a higher population density and a lower socio-economic level among the inhabitants, creating a more favorable terrain for transmission of an epidemic disease,
- geographical encirclement, as this sector is wedged between the pond of Berre and the Martigues canal,
- epidemic encirclement, as this district was located between the two epidemic foci, the parishes of Ferrières and Jonquières.

Figure 4

It is difficult to measure the demographic catch-up after the epidemic. It should be remembered that the working population of Marseille, which lost half its inhabitants during the plague of 1720 and 1722, was particularly hard-hit. The demographers and economists specialized in the 18<sup>th</sup> century all agree that the city's rapid demographic catch-up was largely due to the arrival of migrants, whose presence can be seen in the marriage records. While the number of marriages increased in Aix-en-Provence<sup>5</sup>, Aubagne<sup>6</sup> and Martigues<sup>7</sup>, in Marseille it soared. In the ten years preceding the plague, the monthly number of marriages was 61 (58 per month during the 10 years after the epidemic), 240 marriages per month were celebrated between November 1720 and July 1721, with a record reached in February 1721 with 327 marriages.

### **Medical management and scientific debate**

#### **The Marseille medical corps and the Montpellier mission**

At the beginning of the 18<sup>th</sup> century, several large towns in France did not have a medical faculty. The two most renowned faculties were those of Paris and Montpellier. In the towns without a faculty, doctors were organized in colleges whose legitimacy was recognized by the municipal authorities. In 1720, the medical college in Marseille consisted of 12 doctors<sup>8</sup>. From the outset of summer 1720, even before the decision of the Parliament of Aix placing Marseille under a ban, the provincial and royal authorities were aware of the dire health situation in Marseille. Following advice by his first physician, Pierre Chirac, the Regent of the kingdom sent a medical mission to determine the exact nature of the disease in Marseille. Having been a professor at the faculty of Montpellier, Chirac appointed doctors and surgeons from this faculty to carry out the mission<sup>9</sup>.

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<sup>5</sup> In Aix-en-Provence, there were more than 400 marriages per year in 1721 and 1722 (compared to an average of 220 marriages per year in the preceding decade and 190 in the following).

<sup>6</sup> In Aubagne, 139 marriages were celebrated in 1721 (compared to an average of 42 marriages per year in the preceding decade and 44 in the following decade).

<sup>7</sup> In Martigues, there were 276 marriages in 1721 (compared to an average of 110 marriages per year in the preceding decade and 91 in the following).

<sup>8</sup> Jean Audon, Jean Augier, Jean-Baptiste Bertrand, Claude Coulomb, Michel (whose first name is not known to us), Antoine Montagnier, Etienne Pelissery, Charles Peyssonnel (Dean of the college), François Raymond, Jacques Robert, Jérôme Sicard (father) and Jean (son). In medical management of the epidemic, we can add Charles Peyssonnel's son, Jean-André, who would replace his father (aged 80) even though he was not a member of the college.

<sup>9</sup> On 5 August, the Regent ordered François Chicoyneau (doctor, professor, chancellor of the University of Montpellier and son-in-law of Pierre Chirac), Jean Verny (doctor) and Jean Soulier (surgeon) to go to Marseille.

Chicoyneau, Verny and Soulier arrived in Marseille on 12 August. They visited the sick and performed autopsies. On 20 August, their mission being accomplished, they retired to Aix-en-Provence for a quarantine. Before leaving, the three practitioners reported on the disease in Marseille. We will discuss the report later.

A few weeks after, while Chicoyneau, Verny and Soulier were still in Aix-en-Provence, the Regent ordered them to return to Marseille to treat the plague victims. In this mission, they were helped by three other specialists from the University of Montpellier: A. Deidier, N. Fournier and J. Faybesse.

As the months went by, other doctors and surgeons came to Marseille to treat the plague victims, often after having haggled over their remuneration. This occurred in most of the communes affected by the plague, including the small villages.

### A scientific debate in the midst of an epidemic

As the epidemic ravaged Marseille and Lower Provence, a debate was emerging in the medical community; it focused on two questions:

- Was it the plague or some other disease?
- Was the plague contagious or not?

In 1720, these medical quarrels were nothing new; they had been resurfacing regularly since the 14<sup>th</sup> century. For example, in Aix-en-Provence in the early 17<sup>th</sup> century: "*The plague appeared in Aix on the 28<sup>th</sup> of July 1629, and made, in the beginning, ravages all the more rapid, as the Doctors disputed for a long time on the causes and the nature of the evil, some claimed that it was contagious; the others denied it; and while waiting for a sad experiment to enlighten these serious Doctors, death struck, without distinction, at their sides, citizens of all ages, of all sexes and of all states*" (24).

From the beginning of the epidemic, Pierre Chirac, the medical authority of the time, denied not only the diagnosis of plague, but also the contagiousness of the disease. For him, the poorest inhabitants were afflicted by a malignant fever, which was the result of bad food; sailors and porters were held to be particularly susceptible. And so, to stop the people from eating badly, Chirac proposed "*regulations for service of the sick to be addressed to magistrates, confessors, doctors and surgeons. He wishes that the sick be left in their houses and that kitchens be set up in each district, where the broth will be prepared, and where those who are near the sick will fetch it*" (5).

For Chirac, the disease did not come from the east, and did not develop in the *Grand Saint-Antoine*. According to him, the aldermen's (mis)management had caused fear and dread among the inhabitants. At that time, for many doctors, fear was the main cause of the spread of the disease. In order to combat fear, which was viewed as a favorable breeding ground for disease and death, Chirac suggested that "*violins and drums be paid for and played in the various districts of the town, to give young people the opportunity to cheer up and to ward off sadness and melancholy*" (5).

That was the position of the highest French medical authority on the disease in Marseille, but was it shared by a Parisian authority, admittedly far from the field? What were the actual thoughts of the three Montpellier practitioners sent to give their opinion on the nature of the disease ravaging Marseille? Before leaving for Aix-en-Provence and after having examined the patients, Chicoyneau, Verny and Soulier submitted their conclusions (a) by mail to the Court and the Intendant of Provence, and (b) during a closed meeting with

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In September 1720, this trio was reinforced with the arrival of Antoine Deidier (doctor and professor at the University of Montpellier), Nicolas Fournier (medical student) and Jean Faybesse (surgical student).

Marquis De Pilles (governor of Marseille) and the four city aldermen. Having attended, here is what Pichatty de Croissainte (the King's prosecutor) reported: "*The Doctors of Montpellier came to the Town Hall to tell them what they recognized about the nature and quality of the disease, and to declare to them in a few words that it was truly the plague. But seeing that almost everyone was already out of the City and that terror and fear [generated] awful disorder, they found it good not to increase it, that dissimulation be practiced and that, to try to appease and reassure, a Notice to the public be posted stating that they had found that these were only contagious fevers caused by bad food, which would soon cease by the help we were going to get from all sides, which would bring back the abundance of all things*", (8). And so, on 21 August, the aldermen posted a notice telling the public that, according to the report by the doctors sent by the Regent, the disease in Marseille was not pestilential, but only a contagious malignant fever. Denial of the plague diagnosis displeased the city's physicians, who complained that the aldermen were disdainful of them and that the true nature of the disease was being concealed (25).

It seems that the position taken by Chicoyneau and his colleagues was the result of a certain complacency towards the city's aldermen. In a letter sent by Chicoyneau to Versailles, and partially published by Bertrand, little doubt was left as to the real feelings of the Montpellier professor about the disease, which he described as a "*veritable pestilential fever*", emphasizing the rapidity with which patients died and the fact that "*when a person was attacked by this disease in a house, [everyone else was] soon infected, so that there were several examples of families entirely destroyed by this contagion...*". He went on to point out that this disease is invariably characterized by the same symptoms (buboes) and that it originated in the arrival of a vessel, containing contaminated goods (5).

Obviously, it was difficult for the members of the Montpellier mission to express disagreement with the opinions expressed by Chirac, and they did not hide the fact: "*In carrying out this project, we have tried to conform to the ideas and models that the illustrious Mr. Chirac, the first physician of His Royal Highness, has kindly communicated to us, convinced as we are that it is not permissible to go astray when led by such an enlightened guide. It is to be wished that we could have followed exactly the route he has indicated to us...*" (26).

These considerations were related to the hierarchical weight of the Regent's first physician with regard to the entire medical corps of the kingdom. They were also associated with personal relations, Chirac being the father-in-law of Chicoyneau.

As the words of the chancellor Henri d'Aguesseau attest<sup>10</sup>, the highest political authorities in the kingdom did not wish for the disease in Marseille to be clearly viewed as the plague: "*The public good requires that the people be persuaded that the plague is not contagious, and that the ministry behave as if it were persuaded of the contrary*" (27).

The question of the contagiousness or non-contagiousness of the plague remained, and was the focus of the debate among members of the medical profession.

Clearly, Chicoyneau and the other members of the Montpellier team very quickly came out in favor of the non-contagiousness of the plague, as his letter to the Dean of the College of Physicians of Lyon shows: "*... to establish that the plague is not contagious, I thought I had to tell you in a few words some other facts and reflections that have determined us to prefer and adopt a finding of non-contagion...*" (28).

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<sup>10</sup> Henri François d'Aguesseau Chancellor of France from 1717 to 1722, and then from 1727 to 1750.

Three major arguments were put forward by Chicoyneau to demonstrate the non-contagiousness of the plague (25).

- 1) Notwithstanding the establishment of sanitary cordons around cities (Aix, Toulon, Salon...), the plague developed in the same way as in the communes where no measures were taken. In Marseille, it was when the terror, the flight and the confinement of the inhabitants were at their peak that the disease made the greatest inroads (28).
- 2) It was when the sick were legion that the disease was attenuated: "*... when this City was to be entirely emptied, since more than forty thousand people had already died, we saw the disease diminish appreciably from day to day, although the inhabitants (tired of remaining closed in, or having regained courage) assembled and walked in the streets and public squares, and there must have been infinite seeds of contagion throughout*" (28).
- 3) Contact with plague victims (children suckling the breast of their nurses, people caring for the sick, doctors and surgeons performing autopsies) did not cause the disease to appear: "*Now, if the Plague is Contagious, would it be possible for all these people to have escaped, and for us ourselves to have been able to escape the poisoned draughts of the Contagion...*" (28).

On the other hand, doctors from the *Collège des agrégés* in Marseille opposed this non-contagionist view. However, it should not be imagined that this medical quarrel was simply an opposition between two geographical camps: Paris and Montpellier versus Marseille.

Doctors from Montpellier, or who had studied in Montpellier, had a contagionist approach to the disease. For example, Jean Astruc (professor of medicine in Montpellier), thought that the plague was so contagious that it was impossible to escape it other than by fleeing. Similarly, Nicolas Fournier defended the idea of contagion: "*The plague is entirely foreign to us, and afflicts our regions only when it penetrates them by way of contagion, that is to say, by the communication of persons or goods infected with the pestilential leaven*" (29).

Conversely, some Marseille doctors persisted in denying the diagnosis of plague: Dr Michel maintained that the patients he sent to the infirmaries had no other illness than the boredom of being locked up for some, and the pox for others.

This scientific debate took on nationwide proportions through numerous publications. Doctor Peyssonnel (30) sided with his colleague Bertrand and refuted the anti-contagionist theories of a doctor from Toulon, Doctor Boyer (31). Doctor Fabre, from Martigues, maintained that "*the best preservative is to live soberly and to eat only food of good juice*" (32).

The work of Goiffon from Lyon epitomizes the scientific effervescence and perhaps the stages of knowledge being reached: "*The insects of the Plague, on the contrary, only live in wool, cottons, stuffed animals, furniture, clothes, merchandise and other effects of this nature, it is there that they feed, that they maintain themselves, that they subsist and multiply by numerous generations (...), insinuating themselves into the body of Men, without spreading in the air, by means of which, as in an immense vehicle, they can be carried at the same time in the body of several persons in the places where they will have spread, and it is for this reason that the Plague is an epidemic disease*" (33).

The idea that the plague could be carried by insects is quite remarkable for the epoch. Nevertheless, it must be admitted that in most cases, the reasoning of the contagionists was based on simple common sense and the observation of obvious things such as the

contamination of several people in the same family, on the same street. At the beginning of the 18<sup>th</sup> century, experts were still far from considering the role of ectoparasites in the transmission of the plague: *"A girl who had been at the convalescent home for 50 days had a fever, doctor Bertrand was called, he visited her and finding small red spots on her body, he declared her to be suffering from the plague, and gave her a ticket to go to the hospital of the Charité. The rectors of the convalescents, informed that this girl had not had any contact with anyone, did not want to send her there, and there was a great deal of dispute between them and the doctor, and finally it was agreed that she would be confined until the next day, when the disease would manifest itself further. The next day, the doctor visited her in the presence of the rectors, and found the girl without fever (...) but crying on her bed, dying of hunger. Everyone laughed, the doctor left in confusion and soon became the talk of the town. It was mockingly added that these spots were flea bites which the doctor took for the plague"* (34).

### The work of Antoine Deidier

Among the medical corps (physicians, surgeons) present during the epidemic of 1720-1722, one person stands out both for the relevance of his hypothetical-deductive reasoning and for his ability to acknowledge his errors of judgement.

As mentioned earlier, Antoine Deidier was part of the medical mission led by Chicoyneau and his attitude, prior to his arrival, was negatively perceived by the doctors in Marseille.

While in Marseille, A. Deidier treated the sick and performed many autopsies. As the months went by, he distanced himself from the other members of the Montpellier mission, questioning the influence of food quality in the origin of the disease, and rejecting the notion of fear as a factor in disease transmission: *"Has it ever happened that people have had pleurisy by dint of fearing it? Does the terror of the plague alone have the disastrous privilege of causing it?"* (35). Quite clearly, he was actively involved in the debate on the contagiousness of the plague, and in a very different sense from that of his colleagues in Montpellier: *"... the plague is a disease that is usually fatal, popular, very acute, and I would add very contagious..."* (36).

Finally, Deidier disassociated himself from the Montpellier team to the extent that he no longer signed medical reports with them, and that in his scientific papers, he did not hesitate to criticize the political decisions, medical advice and procrastination occurring during the first weeks of the epidemic. To prove the reality of the contagion, he insisted on the consequences of the 20 August notice to the public: *"... the people learning by this notice that the disease was only a malignant fever, were so encouraged, that leaving all fear and precaution behind, frequenting and communicating with each other; these poor people... were sacrificed to their simple credulity, and saw themselves as victims (...)"* (36). He did not fail to point out certain inconsistencies: *"Since we are finally told by this same Notice that malignant fever is contagious, why should those who have given it this characterization, which can be contested, refuse it to the plague?"* (36).

Between February and May 1721, Deidier carried out experiments. His observations and his use of hypothetical-deductive reasoning made him a true precursor in the field of contagious disease transmission. While dissecting corpses, Deidier observed "black bile turning green". For him, this was the venom of the plague, and it was based on this hypothesis that he conducted his experiments: *"I immediately seized a vigorous and gay dog who would caress anyone who entered the Infirmary, and who devoured very avidly the buboes and plumaceaux that were thrown on the ground in the bandages; I opened his crural vein, where*

*I injected about a dram of this bile diluted with fountain water; and all of a sudden there was my dog, who had gone from being gay to being sad; from being voracious to being completely disgusted; from being stubbornly awake, and soon afterwards suffering from a bubo and two coals which took him away in four days. I repeated similar experiments several times in the space of four months, and always with the same event" (35).*

In addition to inoculating a dog with a disease from a human corpse, Deidier experimented with the transmission of the disease between two animals, from a sick dog to a healthy one: *"To expose my feeling on the contagion of the plague, I begin by stating that one cannot affirm that this disease cannot be communicated, since I have found the way to transplant it from one subject to another, not only from a human corpse to a dog, but from one dog to another dog..." (37).*

There was only one more step to take, that of human experimentation, which was envisaged by Deidier, as his writings attest on at least two occasions: *"From which I conclude that if the plague communicates itself in this way from one heterogeneous flesh to another, it would be done even more quickly with homogeneous flesh, by making the same injection into the vein of a criminal condemned to death, with his consent, and on the authority of the Judges, with the promise of releasing him if he escaped", "... if it were permitted to try these experiments on men condemned to death, the plague would be transmitted from man to man..." (37).*

This project, of human experimentation on the living, was not carried out!

Though Antoine Deidier was far ahead of and opposed to the official medical theories of the early 18<sup>th</sup> century, he was ennobled, decorated Knight of the Order of Saint-Michel, and received, like Chicoyneau, Verny and Soulier, a gratuity of 5400 pounds. However, he was soon marginalized and in 1732, on the death of Chirac, Chicoyneau became Louis XV's first physician. Taking advantage of his political and scientific position, he negatively remembered his "colleague" and had Deidier transferred. Previously a professor at the Faculty of Medicine in Montpellier, he became a simple doctor at the Arsenal of the galleys in Marseille.

### **The study of plague burial sites**

In general, and the mass graves of plague victims are no exception, the study of burial sites gives us information about the dead and about death. They provide precise information on the victims of the plague (age, sex, health status, etc.) and also on the manner in which these bodies were buried, on the gestures that accompanied the corpse, i.e. on the way in which their contemporaries perceived and dealt with this form of death.

Since the 1990s, several archaeological excavations have uncovered mass graves where victims of past plague epidemics were buried (38). Some of these sites are contemporary with the Justinian plague, others with the Black Death, and several concern the epidemic of 1720-1722, namely the Major and the Observance in Marseille, and Délos and Capucins de Ferrières in Martigues. The presence of the plague bacillus in three of these sites has been confirmed (39,40).

### The mass grave on the esplanade of La Major (Marseille)

In 2008, we excavated a burial pit for plague victims that was located in the parish cemetery of Major Cathedral (41). This grave was dug and used at the beginning of September 1720, i.e. at the time when mortality was highest in Marseille: "The Sr. Bouys will pay on the present note one hundred and seventy-one pounds for the days of the peasants who

worked on the 3<sup>rd</sup> and today to make the graves in the cemetery of the Major, in Marseille this 4<sup>th</sup> September 1720, Estelle<sup>11</sup>..

All in all, 106 skeletons were exhumed: 25 immature persons and 81 adults. Out of the adults, 26 were women, 41 were men and 14 were undetermined. Among the minors, 1 was between 0 and 1 year old, 2 between 1 and 4, 10 between 5 and 9, 2 between 10 and 14 years old, 4 between 15 and 19 for 6 were of undetermined age. The massive and precipitous nature of the body dumps, the widespread use of lime and the obvious failure to strip some of the corpses all point to a phase of epidemic peak, which is in line with the historical archives and the health situation in Marseille in early September 1720. The health emergency context is reflected in the extremely rudimentary burial arrangements, highlighting the need to bury a large number of corpses as quickly as possible. It is also shown by the extreme diversity of postures, orientations and positions of the skeletons resulting from hastily made deposits, with some bodies literally thrown from the edges of the grave, or directly dumped from a tomb. The urgency of the burials is also attested to by the presence of apparel, notably metallic clothing items (shoe and belt buckles made of copper or copper alloy, clothing buttons made of copper, etc.), juxtaposed to residues of organic material (shoe leather) and objects of daily life (coins, votive medals, rings, etc.). Finally, the use of lime in multiple burial is evident.

#### Mass plague graves of 1720-1721 in Martigues

In Martigues, two burial sites, Délos and Capucins, were excavated in 1994 (42) and 2002 (41,43) respectively. Both were contemporary with the plague epidemic that afflicted the town between 1720 and 1721. Both sites reveal a system of parallel trench burials. All in all, 249 skeletons were exhumed (77 children under 15 years of age, 24 adolescents and 146 adults), i.e. more than 11% of the 2150 victims of the epidemic. Once again, the massive and precipitous nature of the body dumps, the widespread use of lime and the obvious failure to strip some of the corpses point to a phase of epidemic peak. However, certain nuances in the deposit of the bodies attest that the corpses came from different places: bodies recovered from the streets or from dwellings well after death, and therefore in an advanced state of decomposition, and buried in successive locations after being transported in tombs (e.g. in Trench I of Capucins); corpses of patients who died in hospital and were immediately disposed of (for example, in Trench III of Capucins); bodies hastily thrown out of the upper edges of the trenches, showing that the gravediggers were overwhelmed by the magnitude of their task (for example, in Trench I of Délos).

#### The pit of the Observance (Marseille)

Uncovered in 1994 (41), the huge pit of the Observance convent (more than 30 meters long and about 10 meters wide) was used during the 1722 epidemic relapse. In the distribution of the 179 exhumed skeletons (35 children under 15 years of age, 16 adolescents and 128 adults), three zones are clearly visible: a high-density eastern zone, with bodies piled up head to foot on several levels and where various locations indicate the unloading of dumpers; a central zone, with low density, with the vast majority of burials individualized; a western zone, with almost no density, with a few individuals spaced out against the southern edge of the pit. This method of filling the pit from east to west could not have been compatible with the funerary practices in use at the height of the epidemic in the summer and autumn of 1720 in Marseille.

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<sup>11</sup> Archives municipales de Marseille, series GGL 371 Burials, 1720-1722.

In fact, the digging and use of the Observance pit are linked to the epidemic relapse of 1722. The disproportion between the container and the contained can be explained by the fear of the city authorities who, seeing the contagion return, anticipated the hecatomb they had experienced just two years earlier, and by the small number of deaths due to the relapse. The dating is confirmed by archival documents<sup>12</sup> and by a series of anthropological observations indicating that the patients were systematically cared for by a hospital structure: death verification gestures (44), autopsies (45), bodies buried naked and in shrouds, absence of personal effects, etc.

### **Comparisons between historical and biological archives**

There exists a great temptation, when possible, to compare data from historical archives and what are known as biological archives, which come from the excavation and study of burial sites. This is rarely possible, as one of the two archival sources is often missing or incomplete. However, in two cases we were able to make a comparison concerning the demographic aspect.

In Martigues, where all the available data is rich and detailed, we were able to compare the age profile of the plague victims whose identities were found in the bills of mortuary with that resulting from the study of the skeletons exhumed from the Délos and Capucins sites (Figure 5). Comparison of the palaeodemographic samples from the burial sites with the demographic data from the bill of mortality shows a similar profile, of which the minor differences can be attributed to differences in the samples and the imperfect precision of the ages estimated on the skeletons.

Figure 5

A similar comparison was possible for the Observance pit despite the disappearance of most of the plague records in the 1941 fire. The list of people admitted to this infirmary in 1722 partially escaped the fire (Figure 6). A comparison of the palaeodemographic sample of the skeletons exhumed from the pit with the demographic data of the list of victims enumerated in this hospital also shows a similar profile, in particular an under-representation of those under 1 year of age. The absence of these young victims undoubtedly reflects the weakness of this age group, which can be explained by the very high mortality in the first epidemic phase of 1720-1722 and the impossibility of reconstituting this population before the relapse of the spring of 1722.

Figure 6

### **Conclusion**

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<sup>12</sup> Municipal Archives of Marseille, series GGL 371 Burials, 1720-1722 : “ *Hospital of the Observance, Sieur Bouys will give thirty Livres to Antoine Soulies for the salary of one month which one advances to him on his employment which he has to take care to bury the dead with the pits of the Observance. Marseille, 24 May 1722 Remuzat*”.

We have presented the history of the plague epidemic that struck Marseille in 1720-1722 and also affected a large number of other communities. In this article, we have tried to show how the data available for this epidemic can be studied from a public health perspective so as to better understand the demographic impacts of such a crisis. We also wished to show how the simultaneous reading of historical archives and biological archives could contribute to better anthropological understanding of epidemic phenomena. Other aspects still need to be developed, for example the role of molecular palaeomicrobiology in the identification and typing of different strains of *Yersinia pestis*.

In other words, molecular biology enables us to better understand the evolutionary phenomena of the plague bacillus (19).

In the current health context, we could also envisage an anthropological study comparing the reactions of our ancestors in 1720 with our own face to the Covid epidemic. Although the pathogens have nothing in common in terms of mortality, many individual and collective reactions seem like invariants (46).

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## Figure captions

Figure 1: Age pyramids of the population of Martigues on 1 November 1720 (in white) and 30 June 1721 (in grey), i.e., before and after the plague epidemic. Male subjects are represented on the left, female individuals on the right.

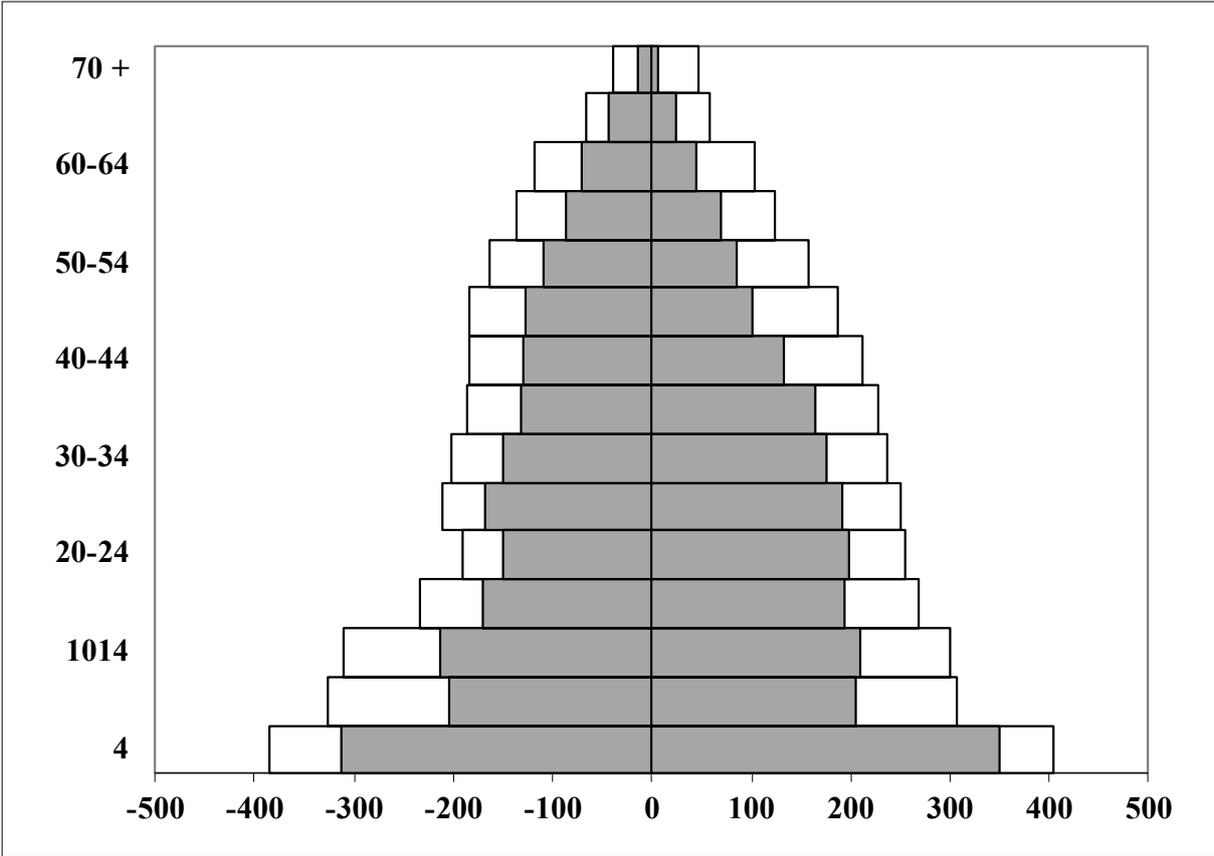
Figure 2: Comparison (in %) by age group of plague victims in Aubagne, Salon-de-Provence, Martigues, Cucuron, Néoules and Mende.

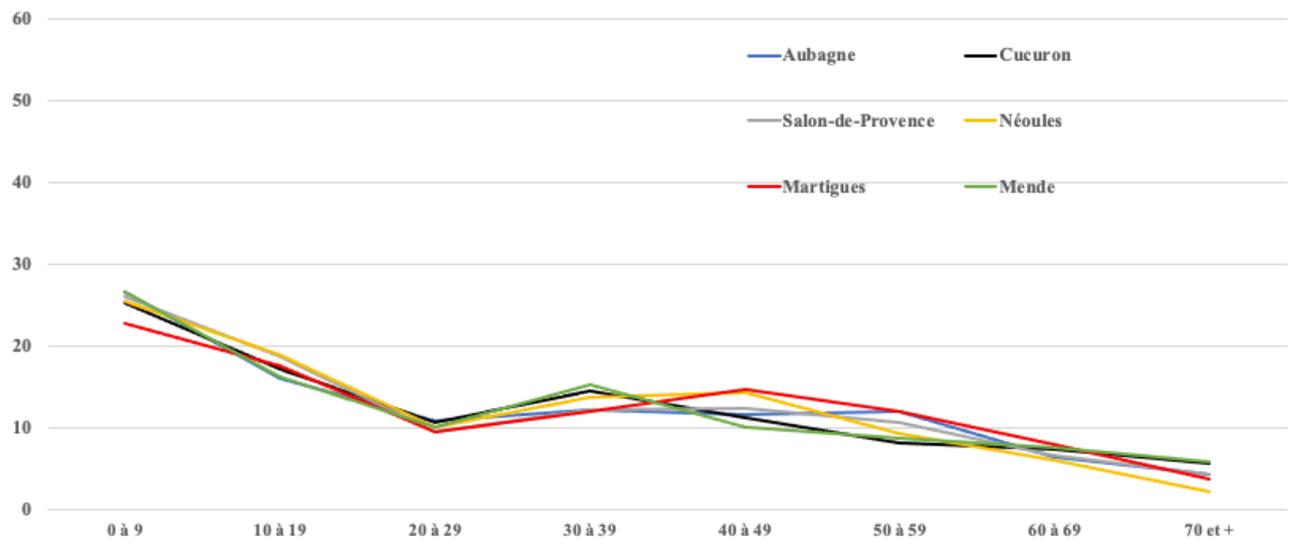
Figure 3: Gender distribution (in %) of adults (aged 20 and over) who died in the plague epidemic of 1720-1722 for the communes of Mende, Cucuron, Néoules, Aubagne, Salon-de-Provence and Martigues.

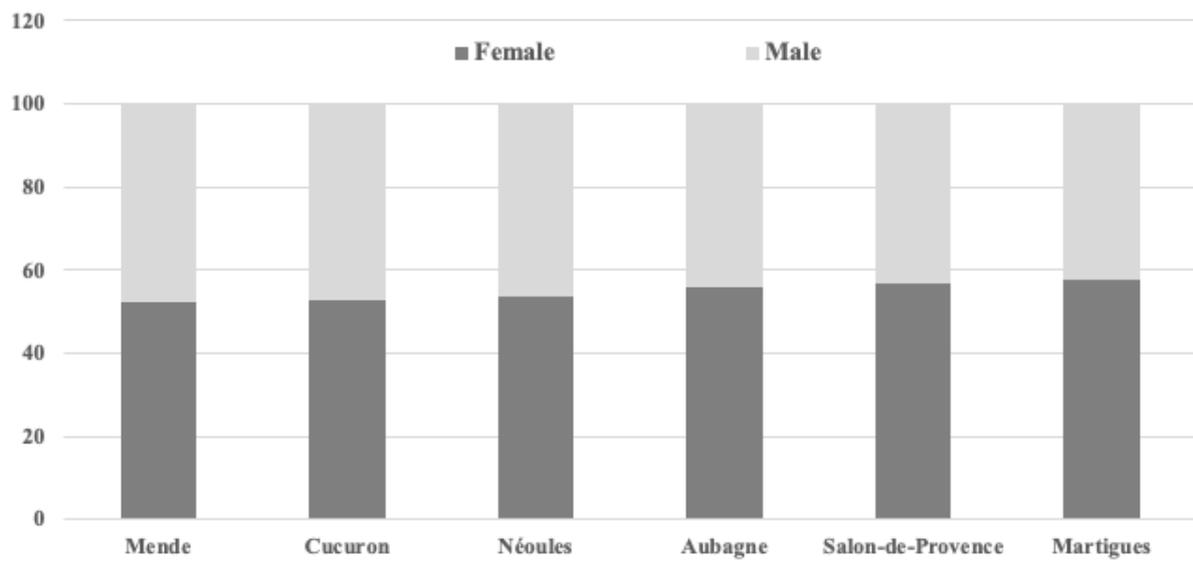
Figure 4: Percentage of victims per plague (epidemic of 1720-1721) for the three intramural parishes of Martigues in relation to the pre-epidemic living population.

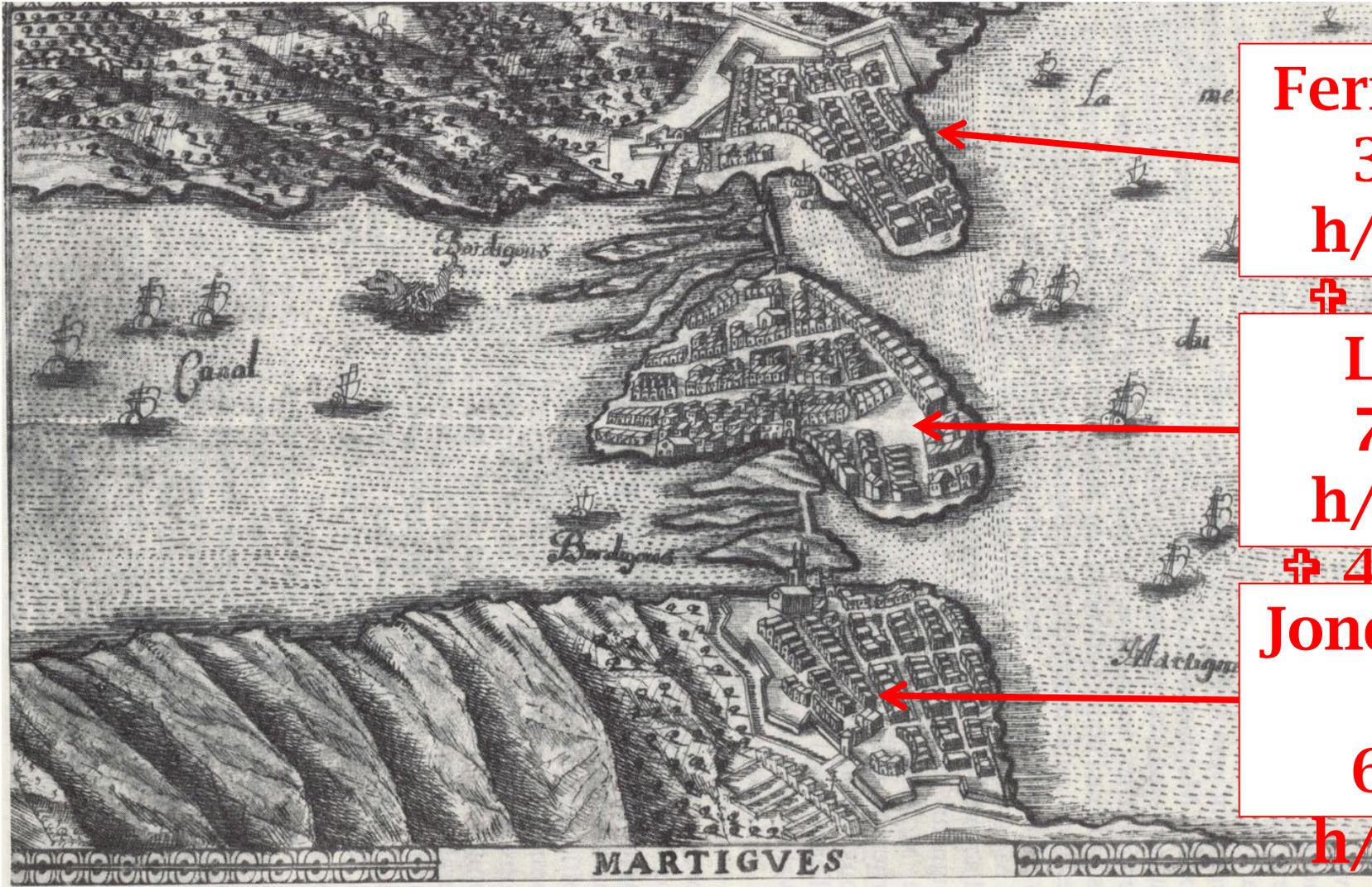
Figure 5: Comparison (in %) of the age distribution of plague victims in Martigues, according to historical and biological records

Figure 6: Comparison (in %) of the age distribution of the victims of the 1722 relapse epidemic in Marseille, between the historical archives and the biological archives.









**Ferrières**  
300  
h/km<sup>2</sup>

⊕ 20 %

**L'Île**  
700  
h/km<sup>2</sup>

⊕ 42,5 %

**Jonquières**  
600  
h/km<sup>2</sup>

⊕ 36,4 %

