

Sex-differential mortality during the 1679 plague epidemic in Granada (Spain)

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RESUMEN

Una mayoría de estudios sobre epidemias de peste coinciden en que no existe mortalidad diferencial por sexo. En este trabajo se busca comprobar si esto sucedió en el brote que afectó en el año 1679 a la ciudad de Granada, una de las más importantes de España en la Edad Moderna. Se han analizado los *Libros de Entierro* manuscritos originales de las parroquias que conservan sus archivos y se han seleccionado 9990 registros de entierro como años control y 2052 del brote de peste. Se han anotado 12 variables de cada registro. La mortalidad de los años control es de tipo atricial y no hay diferencias por sexo en ningún grupo de edad. La mortalidad durante la epidemia es de tipo catastrófico y presenta una proporción significativa en contra del sexo femenino. Los principales factores que pueden justificar esta mortalidad son de carácter socioeconómico, principalmente la pobreza, seguida del carácter patriarcal de la sociedad, el código de honor y ciertos usos y costumbres.

Palabras claves:

Paleoepidemiología
Peste
Mortalidad
Ratio por sexo
Siglo XVII

ABSTRACT

The majority of studies on plague epidemics have found no sex differences in mortality. The objective of this study was to investigate whether the mortality differed between sexes during the 1679 plague epidemic in Granada (Southern Spain), one of the most important cities in Spain in the Modern Age. Data sources were the original burial records of parishes that preserved these documents, selecting 9990 recorded burials in “control” years with no mortality crises and 2052 recorded burials during the plague epidemic. Data were gathered on 12 variables for each death. The mortality showed an attritional pattern during control years, with no difference by sex or age group, but a catastrophic pattern during the epidemic, with a significantly higher mortality among females versus males. Socioeconomic factors appear to explain this sex difference, mainly poverty, the patriarchal nature of contemporary society, codes of honor, and certain habits and customs.

Keywords:

Paleoepidemiology
Plague
Mortality
Sex ratio
XVII century

Introduction

There has been an increase in research on differential mortality during bubonic plague epidemics. Most authors have focused on whether the plague was a universal killer or selective in relation to health status, sex, or age (Bramanti et al. 2018). Investigations have been based on skeletal evidence or on municipal, parish, and/or hospital burial or death records. Skeletal remains have derived from common graves or special cemeteries (Bello et al. 2007; DeWitte 2009, 2010a and b, 2014; Godde et al., 2020; Rigeade, 2007; Signoli, 2006; Scott & Duncan, 2001, among others), and their study shares the typical limitations of paleodemography in regard to the representativeness and completeness of available samples and variations in their preservation status, among other potential sources of bias (Jackes, 2011; Waldron, 2001; Waldron, 2007). These problems are not usually faced by authors investigating written records, although these are not always totally trustworthy, and the preservation status of documents can also be a source of bias. In addition, the reliability of the data depends upon the capacity and diligence of the recordkeeper (Beauvalet-Boutouyrie, 2007; Curtis & Roosen, 2017; Pérez Moreda, 1980; Signoli, 2006). Contemporary reports are also unreliable, given the tendency of authors to exaggerate the number of deaths in epidemics and to depict them in a rather Dantesque manner (Gottfried, 1989).

The results of both skeletal and documental studies generally show that plague mortality was influenced by the age and previous health status of victims but was less affected by their sex (Bramanti et al. 2018; DeWitte, 2009, 2010a and b, 2014; Godde et al. 2020; Ziegler, 2013). Researchers who detected a higher mortality rate among females mainly attributed this finding to cultural and socioeconomic factors (Bardsley, 2014; Curtis & Roosen, 2017; Pérez Moreda, 1987; Signoli et al. 2002).

Spain, in common with other Mediterranean countries, suffered from various plague epidemics from the middle of the VI century to the end of the XVII century (Betrán Moya, 2006; Fuentes Hinojo, 1992; Pérez Moreda, 1980; Villalba, 1803). The XVII century

is the best period for their study because of the larger number of documents available and the order by Pope Pablo V in 1614 for the mandatory registration of all burials by parishes (Beauvalet-Boutouyrie, 2007; Lara Ródenas, 1999). Spain experienced three plague epidemics during the XVII century, which were all imported and affected different regions with variable intensity. The first, in 1596-1602, entered Spain through a Cantabrian port in a boat from Flanders; the second, in 1647-1650, was imported from Algeria; and the third, in 1675-1683, appears to have originated in Izmir and Oran (Pérez Moreda, 1980; Scott & Duncan, 2001; Betrán Moya, 2006).

Granada was one of the foremost cities in Spain throughout the XVI and XVII centuries for its economic activity and its important position in government and justice administration (Barrios & Peinado 2000; Sánchez-Montes 2008). Granada suffered from all three epidemic epidemics that affected the Iberian Peninsula during the XVII century, and historical and documental sources (Anonymous 1679) describe the outbreak in 1679 as the worst (Jiménez-Brobeil et al. 2007). Granada could be divided into three main districts: the Albaycín, the Center, and the Expansion area (Sánchez-Montes, 1989). The Albaycín, the oldest part of the city, was in a state of progressive deterioration and contained the poorest and least populated parishes (Henríquez de Jorquera, 1934). The Center, which started to lose population in the second half of the XVII century, was inhabited by nobles, merchants, and foreign immigrants (largely French) but also attracted beggars (Henríquez de Jorquera, 1934; Sánchez-Montes 1989). The so-called “Expansion” area comprised new constructions on the flat plains outside the city walls, characterized by modern housing with urban streets laid out like a checkerboard but also containing some farms in a countryside setting; the parishes in this area were the most heavily populated of the city and had the highest levels of economic inequality (Henríquez de Jorquera, 1934; Sánchez-Montes 1989).

Granada offers an excellent opportunity for studying possible differential mortality during a plague epidemic because almost all of the parish burial records have been preserved, with only 15% having been lost

at different times. In addition, an abundance of contemporary reports remains available. With this background, the objectives of this study were to compare the mortality of the 1679 plague between the sexes.

Material and methods

Data were gathered from the original burial records preserved in the archives of each parish under study, after obtaining the approval of the Archbishopric of Granada for this purpose. The records were generally in a good state of preservation and were more or less easy to read, depending on the quality of the paper, the types of pen and ink used, and the handwriting of the recordkeeper. Data were collected from each record on 12 variables: date, presence of title (Don/Doña or none), name, sex, age, marital status, economic status (poverty or number of ordered masses), presence/absence of a will, social characteristics (e.g., child, foreigner, slave, priest, etc.), cause of death (only exceptionally recorded) [Alter & Carmichael 1999]), name of father (only for children) and “other” (particular or unusual notations). The age at death is not usually recorded, although some parishes give the age of children. It was therefore necessary to establish three “social age” categories according to the presence/absence of surname, inclusion of father’s name, size and cost of tomb, marital status, and capacity to make a will, among other indicators. These categories were: *child*, up to the age of 8 years, because older children were buried as “*cuerpos mayores*” (elderly bodies); *young person*, ranging from 9 years to the age of majority, although this is poorly defined and can range from 15 years up to even 25 years if the person remained living in the parental home; and *adults*. The sex of a young person or adult can be determined from their given name, whereas a baptismal name was not recorded for many of the youngest children, only described as “*criaturas*” (little ones).

A series of “control” years were selected for the present study representing periods that were free of mortality crises in each quarter of the century (Jiménez-Brobeil & Al Oumaoui, 2002; Jiménez-Brobeil et al. 2003). The burial records of 9990 individuals were gathered from control years in 15 parishes.

Next, burial records were collected between June 1 1679, when one parish noted “the plague started here”, and August 10, given the description in contemporary chronicles of a reduction in the mortality from August 5, when an image of the *Christ of San Agustín* was paraded in the city (López Muñoz et al, 1994). The burial records of 2052 individuals from this period were collected in 15 parishes. It should be taken into account that parish burial records only contain individuals who the parish had buried or dedicated a requiem mass; therefore, the records do not include plague victims dying in the main city hospital (*Hospital Real*) and buried in a nearby common grave (Jiménez Brobeil et al. 2007; López Muñoz et al. 1994). Furthermore, although “died of contagion” or “died of the plague” is noted in some cases, the cause of death is not usually reported, making it impossible to establish the precise number of deaths due to the plague and distinguish them from deaths due to another cause. For this reason, it is usual to describe the mortality during a plague epidemic rather than the mortality for which it is responsible.

The sex and age distributions of mortality data from control years and from the epidemic period were compared to those of data from the census of Granada conducted by the Count of Aranda in 1768-1769 (Sanz Sampelayo, 1980). Although almost a century later, this census was the first to count individuals rather than the heads of tax-paying families and to classify the population by sex and age. In addition, the census results showed that Granada had 56,000 inhabitants, not very different from the population of 50,000 estimated by Sánchez-Montes (1989) from various censuses of heads of family. Nevertheless, due caution should be taken in comparing data from parish archives in the XVII century with those from the census of 1768-69.

Recorded deaths were distributed by sex and age and expressed as absolute values or percentages. Male:female ratios were compared using the chi-square and likelihood-ratio tests. The odds ratio was used to determine the risk of death by sex and by time period (epidemic v. control years), given the retrospective study design (Cerdá et al., 2013). Microsoft Excel and IBM SPSS version 22 were used for statistical analyses.

Results and Discussion

Structure of mortality during control years

Table 1 displays the age and sex distribution of deaths in the control years. There were 3397 children (41.0% of deaths), 790 young people (6.4%), and 5803 adults (52.5%), corresponding to the attritional mortality expected in a population of the ancient demographic regime, with children representing at least 40% of all deaths (Buchet, 1983). The more usual proportion of 50% child deaths described in pre-industrial societies (Livi-Bacci, 1988, 1999) and in the contemporary report by Buffon (1769) was not reached during these years, likely because of the absence of mortality crises, which predominantly affected children in the XVII century (Jiménez-Brobeil et al. 2014). With regard to sex distribution, the burial records revealed a slightly higher percentage of males among children and young people and a slightly higher percentage of females among adults. This is an expected result, given the birth of more males than females and the greater risks of death faced by boys than girls during childhood and adolescence (Livi-Bacci, 1988). Among adults, there was a higher mortality among the women, especially during child-bearing years. It has been reported that women who survived the child-bearing period tended to live somewhat longer than men in the ancient demographic regime (Livi-Bacci, 1988), but the present study cannot contribute data on this issue because the age at death was not given in parish burial records. According to the above data, the control years selected provide good support for constructing the baseline mortality structure to compare with that observed during the epidemic.

Table 1: Deaths for the estimation of baseline mortality rates in control years. M: male. F: female. I: indeterminate. R: male:female ratio.

| | Children | | | Young people | | | Adults | | | Total | | |
|----------|----------|------|--------|--------------|------|--------|--------|------|--------|-------|------|--------|
| | N° | % | R | N° | % | R | N° | % | R | N° | % | R |
| M | 967 | 56.1 | 1:0.78 | 404 | 51.1 | 1:0.95 | 2818 | 48.6 | 1:1.05 | 4189 | 50.4 | 1:0.98 |
| F | 758 | 43.9 | | 386 | 48.8 | | 2985 | 51.4 | | 4129 | 49.6 | |
| I | 1672 | | | 0 | | | 0 | | | 1672 | | |
| T | 3397 | 34.0 | | 790 | 7.9 | | 5803 | 58.1 | | 9990 | | |

Structure of mortality during the epidemic

The outbreak in the summer of 1679 (see figure 1) showed the abrupt rise and fall in mortality rates typically observed during plague epidemics (Scott & Duncan, 2011), and it affected all age groups. Children represented 14.52% of deaths, young people 19.78% and adults 65.69%, a markedly different age distribution to that observed in control years but similar to the percentages of inhabitants in the 1778-79 census of Granada (15.66%, 14.51%, and 69.83%, respectively) (Sanz Sampelayo, 1980) (see figure 2). The similarity between the percentages of living and deceased during the epidemic indicates that it was a catastrophic mortality crisis that killed people of all ages, very distinct from the attritional mortality during control years (Castex, 2007; Margerison & Knüsel, 2002). These results were expected, but this is not the case for the male:female ratio of deaths during the epidemic, as shown in Table 2 and Figure 3. Although this ratio was more or less comparable to observations during the control years for children, the proportion of females dying during the epidemic was markedly higher ($p < 0.001$) among young people and adults, representing around two-thirds of the total in both age groups. This finding is in striking disagreement with most previous studies, which reported no sex differentiation in plague mortality or a higher proportion of male victims (Bramanti et al. 2018; Signoli, 2006).

All three districts of the city (table 3) suffered from a catastrophic mortality crisis that had a greater impact on females than on males. However, the

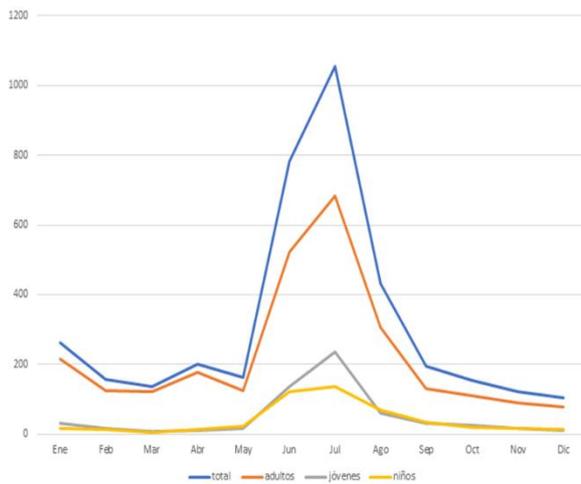


Figura 1: Granada, 1679. Distribution of deaths throughout the year by age group and total. Blue: total/total; orange: adults/adultos; grey: young people/jóvenes; yellow: children/niños.

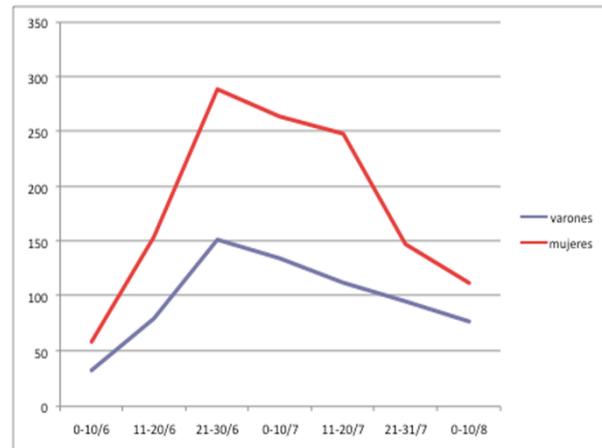


Figura 3: Distribution in absolute numbers of deaths of males and females between June and August 10 1679. Blue: males/varones; red: females/mujeres.

proportion of female victims differed among them, being highest in the Albaycín, the poorest district, followed by the Center and then by the poorer and richer parishes in the Expansion district, respectively. The difference between male and female mortality was highly significant in each district (table 4), and the odds ratio for the risk of mortality among women was higher in poorer parishes and lower in richer parishes (table 5).

Female mortality during the epidemic

In the large majority of species, males are more susceptible than females to infections from parasites, fungi, bacteria, and viruses, and their immunocompetence and resistance to disease are weakened by androgens (Bouman et al. 2005; Klein, 2000, 2004; Takahashi et al. 2020). Sex-differentiation of mortality is also influenced by ecological and physiological factors related to male behavior, the product of sexual selection (Zuk and McKean, 1996; Zuk and Stoehr, 2010). Given that the ecological niche for humans is culture, sex differences in mortality rates are related not only to genetic, physiologic, and behavioral causes but also to socioeconomic factors (Kruger and Nesse, 2006).

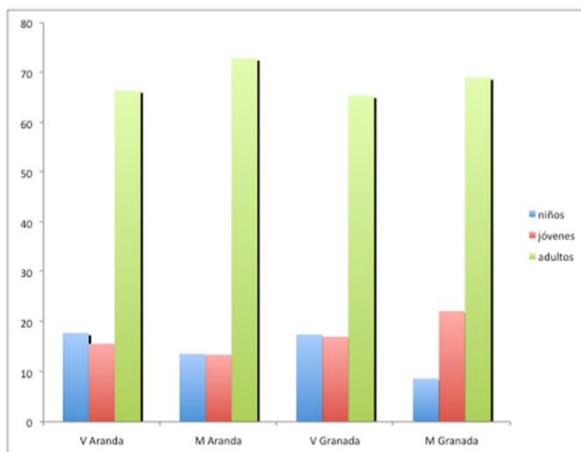


Figura 2: Comparison of percentages of males and females living in the city by age group as recorded in the census of the Count of Aranda, with corresponding deaths between June 1 and August 10 1679. V: males; M: females; blue: children/niños; red: young people/jóvenes; green: adults/adultos.

Researchers observing a higher mortality among females in a plague epidemic have frequently described pregnancy as a cause (Pérez Moreda, 1980, Scott & Duncan, 2001), based on a greater sensitivity of pregnant women to parasitic diseases (Brabin & Brabin, 1992), although not to bacterial and viral (Mor and Cárdenas, 2010). However, this cannot explain the excess female mortality found among young people in Granada, because there are children of more than 8 years, adolescents, and young women biologically capable of pregnancy but included in this age group when they were single and resided in the family home (*hijas de familia*).

Table 2: Deaths from June 1 to August 10 1679 in the whole city. M: male. F: female. I: indeterminate. R: male:female ratio.

| | Children | | | Young people | | | Adults | | | Total | | |
|------------|----------|------|--------|--------------|------|--------|--------|------|--------|-------|------|--------|
| | N° | % | R | N° | % | R | N° | % | R | N° | % | R |
| M | 121 | 51.7 | 1:0.93 | 118 | 29.1 | 1:2.44 | 452 | 33.5 | 1:1.98 | 691 | 34.7 | 1:1.88 |
| F | 113 | 48.3 | | 288 | 70.9 | | 896 | 66.5 | | 1297 | 65.2 | |
| I | 64 | | | 0 | | | 0 | | | 64 | | |
| Tot | 298 | 14.5 | | 406 | 19.8 | | 1348 | 65.7 | | 2052 | | |

Table 3: Deaths from June 1 to August 10 1679 by district. M: male. F: female. I: indeterminate. C: children. Y: Young people. A: adults. R: male:female ratio.

| | C | | | Y | | | A | | | Total | | |
|-----------------|-----|------|--------|-----|------|--------|-----|------|--------|-------|------|--------|
| | N° | % | R | N° | % | R | N° | % | R | N° | % | R |
| Albacyín | | | | | | | | | | | | |
| M | 7 | 36.8 | 1:1.71 | 12 | 19.3 | 1:4.17 | 43 | 23.4 | 1:3.28 | 62 | 24.4 | 1:3.27 |
| F | 12 | 63.2 | | 50 | 80.6 | | 141 | 76.6 | | 203 | 76.6 | |
| I | 15 | | | 0 | | | 0 | | | 15 | | |
| Total | 34 | 12.1 | | 62 | 22.1 | | 188 | 67.1 | | 280 | | |
| Center | | | | | | | | | | | | |
| M | 40 | 54.0 | 1:0.85 | 44 | 31.2 | 1:2.20 | 144 | 34.0 | 1:1.94 | 228 | 35.7 | 1:1.80 |
| F | 34 | 45.9 | | 97 | 68.8 | | 279 | 65.9 | | 410 | 64.3 | |
| I | 16 | | | 0 | | | 0 | | | 0 | | |
| Total | 90 | 13.8 | | 141 | 21.5 | | 423 | 64.7 | | 654 | | |
| R. Exp. | | | | | | | | | | | | |
| M | 30 | 47.6 | 1:1.10 | 17 | 37.8 | 1:1.65 | 118 | 38.4 | 1:1.60 | 165 | 39.8 | 1:1.51 |
| F | 33 | 52.4 | | 28 | 62.2 | | 189 | 61.6 | | 250 | 60.2 | |
| I | 0 | | | 0 | | | 0 | | | 0 | | |
| Total | 63 | 15.2 | | 45 | 10.8 | | 307 | 73.9 | | 415 | | |
| P. Exp. | | | | | | | | | | | | |
| M | 44 | 56.4 | 1:0.77 | 45 | 28.5 | 1:2.51 | 147 | 33.9 | 1:1.95 | 236 | 35.2 | 1:1.84 |
| F | 34 | 43.6 | | 113 | 71.5 | | 287 | 66.1 | | 434 | 64.8 | |
| I | 33 | | | 0 | | | 0 | | | 33 | | |
| Total | 111 | 15.8 | | 158 | 22.5 | | 434 | 61.7 | | 703 | | |

Table 4: Chi-square (χ^2) and likelihood-ratio test results for the sex distribution of deaths during the epidemic, with p-values.

| District | χ^2 with correction | | Likelihood-ratio | |
|-----------------------|--------------------------|---------|------------------|---------|
| | | P-value | | P-value |
| Total Granada | 156.05 | 0.000 | 159.19 | 0.000 |
| Albacyín | 70.08 | 0.000 | 75.01 | 0.000 |
| Center | 37.51 | 0.000 | 38.59 | 0.000 |
| Rich Expansion | 17.04 | 0.000 | 17.60 | 0.000 |
| Poor Expansion | 41.88 | 0.000 | 43.04 | 0.000 |

Unlike the present findings, many studies have reported a very high mortality rate among young people (Bramanti et al. 2018; Hirst, 1952; Scott & Duncan, 2001; Signoli, 2006). This may be because the plague, which is lethal when untreated in 30-60% of cases, is almost the only cause that could affect young people, the age group with greatest resistance to disease. Some authors found that children are less affected by plagues and that many adults may have developed immunity after previous outbreaks (Hirst, 1952), while others found no difference among age groups (DeWitte, 2010). At any rate, there does not appear to be a biological explanation for the fact that 70.9% of young people who died during this epidemic were female, and

it is necessary to take socioeconomic factors into account.

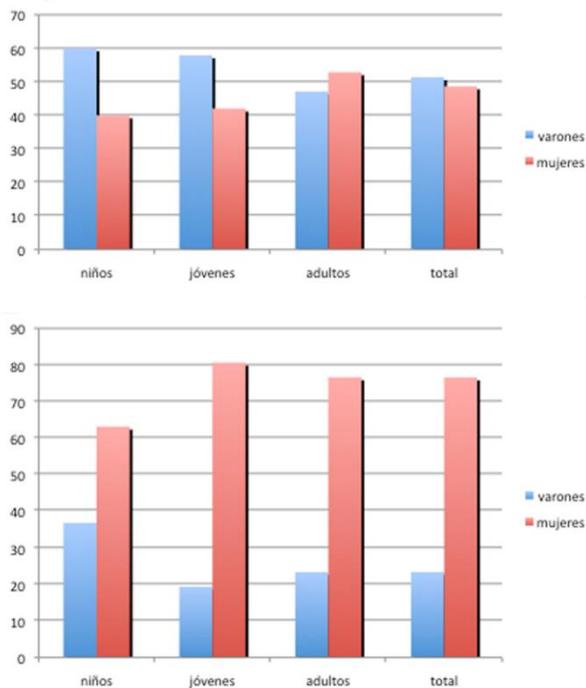


Figura 4: Percentage distribution of deaths by sex and age in the Albaycín district. The upper graph depicts control years and the lower graph depicts the epidemic period (summer of 1679). *Niños*: children; *jóvenes*: young people; *adultos*: adults; blue: males/*varones*; red: females/*mujeres*.

In the XVII century, Andalusian society was characterized by enormous inequality between a small elite of nobles or churchmen and a large majority of poor people, some in extreme poverty (Carmona, 2014). Conditions of life were drastically worsened by crop losses and the resulting rises in the price of grain, increasing the number of homeless, malnourished, and sick people dependent on charity. This century also included the so-called “Maunder Minimum” of the “Little Ice Age” (Lamb, 1979; Le Roy Ladurie, 1983), which was characterized in the southern Iberian Peninsula by a strong climatic variability, especially in regard to rainfall, with anomalous periods of low temperature and episodes of hail and snow (Sánchez Rodrigo, 1994). In 1677, this climactic change produced crop losses (Sánchez Rodrigo, 1994; Villalba, 1803) and consequent subsistence crises. Although these would not have a major direct impact on mortality (Minvielle, 2007), they would primarily affect poorer inhabitants, diminishing their immune response

capacity. This is borne out by the present observation of a higher mortality risk in the poorer parishes, which would also contain fewer stone houses, more rubbish in the streets, worse hygiene conditions, and a greater proliferation of rats (Sánchez-Montes, 1989). Various burial records during the epidemic feature such phrases as “a poor person found dead”, “a woman whose name is not known”, or (on June 11 in La Magdalena) “Three women were buried in the cemetery. It was not known who they were or their names; they were dropped at the doors of the church”.

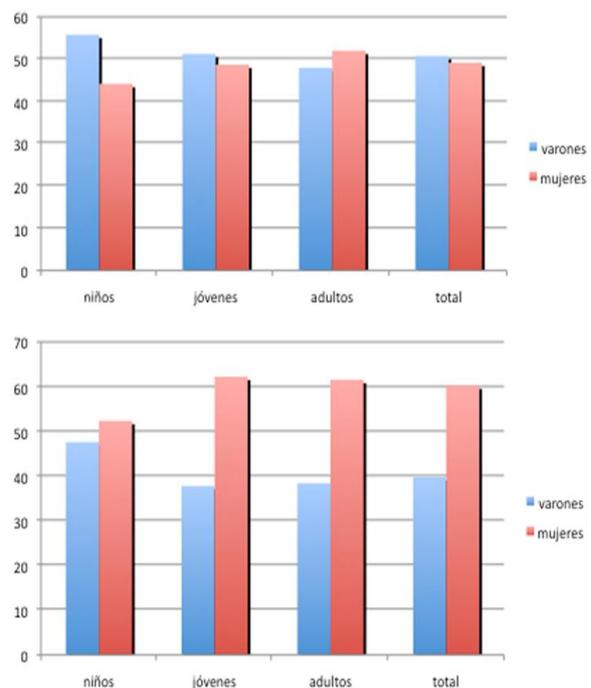


Figura 5: Percentage distribution of deaths by sex and age in the parishes of La Magdalena and Saints Justo and Pastor (rich Expansion). The upper graph depicts control years and the lower graph depicts the epidemic period (summer of 1679). *Niños*: children; *jóvenes*: young people; *adultos*: adults; blue: males/*varones*; red: females/*mujeres*.

The society of the time was strongly patriarchal, and women occupied an inferior position, especially among the poorer classes (Fernández Álvarez, 2002). During a famine, resources would be preferentially distributed to the head of family, responsible for its maintenance, while female children and adolescents were generally the worst fed and, therefore, the most susceptible to disease (Fernández Álvarez, 2002). This might in part explain the greater differentiation between female and male mortality in the poorer

Table 5: Odds ratios and 95% confidence intervals during the epidemic.

| District | Odds ratio for sex (female/male) | | Odds ratio for death during the epidemic | |
|-----------------------|-------------------------------------|-------------------------|--|-------------------------|
| | Value | 95% confidence interval | Value | 95% confidence interval |
| Total Granada | 1.904 | 1.720 – 2.108 | 1.688 | 1.552 - 1.836 |
| Albaycín | 3.457 | 2.558 - 4.671 | 2.944 | 2.249 – 3.855 |
| Center | 1.757 | 1.467 – 2.105 | 1.568 | 1.356 – 1.814 |
| Rich Expansion | 1.564 | 1.267 – 1.931 | 1.473 | 1.226 – 1.770 |
| Poor Expansion | 1.846 | 1.533 – 2.222 | 1.555 | 1.357 – 1.781 |

Table 6: Table 6. Percentage distribution by sex of deaths in control years and during the epidemic in selected parishes, including χ^2 and odds ratio values.

| Parish | Control | | Epidemic | | χ^2 | P | OR sex | OR epidemic |
|--------------------------------------|---------|------|----------|------|----------|------|--------|-------------|
| | %M | %F | %M | %F | | | | |
| S. José (Albaycín) | 52.6 | 47.3 | 18.8 | 81.2 | 25.3 | 0.00 | 4.820 | 4.230 |
| Sta. Ana (Center) | 56.6 | 43.4 | 44.3 | 55.7 | 3.3 | 0.07 | 1.638 | 1.479 |
| Magdalena (Rich Expansion) | 50.0 | 50.0 | 42.4 | 57.5 | 5.2 | 0.02 | 1.359 | 1.300 |
| S. Ildefonso (Poor Expansion) | 54.0 | 45.9 | 38.8 | 61.2 | 20.6 | 0.00 | 1.854 | 1.454 |

parishes (Figures 4 and 5). Table 6 exhibits the mortality data gathered in four representative parishes, including San Ildefonso, a large semi-urban parish, and San José in the Albaycín. Both parishes showed a higher mortality among males during the control years, when the majority of deaths were among boys, who are at greater risk of death than girls during the first years of life, especially in environments where care is inadequate. In Santa Ana, a parish in the Center containing families in a good economic situation, the excess male mortality can be explained by the presence of a hospital for poor males that buried its dead in the parish cemetery. La Magdalena, a rich parish, showed an equal distribution of mortality between the sexes in the control years but a slightly higher female mortality during the epidemic, as also observed in Sta. Ana. By contrast, the mortality among females was much higher in San Ildefonso and was highest in San José.

Poverty can account for the excess female mortality in poorer areas; however, it cannot explain the difference between sexes in parishes with wealthier families, where other social factors must be taken into account. These include habits and customs, the role of women as caregivers, and contemporary codes of

honor. For instance, women wore long skirts reaching down to the ground, whereas male apparel stopped at the knee, and women were accustomed to sit using low chairs or cushions on the floor. These customs might make women more prone to suffer disease-transmitting insect bites, among other negative hygiene effects. In regard to caregiving, wealthy families would have had domestic staff to care for sick members and could afford home visits from physicians, while hospitals generally cared for people without resources. Examples of female caregivers would include Catalina de la Cruz and Isabel de Jesús, slaves of D. Antonio Mota, buried in the parish of Las Angustias in 1679 on June 10 and 11, respectively, followed a few days later by another woman from the same house who was not even given a name.

Contemporary patriarchal codes of honor (Gascón Uceda, 2008) may also have influenced the excess female mortality, especially among young people. Hospitals mainly offered care to males, and it is highly possible that a family would not expect a young daughter to leave home for admission to hospital to be admitted. There are no preserved death records for the Hospital Real, where most of the sick were taken,

although some of the deaths would have been recorded months later in parishes if a mass was ordered in their honor. Interestingly, the females for whom this was the case were married women or widows from the poorest parishes. The question arises whether mainly males were admitted to hospital by families and whether this was why parish burial records predominantly contain females, who would have died at home. This possibility cannot be tested but should be taken into account.

Conclusions

Unlike the findings of previous skeletal or documental studies of plague epidemics, the mortality produced during the 1679 outbreak in Granada was characterized by an elevated excess of female deaths that was very different from the attritional mortality observed in non-plague years. This excess mortality among the women cannot be explained by only biological factors and would be attributable also to socioeconomic factors such as poverty, the patriarchal nature of society, and contemporary habits and customs.

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