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MORTALITY DIFFERENTIALS BY GENDER IN THE FIRST YEARS OF LIFE: THE EFFECT OF HOUSEHOLD STRUCTURE IN CASALGUIDI, 1819-1859

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There is a well-documented gender pattern of mortality during the first years of life. Girls have better survival chances during the first year of life, while boys tend to have better survival chances in the following years. In this paper, we focus on a possible social explanation for this inversion of the gender pattern of mortality. We investigated whether complex household structures lead to a survival disadvantage for infant girls. Large and complex households, especially in sharecropping societies, might incorporate some of the most important features causing gender differentials in mortality, such as: the key importance of the male labor force as a way to ensure their permanence on the farm, the consequent higher economic value of males, and rigidity of social roles within the household. The analysis is based on a sharecropping community of mid-nineteenth century Tuscany, whose findings are compared to a coeval population of Northern Italy to highlight the specificity of the sharecropping society.

Introduction

The existence of a specific mortality pattern by gender in early childhood is widely accepted in the field of historical demography. Many studies have shown how an initial female advantage in the first year is generally followed by an inversion in the roles with girls suffering a clear disadvantage in survival in later childhood, in some cases starting immediately after weaning (Antonella Pinnelli and Paola Mancini 1997; Edward A. Wrigley et al. 1997; Dominique Tabutin and Michel Willems 1998). This is the dominant model in contexts with high mortality rates, such as in pre-transitional or currently developing countries, whereas in countries that have low mortality rates and are already developed, the mortality model sees males being disadvantaged across the board (Greg L. Drevenstedt et al. 2008).

There are two types of explanations for the inversion of mortality differentials between the first and later years of childhood: biological and social (Ingrid Waldron 1987). The biological stance emphasizes the different organic and biological resistance of males and females to illness (Ingrid Waldron 1983), with girls having a stronger immune response to infection during the first year of life, in particular regarding complications related to the respiratory system (David Mage and Maria E. Donner 2004; Annechien Bouman, Maas J. Heineman and Marjike Faas 2005). Biological explanations also involve the higher in-utero mortality of males compared to females, due to biological mechanisms associated with a gender differential production of the gonadal steroid (Drevenstedt *et al*. 2008; Marylin M. McMillen 1979).

After the first year of life, the cause-of-death pattern changes, the biological characteristics of males becoming more favorable. For example, Wrigley and colleagues (1997) attributed the existence of excess female mortality, at least from the age of five, to a higher incidence of tuberculosis in girls. Other studies emphasize that boys' higher birth-weight leads to an increased risk of complications during birth (Waldron 1987; Jennie Kline, Zena Stein and Mervyn W. Susser 1989; Emma Elsmen, Marten Steen and Lena Hellstrom-Westas 2004). Among the possible biological explanations of the inversion of the gender differential in mortality between infancy and early childhood, the existence of possible selection effects should thus not be underestimated, which may lead to the survival of the healthiest males after the first year of life.

The biological hypothesis presupposes that the gender differential is constant over time and depends on the cause of death considered. The social hypothesis also has its supporters, although one theory does not necessarily exclude the other. The social construct is based on the idea that the inversion of the mortality differential to the detriment of girls after the first year of life is due to a different parental and family attitude towards each sex. Some authors have suggested the existence, in some societies, of a lesser consideration of females and their working role and, therefore, of their economic "value" (Thierry Eggerickx and Dominique Tabutin 1994; Pinnelli and Mancini 1997; Jacques Vallin 1988; George Alter, Matteo Manfredini and Paul Nystedt 2004). In fact, in all societies where women were found to be subjected to social discrimination, girls could encounter from early childhood, and above all from adolescence, a disparity in the distribution of family resources, including food, and material and immaterial care (Roger Schofield 2000). This situation is, according to some, typical of poor and underdeveloped populations (Samuel H. Preston 1976). In societies where the male work force provided a much higher economic return than the female work force, typically in historical and contemporary rural societies, the family's attention could be focused, right from early childhood, on the care of boys (Sheila R. Johansson 1986). In these situations the boys represented the family's future workforce, on which their survival depended.

Consideration should also be given to the discriminatory potential of the inheritance model, which generally transmitted wealth down the male line. The existence of patriarchal families, with patrilineal transmission and an extended family structure, which forms the basis of some Asian societies, has been considered as one of the reasons, together with the absence of social stigma, for gender discrimination which was often accompanied by selective infanticide (Renzo Derosas and Noriko Tsuya 2010).

For the European and Italian context, however, it is difficult to think of such a drastic post-birth intervention on the sex ratio, one reason being that the mother/parents could hand over the newborn to an institution thus reducing to a minimum any consequent emotional or financial impact

(David Reher 1995; Katherine A. Lynch 2000). Our estimations of the numbers of children abandoned in Tuscany in the period 1843-1852 (Attilio Zuccagni-Orlandini 1852) show that, in both rural and urban hospitals, 97 males were hosted for every 100 females, therefore with a skewed sex ratio towards females, in a context where the rate of abandonment was around ten percent (Carlo Corsini 1991).

Some studies have shown how in the pre-transitional period, even in the West, infant and pre-adolescent mortality could be influenced by the presence of male and/or female siblings (Marco Breschi, Renzo Derosas and Matteo Manfredini 2004; Michel Oris, Renzo Derosas and Marco Breschi 2004; Renzo Derosas 2012). In the case of Venice, this is clearly demonstrated as having had a differential effect on the survival of males and females, suggesting that after parents had reached a desired number and composition of offspring they dedicated less attention to the care of newborns[1].

This paper aims to verify the existence of a gender difference in mortality in infancy and early childhood (to the disadvantage of females) in a mid-nineteenth-century Tuscan sharecropping population. It examines some of the most intimate mechanisms of the social hypothesis, suggesting that this differential may depend on the household structure, and in particular be manifest within complex households. This hypothesis is based on the fact that the complex structure incorporates fundamental aspects of pre-transitional Tuscan society which might have played a decisive role in determining gender difference in mortality.

The complex household is without doubt a typical feature of the Tuscan countryside throughout the nineteenth century. Its significance is usually associated with the predominant form of land tenure in this Italian region, namely sharecropping. Although also quite common among tenants, the bourgeoisie and poor agricultural landless groups wishing to move up the social ladder, complex households, and multiple ones in particular, represent the typical key element in the link between the land

[1] These studies are much more common for contemporary developing countries (Monica Das Gupta 1987; Rebecca Sear *et al.* 2002; Rebecca Sear and David Coall 2011; Daniel Rosenblum 2013).

holding size and sharecropping family. Only family complexity can, in fact, guarantee the division of roles and work necessary to make the sharecropping household a functioning production and consumption unit, capable of cultivating and producing not only for its survival but also for the landowner, who received half of the crop as payment.

This division of roles and work within the sharecropping household was strongly gendered, representing an essential and typical characteristic within this family unit (Cristina Papa 1985). Agricultural labor, the factor most closely linked to the capacity of the sharecropping family to renew or better their contract, depended on the internal workforce which could guarantee to make the farm as productive and economically advantageous as possible (Andrea Doveri 2000; Giuliana Biagioli 1986).

The workforce was principally based on the male component, who therefore had a higher work and economical value. Pier Giorgio Solinas highlights how this reduced economic value of women was also formalized according to "explicit and standardized measures, that are based on juridically recognized parameters, through which the contributions of each of the family members during their life are valued" (2002, 39). Given the importance of the male component in this type of household, the marriage model was generally patrilocal, with sons remaining in the paternal house even after marriage (Marzio Barbagli 1984). On the social level, sharecropping families were patriarchal, with a predominantly male head of the household who had authority over all the family, and who was the only person who could sign contracts and manage relations with the landowner. This role was transferred to one of his sons after his death. Given these elements, the lower value attached to female work has, in our opinion, both economic and socio-cultural grounds.

The gendered system of family formation and household organization was closely associated with the social role of women in the Tuscan society of the nineteenth century, but above all with farm work and the rural economy of this area. This system was also typical of other rural categories, either landed such as smallholders, or semi-landed such as tenants. As a consequence, essentially all these rural social groups lived in complex households, whose size and level of complexity were determined by the characteristics of the land.

Characterized by a rigid division of labor and social roles as well as a different working and economic value attributed to the sexes, as exemplified by the sharecropping household, a patriarchal family might therefore have produced an inequitable level of care and allocation of resources between the male and female members, possibly leading to gender differences in mortality.

The Community of Casalguidi

Casalguidi is a rural parish located in the north of Tuscany,[2] between Pistoia and Florence. It was at the heart of a dense network of medieval settlements, whose organization remained largely unchanged until the 1950s (David Herlihy 1972; Marco Breschi and Marco Francini 1990). Casalguidi stood out from the rural communities in the area due to its geographical location, and population size (an average of around 2,400 inhabitants in the period 1819-1859). The majority of the population lived on the plains, and a small minority in the hills.

The rural nature of the community also emerged from its economic structure. Casalguidi was a typical sharecropping Tuscan community, where around two-thirds of families were dependent on farming. Sharecropping families dominated but there were also day-laborers and smallholders. The farms featured mixed cultivation, characterized by vines, olive trees and a variety of grains (Breschi, Derosas and Manfredini 2004). A particular feature of the sharecropping system at Casalguidi was the small size of the farms, accompanied by a modest sized household and equally modest degree of complexity.

In the period under analysis, 1819-1859, the average size of the households was little over five units (5.2), with complex family groups larger than nuclear units (respectively, 7.1 and 4.4). Complex households included both extended and multiple households. While extended households included one conjugal unit plus one or more kin, multiple

[2] For more information on Casalguidi, see Marco Breschi and Matteo Manfredini 1998.

households were formed by two or more conjugal units. As a consequence, the mean age of the household heads was significantly higher in multiple households (61.0 years) than in extended (49.2) or nuclear ones (47.6). Unlike other Tuscan sharecropping populations of the time, in Casalguidi extended households outnumbered multiple ones, accounting for 22.1 and 13.1 percent, respectively (Barbagli 1984; Doveri 2000).

However, Casalguidi's economy was not entirely based on agriculture. Along with small businesses and a poor artisanal sector, which involved around 25-30 percent of the population, there were also some proto-industrial activities linked in particular to textiles (embroidery and weaving), the production of clay dishes, and the manufacturing of straw hats. All these aspects meant that Casalguidi had a greater social and economic stratification than other rural villages in the county of Pistoia, although it should be stressed that the group of poor artisans was formed consistently by former peasants who had been evicted by landowners from the farm they lived on, thus undergoing downward social mobility.

From a demographic perspective, Casalguidi presents trends and behaviors that are typical of an *ancien regime* population. A high infant mortality rate (around 200 per thousand), with a resulting low life expectancy (around 35 years), and a high fertility rate (TFT = 5.2 children per woman), are concrete evidence of this and led to an average growth rate of 8.4 per thousand in the period 1819-1859. This general trend also presented sharp differences by occupational group. Day laborers showed, in fact, the highest mortality level (Breschi, Derosas and Manfredini 2004) and a lower fertility compared to sharecroppers (Matteo Manfredini and Marco Breschi 2008).

The population curve of Casalguidi also witnesses a sharp drop in 1854-1855 due to the well-documented cholera epidemic which affected a number of central Italian regions.

The Data: Recovery and Characteristics

This study is based on micro-data regarding individual and family biographies reconstructed from birth, marriage, and death parish registers, integrated with information taken from the Status Animarum (a census-like parish family book). The period studied, 1819 to 1859, corresponds to the time span available from the Status Animarum, while the registers cover longer periods. The good continuity of the Status Animarum (only one missing year: 1822) enabled us to identify each individual for each year considered, along with the composition and structure of the household in which they lived. The integration of the two sources not only enabled us to reconstruct the family context year after year, but also to retrace fundamental demographic information such as migrations (both inbound and outbound), the birth year of individuals not recorded in the birth register and the year of marriage of those who were wed outside the parish of Casalguidi, but went on to live there.

The nominative linkage with the registers also enabled us to frame each single demographic life event in the family context in which it occurred[3]. Naturally, to study infant mortality it was necessary to start with the birth certificates, to which the relevant death certificates were then linked. Then, the life histories of the respective parents were also linked to the birth records of each child, in order to reconstruct the age of the mother at childbirth and other useful information, such as possible twins and father's profession. In total, 3,767 births were tracked; out of which both parents were traced for 3,549 births, for four only the mother was traced, while for 214 births it was not possible to identify either parent from the other registers or the Status Animarum.

Lastly, the families in the Status Animarum were linked, year after year, with the information contained in the tax registers. This additional source enabled us to accurately determine the economic status of each single household over time (Manfredini and Breschi 2008).

Some Elements of the Infant Mortality Pattern. Casalguidi, 1819-59

[3] For a more detailed description of the construction of the dataset, see Matteo Manfredini 1996.

Table 1 shows the probability of neonatal and post-neonatal mortality and mortality from the second to fifth year of life of the births in Casalguidi between 1819 and 1859. The table reports the overall values and those by sex[4]. Overall, around 83 per 1000 newborns died within the first month of life, while the probability of death was around 130 per 1000 in the post-neonatal phase, with an overall value of infant mortality of just under 200 per 1000. Beyond the first year of life, the mortality rate falls further, from around 121 per 1000 in the second year of life to just under 110 per 1000 between two and four years of age.

Table 1

Probability of Death by Age and Sex, Casalguidi, 1819-59

Age	M	F	M/F	Tot.
0 months	84.2	74.1	1.14	82.8
1-11 months	130.3	131.8	0.99	130.5
0-11 months	*196.9*	*186.8*	*1.05*	*195.1*
12-23 months	119.3	122.1	0.98	120.7
2-4 years	101.3	118.9	0.85	109.8

Source: Status Animarum (see text)

The M/F ratio between the probabilities reproduces a common mortality pattern, namely a higher net male mortality in the first month of life (114 male deaths for 100 female deaths), which progressively falls over time. It is almost equal in the post-neonatal phase and in the following year, with a more marked disadvantage for girls from the third year of life. The figures in table 1 are in line with those highlighted by Pinnelli and Mancini (1997) for Italy in the late nineteenth century, although the figure for the first year of life is slightly lower than the national one.

In Casalguidi, infant mortality also displays strong differentials by season of birth and socio-economic status. As highlighted by previous

[4] Fifteen birth records made no reference to sex. These were for newborns who were not baptized because they “died shortly after birth”.

studies on the seasonal nature of infant mortality (Marco Breschi and Massimo Livi Bacci 1994; Marco Breschi, Matteo Manfredini and Lucia Pozzi 2004; Marco Breschi, Renzo Derosas and Matteo Manfredini 2000), the winter birth cohort experienced a decidedly higher probability of death in the first month of life compared to the other seasonal cohorts, a gap that did not narrow in any way during the first year. The neonatal mortality of the winter cohort was even three times higher than the summer cohort, which was the one with the best chance of survival throughout the first year of life. The autumn cohort displayed a worsening survival rate compared to all the other seasonal cohorts from the tenth month of life, reaching the winter levels at the time of the first birthday. This trend can be put in relation to weaning, which, occurring around 10-12 months after birth (Breschi and Livi Bacci 1994), coincided, for the autumn cohort, with the summer cohort. The higher temperatures in this season made the transition to solid food riskier, above all in terms of the strain on the gastrointestinal system.

The effects of socio-economic status (SES) on infant mortality are well known which is also the case for Casalguidi (Breschi, Derosas and Manfredini 2000; Matteo Manfredini and Lucia Pozzi 2004). Whilst neonatal mortality does not appear to be significantly affected by SES, post-neonatal mortality does. In particular, the poorest category of farm and daily laborers showed the highest risk of death for children in the post-neonatal period (1-11 months of age). As previously mentioned, this also represents the social group with the highest proportion of nuclear households.

Gender Mortality Differences in Infancy and Early Childhood: a Longitudinal Analysis: The Model

Given the longitudinal nature of the data used in this study, an Event History Analysis model was used to estimate possible gender differences among the household structures. The model used is a logistical model in discrete time which is best suited to annually surveyed sources such as the Status Animarum (Paul D. Allison 1984; Corrado Lagazio and Laura Pagani 1996). In order to obtain more precise estimates, the model was refined taking consideration the correlation structure of the observations, since many newborns belonged to the same couple, and therefore to the same household. A random-effect model was then used to appropriately manage this data structure.

The dependent variable is a binary variable that assumes the value 0 if the individual is still alive in the selected month, or 1 if not. The effect on mortality of the relation between household structure and sex of the newborn is estimated, in each model, through the interaction between two dichotomous variables of the sex of the child and the household structure. These variables represent males and females on the one hand and nuclear and complex households on the other. The first category includes both the classic biological family, formed by a married couple and children, and single-parent families, while the second category includes complex households, both extended and multiple. The effect of such factors on mortality is estimated after controlling for a set of covariates whose impact on infant mortality has been demonstrated by previous studies. These covariates are both control variables and background variables, aimed at capturing some of the most important risk factors of mortality in the first years of life. Included among the control variables are all those factors that could directly affect the allocation of resources, material and emotional, between the children of different sexes within a household, such as socio-economic factors (family tax and grain price) and parity.[5] On the other hand, mother's age at childbirth, multiple births and current season were also included in the analysis as background variables.

In its general form, the logistic model is expressed by the following equation:

$$\ln(p/1-p) = \alpha + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k$$

[5] The data on prices refer to the market in Florence and were linearized through logarithmic transformation. The trend of grain prices in the period 1819-1859 in Tuscany is characterized by a steady evolution with a single striking increase during the cholera epidemic of 1854-1855, which makes this variable a good proxy of the effects on mortality caused by such a crisis (Breschi, Derosas and Manfredini 2004).

In this formulation, *p* represents the probability of the event occurring in the time interval *t*, *t+1*; *(p/1-p)* represents the odds (and thus *ln(p/1-p)*) is the log-odds); $x_1 \ldots x_k$ indicate the variables (or covariates) included in the model; α and β_n are the parameters to be estimated. α represents the constant of the model, while β_n the coefficient of the *n-th* variable. If the variable is continuous, such as grain price, the coefficient β_n just expresses the variation in the log-odds connected to a unitary change in the independent variable. In the case of categorical variables, on the other hand, β_n expresses the variation in the log-odds associated with a category compared to a reference category of the same variable, holding all the other predictors constant. Table 2 reports the coefficients as exponentiated odds-ratios (OR). This means that each reference category assumes value 1, while non-reference categories display OR<1 or OR>1 in the case of negative or positive variations in the risk of death compared to the reference category.

Therefore, four models were estimated—one for each of the different phases of mortality in early childhood: neonatal (0 months); post-neonatal (1-11 months); mortality in the post-weaning year; and lastly between 2 and 4 years of age. In the first phase, factors of a biological and/or genetic origin and those related to the birth itself are expected to prevail. In the second, exogenous factors, above all those linked to the mother and the related period of breastfeeding, should start to dominate. These exogenous factors should gain relevance in the third and fourth phases, notwithstanding the fact that in the third phase, the weaning could highlight the effects of the hot season. Finally, the fourth model does not include all those explanatory variables associated with endogenous factors nor those whose effects can be directly or indirectly connected to the mother's characteristics and climate, whose impacts on mortality are normally limited to infancy. In other words, model four focuses on social and economic factors, such as grain price, SES, and household structure.

Results

Table 2 presents the results related to the four models illustrated above. As expected, the determinant factors that emerge from the neonatal mortality model are the presence of twins, mostly linked to the difficult conditions of childbirth and breastfeeding period, and environmental elements, of which the negative effect of the winter season stands out, thus confirming the results of the descriptive analysis. While the effect linked to the presence of twins loses its impact over time, the seasonal effect remains, although characterized by an opposite pattern. Between the second and the twenty-third month of life, in fact, children are significantly more likely to die during the summer season, especially in the second year of life. As proved in the descriptive analysis, this pattern particularly involved the autumn birth cohort, which entered the hot season when breastfeeding was just over.

While the post-neonatal period is characterized by the positive relationship between mortality and mother's age at childbirth, the mortality pattern between the second and fifth year of life is dominated by the socio-economic variables. Irrelevant until the end of the first year, socio-economic status, grain price and the household structure all play an important role, and in the expected direction, in modifying the risk of death in early childhood.

As for the core issue of this study, whether or not the household structure determined gender differences in mortality, the results in table 2 highlight that from the second year of life the risk of mortality varied in relation to gender for children born in complex households.

Table 2

Determinants of Mortality in Infancy and Early Childhood.
Logistic Regression. Odds-ratios.

Variables	0 months		1-11 months		12-23 months		2-4 years	
	Freq.	OR	Freq.	OR	Freq.	OR	Freq.	OR
Age			5.9	1.025	17.3	**0.915**	3.0	**0.485**
Current season (ref. Winter)	27.4		24.9		24.5			
Spring	26.8	**0.545**	25.0	0.962	25.3	0.789		
Summer	20.2	**0.355**	25.4	**1.815**	25.8	**4.801**		
Autumn	25.6	**0.656**	24.7	1.172	24.4	**3.222**		
Age at childbirth (ref. <25)	16.4		16.7		18.7			
25-34 years	55.2	0.807	55.9	**1.686**	55.9	0.917		
35+ years	28.4	1.109	27.4	**2.366**	25.4	1.027		
Parity (ref. Firstborn)	17.1		17.0		19.4			
2-5	46.6	0.738	47.1	0.839	48.4	**1.663**		
6+	16.4	0.882	16.2	0.777	16.0	1.176		
Unknown	20.0	0.925	19.8	0.764	16.3	1.143		
Twin (ref. No)	98.3		98.9		99.1			
Yes	1.7	**8.281**	1.1	1.506	0.9	0.726		
Grain price (log)	3.06	0.528	3.06	1.459		**2.632**	3.07	**2.394**
Family Tax (ref. [illegible])	30.3		30.7		25.7		27.5	
Medium-low Tax	52.5	1.275	51.9	0.911	56.7	1.043	55.4	**0.642**
High Tax	17.2	0.900	17.4	0.883	17.5	**0.607**	17.1	**0.354**
Sex (ref. M)	50.6		50.5		51.8		51.2	
F	49.4	0.822	49.5	0.938	48.2	0.907	48.8	1.038
HH structure (ref. [illegible])	45.8		45.8		43.3		49.0	
Complex	54.2	0.996	54.2	0.818	56.7	**0.560**	51.0	**0.618**
F * Complex HH		1.142		1.138		**1.437**		1.421
Log-likelihood		-809		-2149		-1750		-938
Person-months/ Person-years		3,505		34,043		23,182		6,443
Deaths		276		401		366		230

Notes: in bold, significant coefficients at $p<0.05$. OR = Odds Ratios.

The coefficients shown in the table and relative to the variables involved in the interaction (sex, household structure, and interaction term) cannot be interpreted as the simple effect of categorical variables on the dependent variable. They represent the differential effect of a category compared to the reference category when the other variable involved in the interaction assumes the value of the reference category[6]. To appreciate the ORs of all the categories involved in the interaction, the coefficients in the table need to be reworked. The result of this re-calculation (Fig. 1) highlights, first of all, the absence of any significant gender differential in mortality during the first year of life. This indicates not only that male advantage during infancy was not as pronounced as hypothesized, but also that selection did not play any role in the gender differentials later in life.

Starting from the second year of life, it is evident how the complex household ensured a better chance of survival for both sexes than the nuclear family. However, these results also prove that in post-weaning age-groups, the gender difference in mortality is larger in complex than in nuclear households. This differential is steadily detrimental to girls, who experienced decidedly higher risks of death compared to their male counterparts when living in complex households. On the other hand, in nuclear family groups, the sex differential is notably smaller, not statistically significant, and not univocal in sign: between 12 and 23 months of age, girls experience a lower risk of death than boys, while between 2 and 4 years the opposite occurs.

[6] For example, the coefficient 1.073 associated with the category "Female" in the model 2-4 years refers to the differential in the risk of death of girls compared to boys (reference category "M"), when the other variable involved in the interaction, the household structure, assumes the value of the reference category, "Nuclear family".

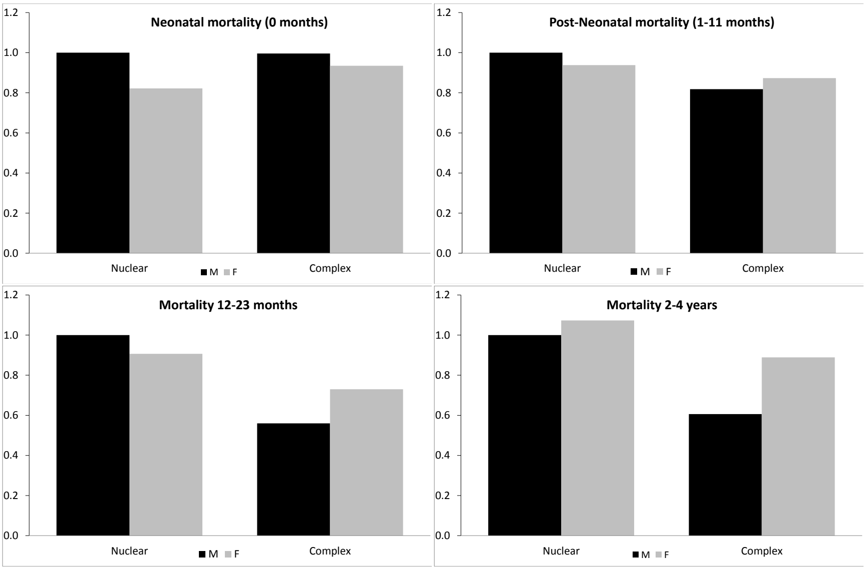

Figure 1

Interaction between Household Structure and Gender in Each of the Models Estimated. Odds Ratios.

It is clear that in complex households a particular mechanism is triggered that puts girls in a disadvantaged position compared to their male peers. Before forming any hypotheses regarding these mechanisms, it is necessary to evaluate the role played by sharecroppers (and tenants) within the group of complex households. Since sharecroppers are largely represented in this group, the effects of belonging to this socioeconomic group—and, therefore, implicitly linked to profession—need to be disentangled from those explicitly attributable to the complexity of the household.

We thus repeated the 12-23 months and 2-4 years models for the various professional categories in Casalguidi[7]. For the reasons mentioned

[7] Figure 2 shows the coefficients. The data in figure 2 are re-workings of estimated coefficients obtained from models 12-23 months and 2-4 years stratified by profession identical to those in table 2.

in the introduction and because of the numbers involved, tenants and smallholders were grouped with sharecroppers. The other two socio-professional groups analyzed were day-laborers, the agricultural category without direct access to the farm and with a much less complex household structure, and non-agricultural categories.

Figure 2 clearly shows how for both the group of sharecroppers, tenants, and smallholders and the group of non-agricultural professions, the model generally follows the one discussed above, i.e. a gender difference in mortality with girls living in complex structures disadvantaged compared to boys. In nuclear family units, conversely, the differential is to the detriment of males or, as in the case of the sharecroppers in the 2-4 years model, to the detriment of girls, but to a lesser extent than their peers in complex families. The situation is somewhat different for day-laborers, although no statistically significant coefficient was found. In this group, the females appear to be systematically disadvantaged, irrespective of the family context and structure, with the exception of complex households in the age bracket 2-4 years.

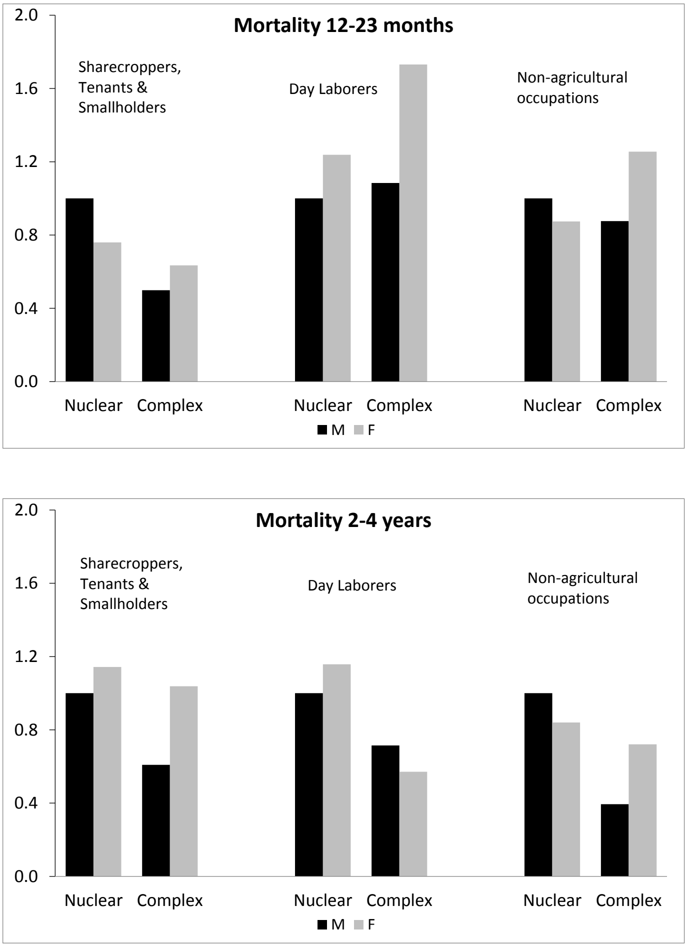

Figure 2
Interaction between household structure and gender by profession.
Odds Ratios for the model 12-23 months (top)
and the model 2-4 years (bottom).

Conclusions

Factors of both a biological and social nature have been put forward to explain the inversion of gender differences in mortality, in which boys have a higher mortality in infancy, while girls have a higher pre-adolescent mortality (1-9 years). The common hypothesis for the former is boys' lower biological and organic resistance to the most common illnesses in the first year of life, while the second focuses on the different social roles and economic value of women which could trigger a male-oriented allocation of resources and care within the family, which was detrimental to girls.

This study has attempted to verify, on the family level, whether these mechanisms were also present in the 19th-century sharecropping community of Casalguidi. Our hypothesis was that a social and economic situation of this type—exemplified by the complex, patriarchal family structure, with a strongly patrilineal transmission and economically centered on the family workforce—could encompass the necessary prerequisites for care practices, and allocation of resources which were unfavorable to female survival already from early childhood.

Our results prove that the inversion of gender mortality differentials was, in Casalguidi, not present because of the lack of the first theoretical stage of such a model. We found, in fact, only a mild and not significant higher risk of mortality for males compared to females in the first year of life. At this stage it is difficult to say whether it occurred due to a general high mortality for both sexes caused by diseases of the respiratory system (as the very high neonatal mortality of the winter cohort suggests) or associated with a favorable allocation of resources to males (mostly caring and nurturing practices, in this case), which could offset their biological disadvantage in this phase of life. This pattern holds regardless of the household structure in which the children were born, although complex households could guarantee a generally higher level of protection to their children than nuclear units.

A gender differential in mortality favoring boys does, on the other hand, emerge within complex households from the second year of life. This result is in line with our hypothesis of a differential mortality by gender in the first years of life for sharecroppers and other landed or semi-landed rural groups, namely in contexts where the economic and productive value of males was much higher than that of females, and where the family economic return was proportional to the family workforce.

As far as non-agricultural social groups are concerned, the interpretation is more complex. We can confidently argue that among the bourgeoisie and the landed gentry, the value of males could be associated with the custom of following patrilineal inheritance. On the other hand, the preference for sons over daughters in poorer non-agricultural social groups, especially poor artisans, could be associated with the aspiration to regain the former status of peasants by preserving a suitable household structure. This is obviously only a speculation that further studies will need to verify. Finally, in the day-laborer families, the concept of the family workforce was much less clear cut, and not decisive for the level of wellbeing of its members. In this context, no differences in mortality emerge between the nuclear and complex household.

In summary, despite the fact that in mid-nineteenth century Italy, the practice of abandoning unwanted children, especially females, already constituted a rudimentary form of post-reproductive *family planning*, a mechanism with similar results, although not necessarily conscious, led to a higher survival of males in early childhood compared to females. This was not simply due to the different economic value of men and women within sharecropping households, as hypothesized at the beginning of this paper, but was rather a multifaceted process in which social and economic reasons were intricately intertwined.

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