

Infant Mortality Broken Into Pieces: A Case Study on Venice in Mid-Nineteenth Century.¹

La Mortalità Infantile Fatta a Pezzi. Un Caso di Studio su Venezia a Metà Ottocento.

Renzo Derosas

Department of History, Ca' Foscari University of Venice, San Marco 2546, I - 30124 Venice, Italy, e-mail: derosas@unive.it

Riassunto: La mortalità infantile è un'astrazione statistica che aggrega una varietà di aspetti eterogenei, influenzati da fattori alquanto diversificati tra loro. Difficilmente se ne possono comprendere i meccanismi senza identificarne almeno le componenti principali. Soprattutto in campo storico, questo pone tuttavia notevoli problemi, sia concettuali che documentari. Usando come esempio un'indagine su Venezia a metà '800, si propone qui un approccio che consente di evidenziare le caratteristiche di tali componenti, legate soprattutto alle diverse fasi dello sviluppo infantile. Analizzando dati tratti da fonti anagrafiche con i metodi dell'Event History Analysis, si mette in luce come le fasi neonatale, dell'allattamento, dello svezzamento fossero influenzate in modo molto diverso da fattori biodemografici, climatici, socioeconomici, familiari, culturali.

Keywords: Infant Mortality, Event History Analysis, Cox Regression, Venice

1. Introduction.

Infant mortality is no simple matter. An infant death can be caused by a wide array of factors of very different nature. The process eventually leading to death is usually neither plain nor straightforward and is influenced by a large number of determinants, that can favour its course or oppose it and even avoid its worst consequence. Of course, this is true at all times and for any demographic regime; however in pre-transitional era infant mortality was subject to a much wider variety of factors than nowadays. The higher the mortality rates, and the less developed the medical knowledge and the technology available for health preservation, the greater the complexity and multidimensionality of mortality patterns.

Under this respect, the task of historians is more challenging than that of scholars of contemporary societies: not only for the obvious reason that historians have a much more difficult access to relevant information, but also from the point of view of the conceptual framework they can refer to for their analyses. Nevertheless, a real comprehension of the mechanisms that governed infant mortality in the past and of the factors that most affected them can only be grounded in a distinction as neat and analytical as possible of its components. Referring to infant mortality as a whole can be necessary and even useful when we aim at providing aggregate measures, establishing

¹ This research is part of the MURST 40% project on "Componenti genetiche, condizioni nelle prime fasi di vita e fattori socio-economici: un'analisi della longevità in Italia.

comparisons or outlining trends for large populations, but we must keep in mind that it is a statistical artefact we are dealing with. As we all know, though sometimes tend to forget, rates can be highly misleading: on the one hand, two groups can have similar infant mortality rates but completely different mortality patterns; on the other hand, the opposite is possible as well, with two groups displaying very similar mortality patterns though keeping dramatically different mortality levels. Both situations will be empirically illustrated in the following pages. Here I want simply to stress that, when it comes to moving from description to interpretation, a more analytical approach is required, taking into account the heterogeneity embedded in infant mortality. Only after breaking it into pieces a more comprehensive interpretation will be possible.

Historical demographers are well aware of all this. In the latest years, the need of accounting for the complexity of mortality patterns has gained pride of place in their research agenda. However results have not been much encouraging thus far. In 1991, Schofield and Reher admitted that "our understanding of historical mortality patterns, and of their causes and implications, is still in its infancy": a statement which is rather surprising to find in the introduction to a volume on *The Decline of Mortality in Europe*. With some good reason, Johansson and Kasakoff (2000) commented ironically that indeed "we are dealing with a case of very prolonged infancy" for scholarly research, unable to develop into maturity despite the remarkable efforts carried out in the last decades and "the enormous amount of solid factual information" accumulated thereby. They agree nonetheless about the impasse dominating research in mortality history, which they attribute to the persisting reliance of analyses on macro, mostly national-level, data. Their own proposal, however – going away from the "misleading mean" to focus into smaller areas or groups – does not really seem able to contribute to the definition of that "complex equation including social, economic, cultural, geographical, and even climatological variables" advocated by Schofield and Reher to understand the mechanisms of mortality in the past, whatever such equation might be. As Pozzi and Gonzáles (1996) acknowledge concluding a review of recent studies on infant mortality in Italy and Spain, moving from description to interpretation still appears so complex and demanding a task that the perspectives of a real progress are "not at all encouraging".

In the following pages, I hope to be able to show that such a point of view is far too pessimistic, and that resorting to source materials largely available in Italian archives and appropriate statistical methods, it is possible to grasp at least some of the complexities lying behind infant mortality in the past. I will also suggest that the conceptual framework used here has a more general validity and can be applied to several other situations. The main point raised by this paper is that the different phases in infant growth – immediately after birth, during breastfeeding, during and after weaning – need to be analysed separately, since they are affected by different risk factors. I will show that some of the most important determinants of infant mortality, such as bio-demographic conditions, household composition, socio-economic status, economic conjuncture, and the like, behave differently in these different phases, and that therefore their function can be appreciated correctly only when analysed in each specific context.

The paper is organised as follows: in Sections 2 and 3 I present the source material used for this analysis and the demographic and socio-economic features of the population under study. Section 4 outlines the statistical method and the models used to analyse infant mortality. In Section 5 I will highlight the most interesting results, leaving to Section 6 some conclusive remarks and suggestions for further research.

2. Source Material and Data.

This study is based on a non-random sample of the Venetian population from 1850 to 1869. The data for this analysis are drawn from the Venetian population register, which was established in 1850 and kept updated until 1869 (Derosas 1989). Furthermore, parish records of births, marriages and deaths have been used to integrate or control the data drawn from the population register. The great worth of population registers is that they allow a longitudinal approach at the individual level. As long as they remain under observation – i.e. they are members of the households selected in the sample – the life histories of individuals can be reconstructed and related to a variety of conditions that might have influenced their development (Alter and Gutmann 1999). Some of these conditions concern the individuals themselves, others regard the family, the household, and the wider community they belonged to. While some are not subject to change, many others, such as the composition of the sibling group or the economic conjuncture, undergo continuous modification along time.

3. The Study Areas.

The sample used for this research includes three different areas of the city: the two parishes of San Raffaele and Santa Eufemia, the latter in the island of Giudecca, and the Jewish Ghetto, at that time still inhabited almost exclusively by members of the Jewish community. The data set reconstitutes spans of the life course of 11,301 individuals, for a total of more than 118,000 person-years observed, with an yearly average of around 5,900 person-years. These three districts were amongst the poorest of the city; they were also quite different from each other as far as social and economic structures are concerned. Most inhabitants of San Raffaele were boatmen, fishermen, porters, and day labourers; many of the women worked as seamstresses or were employed in a tobacco factory located nearby. In 1869, 82 percent of the inhabitants were illiterate, by far the highest percentage in the city. Besides porters and boatmen, many inhabitants of Giudecca were employed in the island's small hemp and leather factories; almost 40 percent of the female population were employed as hemp workers, bead stringers, hat and glove makers, servants. The percentage of illiterates was 56. As for the Jewish population, the sample includes about 700 persons, less than one third of the Jews living in Venice at the time. These were by far the poorest members of the community, and were mainly unskilled labourers, peddlers, artisans, and small retailers. Although data on literacy are not available, their education was nonetheless much higher than that of their Catholic counterpart (Derosas 2000).

Tables 1 displays some descriptive measures of infant mortality, which was overall quite high. Females show a remarkable advantage in the neonatal period, progressively declining with age. Overall, male infant mortality was 12 percent higher than female. Social and cultural factors also played a relevant role in differentiating mortality rates. Among the children of day labourers infant mortality was 53 percent higher than for the children of the middle class. Day labourers include fishermen, boatmen, porters, and other unskilled workers who were generally hired for the day. The middle class is mainly formed by members of the petty bourgeoisie and white-collars. Although the social gap between boatmen, fishermen, and porters on the one hand, and white-collars or even factory workers on the other, may appear rather trivial, the corresponding differences in mortality rates were quite remarkable. Inequalities along the religious cleavage were even sharper, the mortality rate among Jewish children being less than half that of their Catholic counterparts. Actually, for the poorest Jews infant mortality was lower than for the better-off Catholics. As is well known, this was not at all a peculiarity of the Venetian situation. All over the world, in the 19th and, to a lesser extent, the 20th century, the Jewish communities enjoyed a similar advantage in terms of infant and child mortality, in comparison to the other ethnic or religious groups with whom they lived (see Derosas 2000 for a literature review).

Table 1: *Infant mortality by sex, social group and religion. Venice 1850-69*

	# births	1 st day	1 st week	1 st month	q ₀
Total sample	3801	31.8	77.9	131.0	263.6
Males	1970	37.6	84.8	140.1	278.2
Females	1831	25.7	70.5	121.2	248.0
<i>Males/Females</i>	<i>1.08</i>	<i>1.46</i>	<i>1.20</i>	<i>1.16</i>	<i>1.12</i>
Day labourers	1512	37.7	89.9	154.8	306.2
Wage earners	1127	30.2	79.0	126.0	253.8
Artisans, shopkeepers	897	27.9	63.5	111.5	219.6
Middle class	235	21.3	55.3	89.4	200.0
<i>Day labourers/Middle class</i>		<i>1.77</i>	<i>1.63</i>	<i>1.73</i>	<i>1.53</i>
Catholics	3450	34.5	84.3	140.6	277.7
Jews	351	5.7	14.2	37.0	125.4
<i>Catholics/Jews</i>		<i>6.05</i>	<i>5.94</i>	<i>3.80</i>	<i>2.21</i>

Table 2 shows some fertility measures. Interestingly enough, the Jewish fertility was slightly higher than that of the Catholics, notwithstanding their remarkable advantage in infant mortality. On the other hand, differences related to socio-economic status were more marked, both in length and intensity of the reproductive period.

Table 2: *Marital fertility measures by social group and religion. Venice 1850-1869.*

	Avg mother's age at		Birth	TMFR	TMFR ₂₀	TMFR ₂₅
	first birth	last birth	interval			
Total sample	25.6	40.6	29.3	12.0	7.9	5.2
Day labourers	25.4	40.4	28.8	10.2	8.4	5.5
Wage earners	25.9	41.3	27.5	8.7	7.1	5.2
Artisans, shopkeepers	25.1	40.6	30.1	9.0	6.8	4.7
Middle class	25.3	38.9	35.6	7.9	6.0	4.0
Catholics	25.6	40.6	29.4	11.9	7.9	5.2
Jews	25.9	40.9	28.5	-	8.1	5.4

Though the areas included in the sample cannot be considered as representative of the whole city, the Venetian situation in general was, nevertheless, not much better than that outlined above. In the 1880s, infant mortality rates were still around 20 percent, reaching new heights of 34.4 percent in 1889 and 31.3 percent in 1890, as a consequence of a smallpox epidemic. Though the rates subsequently fell, they remained over 20 percent until the end of the century. The mid-nineteenth century in particular was a period of great difficulty for the city. The revolution of 1848-1849 destroyed the modest economic recovery that was beginning after the long depression of the first decades of the century, and concluded with the disastrous cholera epidemic of 1849, when 3,839 people died. A dramatic economic crisis during the winter of 1853-1854 almost tripled the price of corn and resulted in another epidemic in 1854, during which a further 708 people died and infant mortality soared to over 40 percent. There were also other cholera outbreaks in 1855 and 1866 (Derosas 1999, 2002c).

4. Method and Models.

The following analysis adopts an Event History approach. More precisely, I will estimate different proportional hazards models using the semi-parametric method of the Cox regression.

The covariates in the models can be grouped into four different levels. The individual level concerns sex, mother's age at birth, and previous birth interval combined with the vitality of the previous born at the moment of conception of the index child. The family level includes the presence of parents and of grown-up siblings. The household level regards the socio-economic status, referred to the head of the household. Finally the community level includes ethnicity, current season, and current wheat price (logged). Wheat-price series have been drawn from local newspapers, and refer to the prices established every two weeks at the market of Legnago, one of the main corn markets of the region. These covariates refer to several different determinants of infant mortality, spanning from bio-demographic aspects to climatic and environmental conditions to economic and cultural factors. Each of these aspects has been the object of a large number of studies, highlighting their effect on infant and child mortality in historical and especially contemporary populations in developing countries. However, framing the analysis carried out here in the scholarly debate about any of this issues would require most of the space available. On the other hand, most of the covariates are self-explanatory. As mentioned above, rather than verifying some specific hypothesis, the purpose of this paper is to test whether these covariates affect differently the risk of death according to the various stages of infant life. I expect that while some factors will remain substantially unchanged throughout the whole period, others might change direction, and become protective or dangerous according to the particular age bracket considered. Even more interesting, it might be that some factors, while remaining ineffective when a longer age span is taken into account, display an important role in particular and more specific circumstances.

I will refer to three different segments of infant life, going from birth to the end of the first month, from the second to the sixth month, and from the seventh month to the end of the second year of life, roughly corresponding to the neonatal stage, the period of

breastfeeding, and the subsequent weaning and passage to mixed feeding or ordinary nutrition. The shortness of the breastfeeding period is based upon evidences provided by contemporary physicians, and confirmed by age-specific analyses of seasonal pattern of mortality. The second year of life is considered as equivalent to the second semester, as far as feeding and childcare are concerned. Overall, I assume that these different phases are characterised by specific risk profiles, which is indeed quite reasonable, not to say obvious. Nevertheless it is surprising that such consideration have not oriented analyses consequently.

5. Results.

I have estimated four models, one for each age group plus one for the first year of life as a whole, included for the sake of comparison. Results are displayed in Table 3. For each model, percentage distribution or average value, exponentiated coefficients and p-values are reported. I will necessarily restrict my comments to some essential remarks, focusing mostly on the differences highlighted by the segmentation adopted.

Conditions at birth have a strong impact on infant survival. The well-known advantage of females is clearly confirmed: the coefficient is significant only when the first year as a whole is considered, but remains rather constant throughout infant life. Mother's age at childbirth is also a powerful factor influencing mortality, largely documented in literature (Katwijk and Peeters 1998), with remarkably higher risks associated to deliveries taking place at 35 years or later. When one considers the pattern of delayed and prolonged fertility outlined in Table 2, its consequences in terms of excess mortality emerge clearly. Though this is already evident in Model 1, the effect of old age at childbirth is particularly strong in the neonatal period and mostly restricted to it. Interestingly enough, during the following 5 months (Model 3) younger mothers display a strong protective effect, which can be associated to better health conditions or less maternal depletion, particularly important during breastfeeding, when children depend almost entirely on maternal care. Birth spacing is also usually associated to maternal depletion. Somehow unexpectedly, however, we find here that a short birth interval affects the survival of the index child only when the latter's conception takes place after the death of the previous child. Also, such an effect is strongest in the neonatal phase, but keeps its influence throughout the whole period considered here (similar findings in developing countries in Alam and David 1998). Interpretations however are not straightforward, since birth spacing may be a proxy variable both of unobserved biological mechanisms and of maternal care-giving behaviours (Guilkey and Riphahn 1998). Anyway, it is important to highlight its relations with fertility. In fact, it has been shown elsewhere that an infant's death raises by 4.4 times the risk for its mother to undergo a new pregnancy within a year, while it has no effect in a longer time span (Breschi et al. 2000; see Park et al. 1998 for similar results). In this way a recursive process takes place, whereby an infant's death is soon replaced by the birth of a new child who is in its own turn most likely to die quite soon. Finally, also children of parity one show a remarkably higher risk of dying: being restricted to the neonatal phase, it seems reasonable to relate it to the inexperience of mothers in childrearing (Alam 2000).

Table 3: *Parameter estimates for Cox regression models of mortality, Venice 1850-69.*

	Model 1 (1-12 months)			Model 2 (1 st month)			Model 3 (2-6 months)			Model 4 (7-24 months)		
Covariates	Avg	R.Risk	p-val	Avg	R.Risk	p-val	Avg	R.Risk	p-val	Avg	R.Risk	p-val
Sex												
Male	51.1	1	(ref.)	52.1	1	(ref.)	50.8	1	(ref.)	51.1	1	(ref.)
Female	48.9	0.873	0.032	47.9	0.867	0.111	49.2	0.891	0.376	48.9	0.927	0.336
Mother's age at childb.												
25-30 years	23.2	1	(ref.)	23.0	1	(ref.)	23.4	1	(ref.)	23.4	1	(ref.)
< 25 years	19.4	0.838	0.096	19.0	0.962	0.798	19.2	0.643	0.056	21.0	0.907	0.422
30-35 years	21.1	1.011	0.916	20.6	1.110	0.476	21.2	0.955	0.820	20.6	1.054	0.659
35+ years	36.4	1.241	0.015	37.4	1.452	0.004	36.2	1.316	0.120	35.0	1.013	0.906
Previous birth interval												
> 2 years	32.5	1	(ref.)	33.2	1	(ref.)	32.7	1	(ref.)	30.6	1	(ref.)
< 2 years, child dead	20.6	1.575	0.000	21.9	1.622	0.000	20.8	1.496	0.018	18.8	1.325	0.011
< 2 years, child alive	23.3	1.141	0.148	23.3	1.084	0.539	23.9	1.038	0.842	23.5	1.103	0.381
First born	15.1	1.217	0.079	16.0	1.472	0.013	15.2	1.032	0.895	15.2	0.955	0.741
Unknown	8.4	0.784	0.133	5.6	0.730	0.242	7.5	0.950	0.862	11.8	0.956	0.773
Father												
Present	96.6	1	(ref.)	96.4	1	(ref.)	96.5	1	(ref.)	96.7	1	(ref.)
Absent	3.4	1.045	0.801	3.6	0.750	0.294	3.5	1.313	0.420	3.3	1.096	0.667
Mother												
Present	97.8	1	(ref.)	97.5	1	(ref.)	97.9	1	(ref.)	98.0	1	(ref.)
Absent	2.2	1.864	0.000	2.5	2.559	0.000	2.1	1.765	0.114	2.0	1.404	0.146
6+ year old brothers												
Absent	69.6	1	(ref.)	71.6	1	(ref.)	70.4	1	(ref.)	67.0	1	(ref.)
Present	30.4	1.134	0.114	28.4	1.321	0.013	29.6	0.977	0.888	33.0	0.923	0.419
6+ year old sisters												
Absent	68.5	1	(ref.)	70.6	1	(ref.)	69.4	1	(ref.)	65.9	1	(ref.)
Present	31.5	0.798	0.006	29.4	0.812	0.073	30.6	0.884	0.448	34.1	0.751	0.004
Head's SES												
Day labourer	39.2	1	(ref.)	39.7	1	(ref.)	39.5	1	(ref.)	37.5	1	(ref.)
Wage earner	29.5	0.823	0.010	30.0	0.859	0.151	29.2	0.897	0.481	30.1	0.644	0.000
Artisan, shopkeeper	23.9	0.763	0.001	24.0	0.812	0.081	23.8	0.817	0.242	24.5	0.717	0.001
Middle class	6.7	0.611	0.002	6.4	0.575	0.018	6.8	0.584	0.106	7.3	0.618	0.006
Unknown	0.6	0.847	0.664	n.i.			0.7	2.361	0.096	0.6	1.266	0.539
Wheat price (logged)	2.76	1.016	0.843	2.76	0.957	0.699	2.76	0.971	0.859	2.76	1.476	0.000
Current season												
Winter	23.9	1	(ref.)	23.5	1	(ref.)	23.5	1	(ref.)	24.8	1	(ref.)
Spring	24.3	0.822	0.019	26.1	0.752	0.008	22.4	0.770	0.162	24.1	0.898	0.390
Summer	25.3	0.629	0.000	27.1	0.254	0.000	25.9	0.842	0.331	24.9	1.835	0.000
Autumn	26.5	0.708	0.000	23.3	0.492	0.000	28.2	0.751	0.114	26.3	1.277	0.037
Ethnicity												
Catholic	89.8	1	(ref.)	90.5	1	(ref.)	89.6	1	(ref.)	88.9	1	(ref.)
Jew	10.2	0.461	0.000	9.5	0.286	0.000	10.4	0.505	0.023	11.1	0.574	0.001
Events	1005			505			241			654		
Person-years	3128			280			1313			4189		
Max log likelihood	-6761.66			-2774.76			-1882.26			-5095.34		
Chisq test of model	174.47			221.24			41.43			133.76		
df	21			20			21			21		
Overall p-value	0.000			0.000			0.005			0.000		

The composition of the household concerns only the presence of parents and that of siblings above 5 years of age, an arbitrary threshold marking the passage to late childhood. As one would expect, the absence of the mother is extremely negative for child survival. However its effect is very strong for neonatal mortality, where the link with maternal mortality is more direct, while becoming weaker afterwards and losing statistical significance. On the other hand, fathers turn out not to be relevant in child survival. Both results are consistent with similar findings for other historical settings (Reher and González-Quirón 2001). It should be mentioned, however, that the absence of the father has an indirect negative effect: in fact, I have shown elsewhere that for fatherless children the impact of socio-economic differences on infant mortality is much sharper than it is already for children in complete families (Derosas 2002a).

As for the presence of other kin, there is no evidence of any influence on child survival (Breschi et al. 1999). The only exception concerns grown-up brothers and sisters, though in opposite ways: while brothers have a negative impact on neonatal mortality, sisters display a protective effect in late infancy. A further aspect, not apparent here but explored much more in depth elsewhere (Derosas 2002b), is that the negative effect of older brothers is strictly sex-selective: interacting the gender of the index child with the presence of grown-up brothers, it turns out that the risk of neonatal death for females born in a family where such a brother is present is almost twice that of females where the latter is absent. On the other hand, the protection provided by sisters in late infancy is not sex-biased. Both results are important, since they concern the issue of maternal care and its influence on child health. Indeed, the positive effect of grown-up sisters can be easily attributed to the help in childcare they usually provided. Nevertheless, it is worth stressing the relevance of their contribution in terms of child survival, suggesting that if such a presence could make that difference, the material and emotional resources that mothers could devote to their children were rather limited overall. As for the excess female neonatal mortality related to older brothers, I interpret it as an evidence of a widespread resort to covert infanticide, adopted as a form of post-natal control of the size and composition of the offspring group. I have also shown elsewhere that the presence of grown-up children lowered significantly the risk of a new conception (Breschi et al. 2000). If this occurred anyway and the new baby was a female, some kind of gender bias induced a reduction or withdrawal of parental care whose outcome was easily the new-born's death. Unfortunately I cannot further substantiate my argument here (more details in Derosas 2002b). It is worth noting however that while a widespread resort to female infanticide by European populations in the past has been frequently suspected, no convincing evidence has been produced thus far: indeed, females display everywhere a lower infant mortality rate. This is however too rough an indicator. As the Venetian case suggests, a more refined analysis, properly focused on female neonatal mortality and offspring configuration, can support the infanticide hypothesis.

As mentioned already, socio-economic inequalities are clearly mirrored by mortality differentials. To some extent, the size of such differentials is somewhat surprising, since they relate to people who lived in the same neighbourhoods, and were certainly much closer in the social hierarchy than these figures seem to suggest. Indeed, the mechanisms which translated these social differences into so different mortality outcomes still need to be investigated. Though not unexpected, it is worth stressing that

social effect is strongest after weaning, whereas during breastfeeding maternal cares and milk represent a valuable buffer against the threats of the external world. A similar remark can be done about the effect of a short-term economic stress, as is expressed by a rise in the current price of wheat. While apparently infant mortality as a whole is not affected by wheat prices, late infant and early childhood mortality are, and also rather strongly. Again, however, the ways through which the economic conjuncture could concern child health are far from being clearly outlined.

The effects of climatic conditions, proxied here by current season, are on the contrary rather straightforward and well-known. As Model 1 shows and literature has already highlighted (Breschi and Livi Bacci 1986), winter was extremely dangerous for infant survival. However such a result is indeed a "misleading mean", hiding the radical changes which take place throughout infant growth. In fact, for new-borns wintertime is four times as dangerous as summertime; during breastfeeding, on the contrary, there is no evident seasonal pattern; finally summer becomes the most dangerous season after weaning, while winter and spring are now the safest ones. It is interesting to notice also that summer and spring cohorts have overall similar infant mortality rates. This similarity is however only apparent, being the outcome of two opposite factors: spring cohorts had a much higher neonatal mortality than summer ones, but were usually weaned before summer and were less exposed to gastrointestinal diseases associated to weaning; on the contrary, summer cohorts faced weaning in the hottest period and were much more likely to die by water-borne diseases (Breschi, Derosas, and Manfredini 2000). As a result, the excess neonatal mortality of spring cohorts is compensated by the excess post-neonatal mortality of summer cohorts: overall, the rates are the same, but patterns, paces, causes of death are largely different.

I have mentioned already the enormous importance of ethnicity as a powerful factor of mortality differential. This aspect has been the object of a specific study, whose results can only be shortly sketched here (Derosas 2000). Its most interesting outcome is that the mortality patterns of Catholics and Jews are amazingly similar, notwithstanding the enormous gap in mortality levels. In a way, this should not be really surprising, since both groups lived in the same urban area, at close contact with each other, and shared the same social setting, the same economic conjuncture, the same epidemiological environment, the same medical knowledge, to a large extent even the same demographic behaviour. More particularly, running separate models as those displayed in Table 3, we find exactly the same coefficients for Jews and Catholics: in both populations infant and child mortality were affected by the same factors, in the same way, and with the same (relative) strength. In sum, Jewish infants were exposed exactly to the same risks as the Catholics; only, their resistance to health-threatening conditions was much stronger. Although it is sad to have to resort to a kind of residual explanation, my hypothesis is that the Jews were less vulnerable because they enjoyed cares, attentions and perceptions for their health and wellbeing that in Catholic families were usually and largely lacking. Indeed, such an attitude was deeply rooted in Jewish culture and is widely documented in literature (Marks 1994), as well as a kind of fatalism and passivity is typical of Catholic popular culture, in the past or even in contemporary populations, especially in conditions of dire emiseration and social destitution (Scheper-Hughes 1992). In a way, therefore, this aspect is coherent and complementary to the interpretation of infanticide outlined above.

6. Conclusions.

Each of the topics mentioned in this paper would require a much more detailed and careful analysis than it was possible to develop here. In many cases they have been already the object of specific studies, cited throughout the paper and shortly summarised; other aspects – in particular the important one concerning the interplay of social status, economic conjuncture, and mortality outcome – still need further investigation. Rather than carrying out a systematic analysis of the determinants of infant mortality, however, my main purpose was to suggest that distinguishing the different phases of infant growth can enhance significantly our understanding of its mechanisms. Indeed, highlighting the age-specific effect of the covariates taken into account can turn out to be extremely revealing of patterns otherwise difficult to acknowledge. This is the case of climate or, more unexpectedly, of the composition of the sibling group and its possible relation with infanticide. It is also the case of the similarity of mortality patterns of Jews and Catholics, which allows to rule out most of the explanations, such as prolonged breastfeeding, usually put forward about the Jewish advantage in infant and child mortality.

It goes without saying that infant mortality can be broken into further, smaller pieces. For instance, it would be interesting to carry out specific analysis by cause of death. The more complex and refined our approach, the deeper our understanding of its specific components. This seems particularly important as it comes to the interpretation of the mortality transition. What were the determinants most involved in the reduction of mortality, is a question which still requires careful investigation. Indeed, some scholars argued that several, distinct and rather independent transitions have taken place, varying in time and pace (Condran 1987).

Such a question goes far beyond the purpose of this paper. By way of conclusion, I would rather notice that for sure, while stressing the importance of decomposing infant mortality, I do not mean to suggest that the search for a more general interpretation is to be abandoned. On the contrary, the different pieces, once properly acknowledged, should be hopefully recomposed into a more coherent and solid framework. In the Venetian case, such a framework seems to concern the primacy of cultural factors in determining mortality levels and differentials. For decades, the debate on mortality transition has stuck to the dichotomy opposing "better nutrition" to "public health measures". Our results suggest a different point of view, showing that a large share of mortality in the past was rather due to behavioural factors. The difference in Jewish and Catholic infant mortality rates is just the most obvious and convincing example of such a prominence of culture above material conditions and external constraints. The same could be said about climate: as foreign visitors often complained, the Venetian populace did not seem to care at all about heating, since they used to spend most of their time outdoor: as a result, those who were obliged to stay at home, the new-borns and the elderly, died disproportionately during wintertime (Derosas 2002c). At a closer look, even many of the biological predispositions to death, such as mother's age or birth interval, were in fact only partly biological, as the Jewish example once more shows.

The "fatal years", as Preston and Haines (1991) refer to infancy and early childhood, were certainly fatal because of the enormous toll they paid to death; but they were not at

all fatal, in the sense that they were not really unavoidable, if not in the framework of the culture where they happened. Correspondingly, one can hardly understand the causes of the decline in infant mortality if not in the framework of a deep cultural change, which made child survival not only technically achievable at much more satisfying rates, but also shared as a primary goal by the majority of the population, and especially by mothers. Unfortunately, understanding the role of culture in demographic behaviour has always proven to be a very difficult task. Hopefully, the analytic approach proposed here will be of some help for that purpose.

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