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Research Article

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Abstract

OBJECTIVE
The aim of this article is to investigate the parallel decline of early baptism and early mortality at the beginning of the demographic transition in a European high-neonatal mortality context.

METHODS
We use an individual-nominative linked database of 33,000 births and 10,000 deaths for 11 parishes in the province of Padua (northeast Italy) from 1816 to 1870. We utilize life tables, logistic regressions, and two-level logistic regressions, including characteristics of the family.

RESULTS
Life tables and regression models show that during the winter, the association between early baptism and the risk of death is pronounced. The connection persists also during the summer, when the exposure to low temperature could not influence the risk of death, and a reverse effect could prevail. (Children *in periculo mortis* were immediately baptized.) Family behaviours influence both early baptism and early death.

CONCLUSIONS
The data shows clearly that those social groups and families and those areas experiencing the most intense decline in early baptism were also those in which mortality during the first three months of life declined more. However, it is not true that – as suggested by commentators at the time – the strong statistical connection between the two events was just a direct one, with cold exposure exacerbated by early baptism increasing the risk of dying from hypothermia or respiratory diseases.

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CONTRIBUTION

We first show that in the province of Padua during the central part of the 19th century (1816–1870), there is a clear and strong statistical connection between the decline of early mortality and the decline of early baptism. Second, we try to disentangle the meaning of this connection.

1. Introduction

The aim of this article is to investigate the parallel decline of early baptism and early mortality at the beginning of the demographic transition in a European high-neonatal mortality context.[4] We analyse individual-nominative linked archives of births and deaths within the first month of life in the province of Padua, in the Veneto region (northeast Italy), in the central part of the 19th century (1816–1870). During this period in Padua and its surroundings, the risk of dying within the first week of life declined from 140‰ to 70‰, and also the proportion of children baptised in the first two days of life halved, dropping from 70% to 35% (Figure 1).

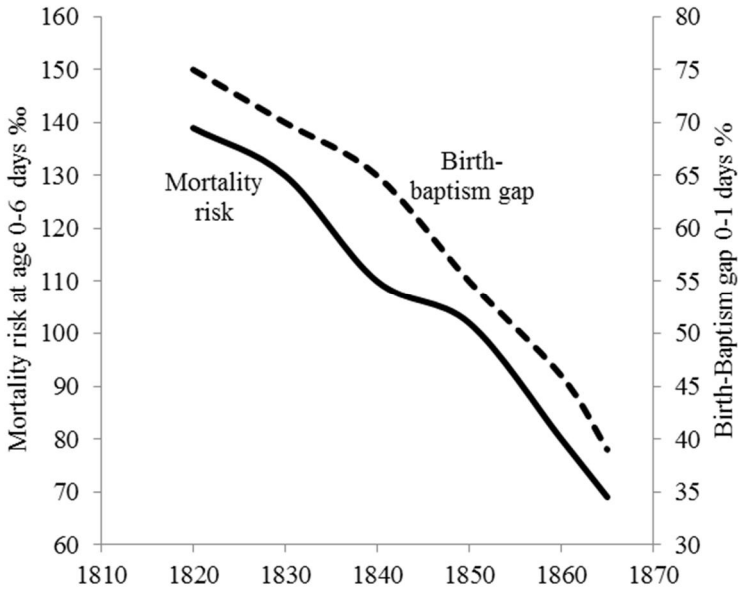
This statistical connection could be due to direct, reverse, and/or spurious factors. Firstly, a direct effect could be surmised, as being baptised at a very young age exposes infants to additional mortality risks, especially in winter. Many historical sources confirm a widespread awareness – among intellectuals – of the risks related to the habit of bringing a child to the church in the first days of life, especially during winter (Gourdon 2006). Already in the 18th century, a physician of Verona, Giovanni Verardo Zeviani, author of a dissertation on *Le numerose morti dei bambini* ("The numerous deaths of children") published in 1775, mentioned cold as "the most common and deadly" cause of death, mainly because of the habit of bringing "to the Holy Font the newborn; this is extremely harmful and dangerous for them, even when applying the greatest care to avoid these sad consequences."[5] In 1826, Giovanni Contarini, a Venetian government adviser, wrote a report to Vienna indicating that, among the leading causes of death of children, "the very special cause, perhaps the one which causes most deaths, is the fatal practice of carrying the child on the first day or on the day after birth, from the father's house to the church to be baptised (…); inasmuch as the church, especially in the countryside, is far away and (inasmuch as) the child is

[4] In this paper we use the following definitions: 'neonatal mortality' (first month), 'early mortality' (first three months), and 'infant mortality' (first year).

[5] "Al Sagro Fonte bambini di fresco nati; che questo è per essi di grave danno e pericolo, per quante cauzioni si adoprino a prevenire tristi effetti" (Zeviani 1775: 50, our translation).

usually insufficiently protected."[6] A monograph of the *Inchiesta Agraria Jacini* (a nationwide survey of the conditions of agriculture commissioned by the Italian parliament, published in 1884) for the province of Treviso (a few kilometres from Padua) states: "Infant mortality is frequent, not only because of the ignorance of mothers, but also the habit of taking the children to the Church during the raw winter. In many places the church is two or even three kilometres away from the [newborn's] house."[7]

Figure 1: The parallel decline of early baptism and mortality during the first week of life in the province of Padua (northeast Italy) 1816–1870



Source: our calculation on CHILD database.[8]

[6] "La specialissima causa, quella che cagiona forse la maggiore mortalità, è la fatalissima pratica di trasportar il bambino nel primo giorno o nel giorno appresso della nascita, dalla casa paterna alla chiesa per essere battezzato, e ciò tanto nell'inverno e con il gran freddo, come nell'estate sotto la sferza di un ardentissimo sole; quantunque la chiesa sia specialmente nelle campagne, molto distante quantunque il bambino si ordinatamente mal difeso" (quoted from Residori 1984: 30, our translation).

[7] "La mortalità dei bambini è frequente non soltanto per l"ignoranza delle madri, ma anche per l"uso di portare i neonati al battistero nel crudo inverno. In molti siti la distanza della casa dalla chiesa è di due, persino tre chilometri" (quoted from Lazzarini 1983: 219, our translation).

[8] The data of these 11 parishes belongs to a wider sample of 46 parishes of the provinces of Padua, Venice, Treviso, Vicenza, and Verona, for a total of 157,000 births and 62,000 deaths at age 0–4 years (Piccione

The association, however, could also be the reverse: It may have been that many children were baptised immediately when parents or other adults involved in childbirth perceived that the child was in danger. This determines a sort of frailty effect (Vaupel, Manton, and Stallard 1979; Aalen 1994): Infants who were presumed to be unlikely to survive were baptised very early, mostly on the first day of life. For children who appeared healthy, there was less urgency. The implication is that infants baptised very early could be on average less robust than those baptised later in life. This probably happened in England during the 17th and 18th centuries (see note 13), but also the case of Battaglia (a parish in the province of Padova), presented in Figures 2 and 3 (below), could be indicative of this phenomenon. Moreover, in the registers of births, it is common to find notes like 'baptised in the womb,' 'baptised before birth,' 'baptised by the midwife,' and so on for children baptised the day of their birth (and often of death). Death without baptism was seen as exposing children and the family to undue spiritual danger (more details in the next section).

Finally, there could be other variables that change over time, related to the decline in neonatal mortality and/or to the increase of the birth–baptism gap. Consequently, the statistical relationship highlighted by Figure 1 may, at least in part, be spurious.

The aims of this article are (1) to describe the relationship between the decline of early baptism and neonatal death in the province of Padua from 1816 to 1870 and (2) to try to disentangle the direct, reverse, and spurious effects. After a brief historical overview of the practices of baptism in Western Europe and a review of the change in the birth–baptism gap and the connection with neonatal deaths in England, France, Italy, and Veneto during the 18th and 19th centuries, we explain the data and methods used. Then, we describe the changes in the course of 55 years (1816–1870) of early baptism and early mortality. Finally, through the use of life tables and logit regression models, we try to answer our second specific research question.

Before achieving our goals, we must take into account a possible alternative interpretation of Figure 1. The parallel decline of the two indicators of early baptism and early deaths might, in fact, be an artefact: If birth–baptism intervals are getting longer, and if more children die without being registered by the priests, neonatal mortality could automatically seem to decline. This could be a sort of extreme frailty effect, as the infants included in the analysis (i.e., the baptised children) could be selected for being robust, as the least robust were more likely to die before they could be baptized. This selection was dramatic in London during the late 18th century. There, a dramatic lengthening of the birth–baptism interval was associated with apparent growing numbers of stillborn burials, and with private baptisms (Boulton and

2016). Data has been collected, registered and linked during the last 10 years, when the project CHILD (Collecting Habsburg Information on Life and Death) was developed at the Dept. of Statistical Sciences, University of Padua (Italy).

Davenport 2015). Also, in our sample, a few children were baptised at home by parents or midwives, although exclusively in situations of emergency as the Catholic Church forbade private baptism in any other instance. Others died without baptism. However, both emergency baptisms and deaths without baptism were systematically reported by a priest in the civil register of births (see the next section). Moreover, the proportion of stillbirths, here defined as the newborns who were registered as dead on the day of birth (about 2% to 3% of the total of the registered births in the province of Padua), did not receive baptism and had no name did not change over the time span from 1816 to 1870. (See Appendix.)

2. Baptismal practices in Western Europe: Ecclesiastical rules and real practices

2.1 Evolution of ecclesiastical rules

In the Christian world, at the beginning of the 19th century, baptism was celebrated for religious reasons during the first days or weeks of a child's life. The presence of a nonbaptised child or of a nonpurified new mother was believed to have a strong negative influence on the life of the child and the whole family. Only the rite of baptism could restore the purity of the household. If a child died without baptism, it was believed that the child could not enter heaven, while their spirit would remain in the house, bringing bad luck to the entire family and community.

However, these beliefs have not always been the same during the Christian era, and the meaning assigned to the baptism and the rules governing the rite of baptism have also changed over the centuries. In the early centuries of Christianity, it seems that there were only two days on which baptisms were celebrated: the two Saturdays preceding Easter and Pentecost. We are sure that this was the case from the 3rd century, and that exceptions were made only for baptisms celebrated *in casu necessitatis*, that is, when the recipient was at risk of death (Torquebiau 1937: 164). This practice was seemingly well suited to a period in which baptism was administered to adults but was progressively abandoned as infant baptism became more and more common. In Italy, infant baptism was the standard from the 5th century, at least in the cities (Cattaneo 1975). A vestige of this standard still survives in the rule of the Catholic Church that, whenever possible, adults are baptised in the days preceding Easter or Pentecost.

During the Middle Ages, delay in baptism came to be seen as exposing children to undue spiritual danger. Charlemagne (742–814) ruled that infants had to be baptised *infra annum* (within a year of life), while adults could only be baptised on the two aforementioned days, except for emergencies. Thereafter, the most common practice

seems to have been to baptize infants of about one month, but reducing the delay if they were born close to Easter or Pentecost in order to take advantage of those solemn occasions. In the last centuries of the Middle Ages, many councils, synods, and theologians used the formula *quamprimum* (as soon as possible) to indicate when a newborn should be baptised (Bellamy 1932: 276; Corblet 1881–1882, t.1: 493).

For the modern Catholic Church, it was the Council of Trent (1545–1563) that consolidated rules about baptismal delay. Confronted with the Protestant Reformation and with opinions favourable to adult baptism, the Church reaffirmed that baptism was to be administered to infants. It also reiterated the prescription that it must be celebrated *quamprimum*. Fifty years later, the *Rituale Romanun* (published in 1614), which regulated how rituals were to be performed according to the Tridentine prescriptions, required the newborn to be brought to Church for baptism *quamprimum*.[9] From the point of view of official Catholic prescriptions, no change in this rule is found in the following centuries, as the Code of Canon Law of 1917 still stated that "Infants have to be baptised *quamprimum*; and priests and preachers must frequently remind the faithful of this important obligation."[10] It is possible that the mention of the need to remind parents that they should bring their children to church for baptism as soon as possible reflected a change in practice, which the Catholic Church was trying to contain.

The *quamprimum* formula allowed some space for interpretation, however. Following the Council of Trent, more detailed formal rules were introduced. As soon as the Council ended, Archbishop Carlo Borromeo presided over the First Provincial Council of Milan (1565), whose 'Constitutions' and 'Decrees' circulated widely across Catholic Europe and were extremely influential (Alfani 2009: 101–102). Regarding the delay of baptism, the Milanese council stated that it was to be celebrated within eight days of birth (Alfani 2009: 134). Elsewhere in Europe, even stricter rules were found. For example, the Synod of Paris of 1673 established a limit of just three days, and the same was true in the French province of Narbonne after 1609. In France, the lay authorities also tried to ensure that baptism was not delayed: A royal ordinance of 1698 decreed that baptism must take place within 24 hours of birth (Alfani and Gourdon 2012b: 40–41).[11]

[9] "Opportune Parochus hortetur eos, ad quos ea cura pertinet, ut natos infantes sive baptizandos, sive baptizatos quamprimum fieri poterit, et qua decet Christiana modestia, sine pompa et vanitate deferant ad ecclesiam, ne illis Sacramentum tantopere necessarium nimium differatur cum periculo salutis, et ut iis, qui ex necessitate privati baptizati sunt, consuetae caeremoniae, ritusquae suppleantur, omissa forma, et ablutione", *Rituale romanum. Editio princeps (1614)*. Libreria Editrice Vaticana, Roma, 2004: 7–8.

[10] "Infantes quamprimum baptizentur; et parochi ac concionatores frequenter fideles de hac gravi eorum obbligatione commoneant." Codex Iuris Canonici, Typis polyglottis vaticanis, Rome 1917, can. 770: 225.

[11] Generally, Protestant churches were less strict than Catholic churches regarding delay of baptism, but nevertheless all early modern European populations seem to have favoured immediate baptism; see Alfani and Gourdon 2012a for some examples and see the following sentences on England.

It is important to make one final observation about the norms attempting to limit the delay of baptism. They should not be seen as an attempt on the part of the Catholic Church to change behaviour (as it tried very actively to do, especially after Trent, with respect to other practices; see Alfani 2009 for examples). Their aim was simply to prevent deviant cases, since the dominant practice, from the late Middle Ages at least, was to baptize children very soon after birth, given that baptism was considered a necessary condition to ensure spiritual salvation (Le Goff 1982; Prosperi 2005).

The situation might have changed by the late 19th century. While the Church was, for a period at least, stubborn in defending the *quamprimum* principle, many doctors began to stress the dangers of early baptism (see also the above quotations in notes 2–4). The Church also participated in the change in the culture of caring for babies, now confirmed by the following findings. In the course of systematic research on moral casuistry in use in the diocese of Padua during the first half of the 20th century, Dalla-Zuanna (2010) came across a case of delayed baptism, discussed by the priests in the course of one of their regular meetings. The official position of the diocese was that "baptism should be administered within the first two to three days, and absolutely no later than the eighth day." However, it was also stated that "baptism could be administered in private houses not only if the child was in danger of life, but even to avoid any danger caused by the baptism in the church, like that of taking a disease."[12] So even if the norm of early baptism is confirmed, at the beginning of the 20th century in Padua, for the church authorities, attention to the health of the child outweighed the need to bring the child to church for baptism.

2.2 Empirical findings in Europe and Italy

The ecclesiastical rules discussed in the previous section were applied by the Catholic Church. The Churches prevalent in Christian countries other than Italy may not have followed these or similar rules, or the way in which the rules were actually applied might have been different from one country to another, independently from the Churches being considered.

As a matter of fact, empirical studies on the long-term birth–baptism gap in Europe show important differences, both in time and in space. Let us consider some examples from England, France, Italy, and the Veneto region. In their seminal article on this topic, Berry and Schofield (1971) show that in England, between the 16th and the beginning of 19th century, the interval between birth and baptism grows progressively, disregarding the requirements of the Church of England, which in 1549 decreed that baptism must be administered on the Sunday following the birth, while in 1662, the rule

[12] Bollettino della diocesi di Padova 1917–1918, 194–197, our translation from Latin.

became a little less compelling: "the first or second Sunday next after the birth." As stated in the first part of Table 1, in the last decades of the 18th century, these rules were widely disregarded by more than three-quarters of couples, and more than half of English children born at the beginning of the 19th century and included in the sample of parish of Berry and Schofield were baptised after the first month of life.[13]

In France couples had to pay a fine if they did not bring the child to be baptised in the church within 24 hours of birth, following the royal bill of 1698. Blayo and Henry (1967: 106–108) show that from 1740 to 1792, in the northwestern French regions of Bretagne and Anjou, the law was strictly respected, as 99% of children were baptised on the day of birth or the day after. The situation changed after the Revolution (1789) and the laicisation of the Civil Status (1792). In Paris the changes – already begun in the first half of the 19th century – accelerated considerably in the second half, so much so that in 1887 baptism in the first week of life was the exception, while in the 1850s it was still the rule (Gourdon 2006, see Table 1).

In Italy as a whole – although the available data is fragmentary – it seems reasonable to state that during the 18th century and in the first decades of the 19th century, early baptism was the norm, and late baptism prevailed much more slowly than in France, not to mention England. In the town of Teramo (in the Abruzzo region in central-southern Italy, the Kingdom of Naples), between 1637 and 1730, the birth–baptism gap narrowed in accordance with the requirements of the Council of Trento, rewritten by diocesan synods. Consequently, from 1700 to 1730, more than half of baptisms took place on the first day of life, 90% within the first three days, and less than 1% of children were baptised after the first week of life (Basilico 2010). The same author shows that, at the beginning of the 18th century, the proportion of infants baptised in the first few days of life was even higher in two little towns not far from Teramo (Monsampolo del Tronto, in the Papal State, and Mosciano Sant'Angelo, in the Kingdom of Naples). In Rome in 1831, 66% of baptisms were on the day of birth or the next day, and 99% were within the first three days (Table 1). In the following decades, things started to change, especially after 1870, when Rome became the capital of Italy and there was a growing opposition to the Pope (Gourdon 2006).

[13] These results for England are confirmed by other authors (for a review, see Dewhurst and Hinde 1996; see also Boulton and Davenport 2015). Moreover, there were several nonconformist churches in England by the 19th century, some of which practiced adult baptism. With regard to our article, the most interesting result is the narrowing of the gap between birth and baptism in years of bad harvests and epidemics, demonstrating the fact that – in England as in Veneto – parents accelerated the timing of baptism when they perceived risks for the life of the child.

Table 1: Comparative quartiles of distribution of birth–baptism gap (in days) in England 1650–1812, the city of Paris 1824–1887, the city of Rome 1831–1879, and the province of Padua 1816–1870

	25%	50%	75%	Semi inter-quartile range	N. of parishes
England (the median parish)	a	b	c	(c–a)/2	
1650–1700	2	8	14	6	23
1771–1789	16	26	38	11	21
1791–1812	22	30	64	21	32
The city of Paris					
1824–1828	0–3	0–3	4–7	---	---
1855–1858	0–3	0–3	15–30	---	---
1887	8–14	>30	>30	---	---
The city of Rome					
1831	0–1	0–1	2–3	---	14
1851	0–1	2–3	2–3	---	15
1861	2–3	2–3	2–3	---	15
1869	2–3	2–3	4–15	---	16
1872	2	4	6	4	24
1879	4	6	10	7	18
The province of Padua					
1816–1825	0	1	2	1	11
1826–1835	0	1	2	1	11
1836–1845	0	1	2	1	11
1846–1855	1	1	3	2	11
1856–1865	1	2	5	3	11
1866–1870	1	3	8	4	11

Sources: England: Berry and Schofield 1971; Paris: Ratcliffe 1998 quoted by Gourdon 2006; Rome: Gourdon 2006; Padua, our elaboration on CHILD database.

The last part of Table 1 – where we anticipate some of our results – shows that during the period from 1830 to 1870 the situation of the province of Padua is virtually identical to that of Rome: Around 1831, more than half of children were baptised in the first two days of life, and less than 1% of baptisms took place after the first month of life. As in Rome, changes began to occur during the 1840s, and in the five-year period between 1866 and 1870, more than a quarter of baptisms in the province of Padua were administered after the first week of life.

2.3 Early baptism and early mortality

Some authors have focused their attention on the connection between death and baptismal practices in several areas of Christian Europe (see, e.g., Jones 1980). However, in an extended essay on baptism in Rome and Paris during the 19th century, Gourdon (2006) does not observe a strict relationship between the expansion of the birth–baptism gap and the decline of mortality in the first months of life. According to

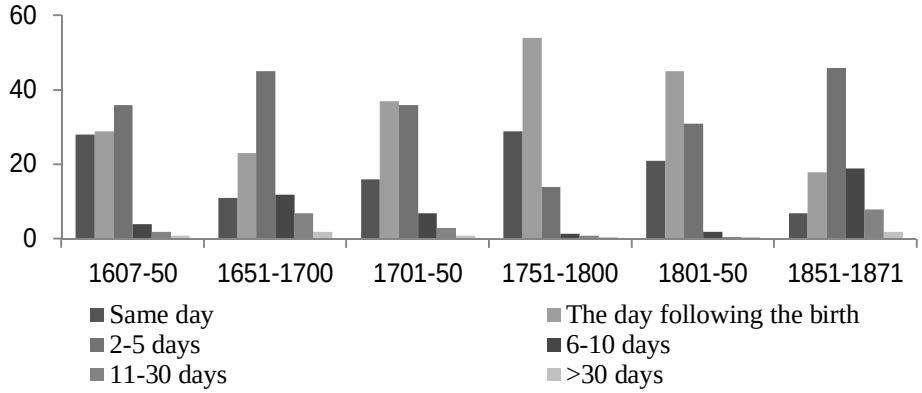
Gourdon, the rejection of the ecclesiastical prescriptions on the birth–baptism gap is due, rather, to the transformation of the functions of baptism: from an exclusively religious and 'magical' act (to save the child's soul and protect the child and the family from disease and ill omen) to a rite of admission of the child into the family and into society. This change could only be indirectly connected to the probability of the baby's survival.

The empirical results of some case studies in Veneto were not totally homogenous, although in most cases a statistical association in the same direction of our data has been observed. Residori (1984), studying the village of Dueville (in the province of Vicenza), discovered that the percentage of baptisms performed on the first day of life decreased from 36% during the period between 1824 and 1833 to 25% between 1880 and 1889, without any change in the mortality rate. On the other hand, Boatto (1998), by comparing data from San Stino di Livenza (in the eastern part of the province of Venice) in the periods 1816 to 1820 and 1846 to 1850, points out a decrease in infant mortality (from 219‰ to 167‰) together with a remarkable decrease in baptisms performed on the first day of life. Also Zannini and Gazzi (2003), analysing data from the parish of Seren del Grappa (near Feltre, in the pre-Alpine region), proved that the mid-19th century was a turning point for both the decrease in neonatal mortality and the end of the practice of baptising on the first day of life.

For the rural parish of Battaglia (15 km south of Padua), we have long-term data for both neonatal mortality (1664–1871) and the birth–baptism gap (1607–1871). The proportion of baptisms in the first two days of life grows significantly in the 100 years from 1750 to 1850, exceeding 80% of total baptisms, just when mortality in the first month of life doubled, exceeding even 250‰ in the 1800s (Figure 2 and 3).[14]

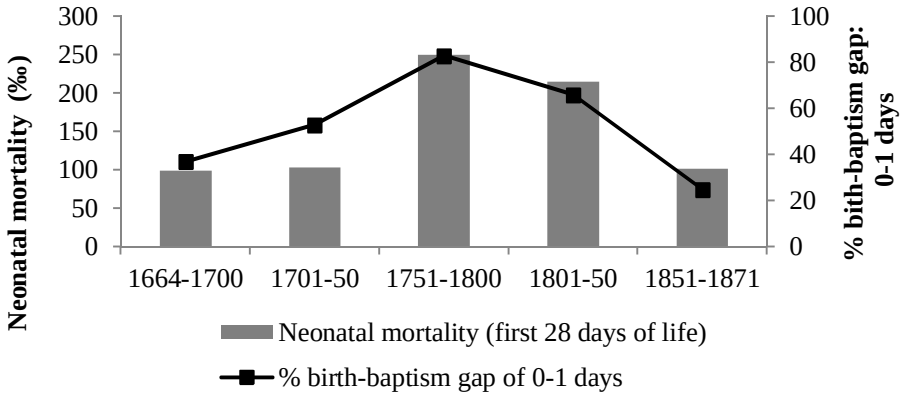
[14] The secular trend of neonatal mortality observed in Battaglia (Figure 3) is similar to that of many parishes of Veneto. (For an extensive description, see Dalla Zuanna and Rosina 2011.) In the middle of the 17th century, infant mortality (during the first year of life) in this region began to increase, starting at 250‰ around 1650, and rising to 350‰ from 1750–1850 – one of the highest levels ever recorded for an extended period in a region of modern Europe. By the early 1900s, however, it had steadily dropped to 150‰, the lowest level among all Italian regions. These peculiar swings attracted the interest of Italian scholars working on the end of the old demographic regime and the first steps of the demographic transition in Italy (Derosas 2002, 2009; Dalla Zuanna and Rosina 2011; Rosina and Zannini 2004; Pozzi 1991; Piccione, Dalla-Zuanna, and Minello 2014). These swings in infant mortality were due to the increase or reduction of winter mortality during the first month (neonatal mortality). From 1750 to 1850, winter neonatal mortality was three to four times higher in Veneto than in other areas with similar winter temperatures (such as England). The exceptional winter neonatal over-mortality – mainly during January and February, when the risk of death was almost double that of the summer period – justifies the need to focus on neonatal mortality in Veneto, both to search for evidence in support of the impact of the season and also to verify the incidence of other factors, such as baptismal practices and related social norms.

Figure 2: Birth–baptism gap in the parish of Battaglia (province of Padua), 1607–1871 (% baptisms)



Source. Furegato 2007. Based on parish registers.

Figure 3: Neonatal mortality and birth–baptism gap in the parish of Battaglia (province of Padua), 1607–1871 (% baptisms), 1664–1871 (deaths)



Source. Furegato 2007. Based on parish registers.

3. Data and variables

3.1 Data

We focus on 11 parishes in the province of Padua, in the central part of the region of Veneto (Table 2).[15] At least one parish for each district of the province is included, excluding the district of Conselve. For the vast district of Padua (one-third of the population of the province in both censuses of 1857 and 1871) we have considered four parishes representing the city (Santa Sofia and Eremitani), the hinterland (Chiesanuova), and the countryside (Casalserugo). The district of Este is represented by two small parishes: Valnogaredo and Faedo. The parish of Pontelongo represents the two neighbouring districts of Conselve and Piove di Sacco.[16]

As we want to build representative mortality indicators of the province of Padua, it is necessary to weigh the data, given that the number of births in our database is not always proportional to the number of inhabitants of the respective district. For example,

[15] During the time considered, Veneto was first a region of the Habsburg Empire (1816–1866) and later became part of the Kingdom of Italy (1866–1870). Earlier, at the time of the Napoleonic Empire and during the last decades of the Republic of Venice (which fell in 1797), this area was economically and socially underdeveloped. During the Habsburg period a new impulse overtook the region: The new administration accomplished new public works, rail and road transport, and reclamation of wetlands. However, this was not sufficient to significantly improve the social conditions and the lifestyle of the local population, especially in rural areas, due to land organisation and severe taxation. Land organisation was based on medium and large estates assigned through sharecropping, rent, or a mix of the two. The landscape of the region was therefore characterised by large arable fields cultivated with cereals, flanked by rows of vines interspersed with elms, ash, walnut, and cherry trees (the so-called *aratorio arborato vitato*, Scarpa 1963). Between the 17th and the 19th centuries the cultivation of silkworms was introduced. It allowed the proliferation of small mills for silk processing mainly based on home work of women (Lazzarini 1981). Producing maize and wine to pay high rents to owners also meant limiting the surface devoted to meadow. Consequently, another major characteristic of Venetian agriculture in the 19th century was a shortage of fodder for animals, a phenomenon further worsened by the increase in population after the recovery from the last great plague (1630). This Malthusian factor contributed greatly to maintaining the area and its population in a state of backwardness: the lack of sufficient resources to feed the animals continued to encourage the tendency to produce "more *polenta* and less meat" (Lazzarini 1981: 88). About agrarian innovation and Malthusian dynamics in northern Italy during the Modern period, also see Alfani 2013.

[16] From the geographical viewpoint, the rural parishes included in the analyses are mostly homogeneous, in completely flat country, with the exception of Valnogaredo and Faedo, which are in the Euganei Hills (100–400 meters above sea level). The southern part of the province (the districts of Este, Montagnana, Conselve, Monselice, and Piove di Sacco) was characterised by more extensive cultivation, the presence of wetlands, and a larger proportion of daily workers. In the northern part of the province (the districts of Cittadella and Camposampiero) there are numerous rivers and springs: the abundance of water greatly encouraged the monoculture of maize. The economic landscape of the city of Padua was mainly based on traditional crafts and commercial activities, as modern industrial development started only in the middle of the century. In 1850, the old walls built in the middle of 16th century still marked the boundaries with the country: the parish of Chiesanuova – located only a couple of kilometers from the city walls – was composed almost entirely of peasants (see the following Table 3).

the District of Este had, in 1871, 12.1% of the inhabitants of the province of Padua, while the number of total births registered in the two parishes of Faedo and Valnogaredo – here representing the Este district – are just 5.9% of the total births registered in the 11 parishes in Table 2. The simple weighting technique is analytically described in the footnote of Table 2: For Este the weight is the ratio 12.1/5.9=2.051.

Our analysis has been developed using unpublished nominative data, part of the CHILD project. The data has been collected from civil registers of parochial archives from 1816 to 1870. During the Austrian Empire and the first five years of the Kingdom of Italy, parish priests doubled as civil officers, paid by the state. They were supervised by the district and provincial authorities, as evidenced also by the frequent stamps on the pages of the preprinted registers. These civil registers and/or their copies – not to be confused with the less structured traditional ecclesiastic registers that continued to be filled by the priests – are preserved (in single or double copy) in the parish archives and/or in the diocesan archive. Looking at the registers, it can be noticed that – depending on the parish and/or the priest who recorded – the sequence of the registrations can follow either the temporal order of births, or that of baptisms, or both. For our purposes, this is not an issue of concern as in the registrations of birth the date of birth and the date of baptism are practically always present if the child survived or if the child died after the first day of life.

The records from the registers of births include the following information: date of birth; name and surname of the child; names, jobs, and date of marriage of mother and father; and date of the child's baptism. Records from registers of deaths include: name and surname of the deceased, age at death, job of the deceased (or of the father, in the case of the death of children), date and place of death, and cause of death. This information makes it possible not only to analyse some determinants of neonatal mortality but also to investigate in depth the effect of the delay between birth and baptism on the risk of dying during the first days of life.

Table 2: Data collection and weight coefficient in the 11 parishes of the province of Padua ([a])

Parish	District	Years		Type of record (children born 1816-1870)			Population of the area in 1871		Births	Weight
		First	Last	Births Bi	Deaths 0-4 year	Deaths 0-4 year %	Ni	Ni/N	Bi/B	Ni/N / Bi/B
San Giorgio delle Pertiche	Camposampiero	1816	1870	2,985	1,190	40	37,331	0.102	0.089	1.146
Onara	Cittadella	1816	1870	2,522	962	38	32,528	0.089	0.075	1.187
Eremitani	Padua (city)	1817	1870	4,392	2,204	50	44,607	0.122	0.282	0.433
Santa Sofia	Padua (city)	1816	1870	5,030	1,875	37				
Chiesanuova	Padua (hinterland)	1816	1870	3,591	1,389	39	21,500	0.059	0.107	0.551
Casalserugo	Padua (country)	1818	1867	2,409	1,117	46	61,294	0.168	0.072	2.333
Pernumia	Monselice	1816	1866	4,609	2,085	45	31,947	0.088	0.138	0.638
Faedo	Este	1817	1890	1,247	535	43	44,092	0.121	0.059	2.051
Valnogaredo	Este	1816	1859	721	350	49				
Pontelongo	Piove di Sacco – Conselve	1816	1866	3,749	1,822	49	58,623	0.161	0.112	1.438
Urbana	Montagnana	1817	1866	2,204	1,030	47	32,508	0.089	0.066	1.348
Total	---	---	---	33,459	14,559	44	364,430	1.000	1.000	1.000

([a]) In order to have representative data for the province as a whole, we calculated the following weights: Wi = Ni/N / Bi/B, where i is the district or the sub-district (only for the big district of Padua), Ni the population at the Italian census of 1871 (the first available of good quality) in the district or sub-district i, Bi the number of children born in the parish(es) belonging to the district (or sub-district) i from 1816 to 1870, N the population at the census of 1871 in the province of Padua, and B the number of children born in the 11 parishes from 1816 to 1870 (see Table 2). For calculating weights, the number of children born during the last years in Casalserugo, Pernumia, Valnogaredo, Pontelongo, and Urbana has been estimated, since data for these parishes is not available for the complete period from 1816 to 1870. These weights have been assigned to each of the 33,459 birth records. The distribution by district of the population of the province of Padua is similar, considering both the Italian Census of 1871 and the Habsburg Census of 1857. To the best of our knowledge, before 1857 data on population or births by district is not available. In this weighting procedure, we prefer to use data of the Italian census of 1871 as good quality data have been published by municipality and sub-municipality. This choice allows us to calculate separate weights for the three components of the district of Padua (city, hinterland, and country).

Each death registration has been connected with the corresponding birth registration through the following linkage keys: name and surname of the child, name of the father, and name and surname of the mother. The link has been made easier by the availability of information about the age of the children at death, as recorded by the parish priests. This information is quite reliable, especially for children who died within the first months of life (Dalla-Zuanna and Rossi 2010). Thanks to this procedure, it has been possible to compute the real number of days of life of the child and the gap between birth and baptism. The quality of linkage is good, as already tested in a previous article on six parishes throughout the region (Piccione, Dalla-Zuanna, and Minello 2014). For information on quality of data on the 11 parishes here analysed, see Appendix.

3.2 Variables

In this article we consider the following information included in the registers: sex; socioeconomic condition; dates of birth, baptism and death; parish of birth/death; and season of birth.

Sex. The proportion of male (52%) and female (48%) births is the usual one for human populations, suggesting the absence of a systematic gender discrimination in the registrations.

Socioeconomic condition. The socioeconomic condition of the child is obtained from the information about the occupation of the father as indicated in the register of births or, if absent, in the register of deaths (Table 3).[17] Although Bengtsson (1999) criticizes this variable as an indicator of the level of well-being of the family, it is often adopted in those contexts that aim to establish a connection between economic conditions and child mortality (Watterson 1988, Fure 2002). The occupation of fathers has been divided into seven categories: farmers (mainly peasants, tenant farmers), craftsmen and laborers, merchants, employees or civil servants or skilled workers or well-to-do (labelled from now on "employees")[18] servants, landowners, and unknown. The last category – "unknown" – includes those occupations that are impossible to classify and missing values. We referred to this classification for two reasons. First, this is the most suitable classification for the social context of Veneto during the 19th century: It includes, in fact, the most diverse and relevant occupations and related social

[17] When both pieces of information are available, we check if the job of the father is the same in the birth and in the death registration. In the great majority of cases, they correspond. When they do not, we use the job recorded in the registers of birth.

[18] We collapsed all these categories into one for two reasons: firstly because the life standard of these categories, despite some differentiation, is definitely distinct from that of the other considered categories, and secondly because of the scarce number of cases.

groups. Second, international classifications of occupations (like HISCO) are still not available for the Italian context, and hardly reliable for the data we are studying. Most of the occupations are reported in our registers using dialect and obsolete terms, difficult to recode following the international standards. Due to the characteristics of the area, most of the fathers of the newborn are farmers (66%, excluding unknowns), 10% are craftsmen and laborers, and 8% are merchants. Only 2% of fathers were employees, only 2% servants (mainly in the urban houses), and 5% land owners (who, mainly in the rural parishes, were usually farmers with a small or very small property). Unfortunately, it is not possible to divide farmers into subcategories (distinguishing between day labourers, landless rural workers, tenants, sharecroppers, and small owners, etc., as suggested by Lazzarini (1983), because the priests almost always use the term "villico" (farmer), without further specification.[19] The category of unknown occupations (7% of the sample) includes many parents of stillborn babies (i.e., children with the same date of birth and death, and without date of baptism). Priests sometimes recorded stillbirths only in the register of deaths (as explained before, in these cases in which we had to reconstruct a "birth registration"), often without indicating the occupation of the father. The main differences by parish are clearly related to rural/urban location, with an almost total absence of farmers in the two urban parishes.[20]

[19] As this data comes from birth registrations, it could be that some groups are over/under-represented if there are fertility differentials by social status. However, a preliminary analysis shows that natural fertility was the norm in each social class. In the multivariate analyses we reduced the categories into: farmer, craftsmen and laborers, merchant, employee and civil servant, servant, land owner, and missing.

[20] Some differences between the country parishes are not easy to interpret. It could be that – with the exception of Urbana – the owners of a small estate were usually classified as farmers. In the case of Pontelongo – even if the local chronicles suggest an economy mainly based on agriculture, just as in the other country parishes of the sample – it could be that many farmers who integrated land income with other occasional manual jobs or small individual commerce were not classified as farmers. Finally, although the categories employee (including civil servants, skilled workers, and well-to-do), servant, and landowner are little represented, especially in the country parishes, their total numbers are large enough to include them in the analysis as specific or collapsed groups.

Table 3: Children born 1816–1870 in 11 parishes of the province of Padua, classified by occupation of the father. Row %

Parish	Farmer	Craftsman	Merchant	Employee	Servant	Landowner	Unknown	Total (a.v.)
San Giorgio d. P.	78	6	5	1	0	6	4	2,985
Onara	98	0	1	0	0	0	1	2,522
Eremitani (urban)	13	29	29	8	9	2	10	4,392
Santa Sofia (urban)	1	31	25	13	14	8	8	5,030
Chiesanuova	82	9	2	0	0	4	3	3,591
Casalserugo	80	6	5	4	2	2	1	2,409
Pernumia	43	9	4	0	0	2	42	4,609
Faedo	81	1	0	0	0	8	10	1,247
Valnogaredo	96	0	0	0	0	1	3	721
Pontelongo	47	20	21	2	2	4	4	3,749
Urbana	73	4	3	0	1	17	2	2,204
Total (weighted)	66	10	8	2	2	5	7	33,459
Total *(absolute value)*	22,083	3,346	2,677	670	669	1,673	2,342	33,459

Dates of birth, baptism, and death. The time between birth and baptism has been computed with great precision thanks to the use of month century coding and the presence of date of birth and date of baptism in the registers. Intervals considered are defined as follows: 0, when the day of birth is the same of that of baptism (32%), 1 if the child was baptised the day following birth (39%), 2 if the lapse is of two days (11%), and so on with three (7%), four (6%), and five days (5%). Stillbirths and children who did not receive baptism have been excluded in the present analysis (see Appendix).

Parish of birth/death. The characteristics of the different parishes have already been described in previous tables and paragraphs. Here we underline the different dimensions of the parishes, from Santa Sofia (5,030 births, 15% of the sample) to Valnogaredo (721, 2% of the sample). Data from Valnogaredo has been integrated with that of Faedo (totalling 1,968 cases) to represent the district of Este. Other parishes vary from 2,000 to 4,000 cases. (For more details see Table 2.) Consequently, the weighting procedure is essential for obtaining information about the whole province of Padua without over- or under-representing any local situation.

Season of birth. Months have been grouped using the division also applied during the 19th century in the Preparatory Acts of the Austrian Land Register (*Atti preparatori del Catasto Austriaco*). December, January, and February have been considered winter months; March, April, and May spring months; June, July, and August summer months; and September, October, and November autumn. This distinction overlaps the so-called meteorological seasons. As is common, during the old regime, births were not equally distributed by season: Most children were born during spring (31%), the seasons with the lowest levels of births were autumn and winter (22%), whereas 25% of children were born in the summer.

Second-level variables: The family is our second level of analysis for multilevel models (see the following section). Using the name of the mother, father, and date of

their marriage, we reconstructed family units and classified each record as belonging to a family. In our multilevel analyses we used only families with at least two children. The gap between birth and baptism is included as the median among birth–baptism gaps of children of the same parents. In this multilevel model we also included as a first-level (individual) variable the difference between the individual birth–baptism gap and the median gap between birth and baptism of the children with the same parents. We consider the gap from the median as <0, 0, or >0.

4. Methods

To analyse the relationship between early baptism and early survival, we use the season of birth and the cluster of children of the same parents as differential clues.

During the warm season, the connection between the birth–baptism gap and the probability of dying during the first weeks cannot be due to cold.[21] The direct effect of early baptism on early death should be strictly linked to temperature, being absent in summer, reaching its maximum level during the winter months. On the other hand the reverse effect – due to the habit of early baptism practiced *in casu necessitates* often at home by the midwife for children born in a critical situation – should not significantly change with the season during the period from 1816 to 1870, being mainly linked to endogenous risk of death. Finally, other variables, not measurable with our dataset, could influence both early baptism and survival, determining a spurious statistical association (spurious effect), that could interact with external temperature. Although our data does not allow us either to calculate analytically or to isolate these three components of the statistical connection between early baptism and early death, running our models separately for each season, we distinguish between a statistical association in the case of presence (winter) or absence (summer) of the direct effect.

Moreover, clustering the data by couple, we measure the connection between the baptismal behaviour of the couple and the neonatal mortality of their children. We

[21] The mean of minimum temperatures in Padua during the period from 1816 to 1870 were 19.8° in June, 19.8° in July, and 18.7° in August (our calculation with daily data published by Camuffo and Jones 2002). In contrast, during the cold season the mean of minimum temperatures in Padua from 1816 to 1870 were 1.8° in December, 0.3° in January, and 2.1° in February. Beyond normal short-term fluctuations, no clear trend can be seen over minimum temperature or the average winter temperatures between 1816 and 1870 (Camuffo and Jones 2002). See Dalla Zuanna and Rosina (2011), who analysed in detail the close connections between winter outside temperature and risk of neonatal mortality in the parish of Casalserugo (10 km far from Padua). It may be possible that hot temperatures were also dangerous for newborn babies (see also note 4). However, in a careful regression analysis of the effect of daily temperature on daily risk of death at age 0–4 years in the same parishes considered in this article, Piccione (2016) shows that high external temperatures do not increase the risk of dying in the first days and months of life. On the other hand, at age 1–4 (i.e., after the weaning), during summer the higher the daily temperature, the higher the probability of death.

observe that, net of all considered variables, couples who tend to increase the interval between birth and baptism for their children are those whose children have a greater chance of survival during the first days and weeks of life. This statistical connection may be partially due to the reverse effect, as some women are subject to high risk of death for all their children for endogenous reasons. However, the behaviour of couples who decide to postpone the baptism of all their infants could also be important, identifying part of what we have called spurious effect.

The detailed analysis is the following: Firstly, in a preliminary analysis we calculate the probability of dying during the first month in the province of Padua and the distribution of births by birth–baptism gap, showing the trends from 1816 to 1870 by sex, season, occupation of father, and parish.[22] Secondly, we calculate the life table during the first month of life according to the day of baptism, for children born in winter or summer.

Thirdly, we use a discrete time setting in order to recognize the effect of changes over time, using a time-varying variable that identifies the days after baptism. We organize our data, splitting each record in a number of rows equal to the number of days lived, in this case after the day of baptism. In this case, we consider every single day lived as a distinct observation, stopping our analyses 28 days (one month) after the birth, since we think that the effect of early baptism, if existent, will affect the children mainly in the first month of life.

Our aim is to measure the effect of the day of baptism on the risk of survival, controlling for the strong effect of age. Each child enters in the dataset at baptism and exits either at death or censoring, with a number of rows equal to the number of days lived after baptism, for a maximum of 28 rows/days (if baptised at day 0 and survived until the day 27). The age (in days) is time varying, from the age at baptism to the age at death or to the age 27 days, if censored. The gap birth–baptism is time-fixed, i.e., the same for each row of the same child. Finally, the response variable is 0 (alive) or 1 (died) (see Table 4).

A child baptised on day 4 who lived beyond day 27 will be represented by 24 rows, i.e., one for each day of his/her first month of life after the day of baptism. The age in days is time-varying (from 4 to 27), the gap between birth and baptism is time-fixed (in this case 4), and the value of the response variable is always 0. Table 4 shows two other cases: child 1, who was baptised on day 4 and died on day 6, and child 2, who was baptised immediately and died on the first day of life (the day 0).

[22] This article does not give particular emphasis to mortality differences by sex, birth order, and gap from the previous births, although in contexts close to ours these variables proved to be significant (see, e.g., Derosas 2002 and 2003). As results will show, premature mortality is systematically higher for males, while the birth–baptism gap does not change between boys and girls. Differences by birth-order and birth-gap will be analysed in further research.

Table 4: Organisation of the database: two examples

Child	Age in days	Died	Birth–baptism gap
1	4	0	4
1	5	0	4
1	6	1	4
2	0	1	0

Our sample includes all the children who survived after baptism. We excluded stillbirths, i.e., the children with missing information about the date of baptism and who died on the same day of birth or who were baptised but defined by the priest as stillbirths. This choice should not interact with the possibility of analysing the decline of neonatal mortality, as the proportion of stillbirths does not change during the period from 1816 to 1870 (see Appendix).[23]

We run eight logit regression models on the person-period dataset described above, where the response variable is death (yes/no in the period of time considered). The first model L_1 includes all the covariates: age (time varying), parish, season of birth, job of father, decade of birth, and sex. In the second model L_2 we add the gap between birth and baptism, as a time-fixed variable. The following four models are similar to L_2, but stratified by season of birth (L_{WI}, L_{SP}, L_{SU}, L_{FA}), in order to observe the connection between birth–baptism gap and survival in absence or at different levels of the presence of the effect of the external temperature on the risk of dying.

In the model L_{ML} we restrict the dataset, selecting only the births with at least one sibling (identified using the name of father/mother and the day of marriage), and performing a two-level model, with the child as the first level and the couple as the second level. In order to distinguish between the couple effect and individual effect of early baptism on the risk of early death, the birth–baptism gap is included as both couple-variable (the median among birth–baptism gaps of siblings) and birth-variable (the difference between the individual birth–baptism gap and the just-defined median gap).[24] Both indicators are then used to study the variability of the individual response.

[23] In our sample there are very few cases of children who died before receiving baptism surviving for more than a day. We tend to consider these cases to be the result of an error in the transcription of the information rather than real cases of omission of baptism.

[24] For an extensive description of the technique of centering predictor variables in multilevel models, see Paccagnella (2006) and Enders and Tofighi (2007). Including in the model as explanatory variables both the mean (or median) value and the individual value (rather than the difference between individual value and mean (or median), the estimations of regression coefficients are systematically biased, as the two explanatory variables are systematically correlated. In this paper we use the median rather than the mean as family indicator because in some families there are sparse high values of the birth–baptism gap. (For example, consider the sequence 0, 0, 1, 1, 43 for five children of the same couple: In our opinion, the median 1 represents the family behaviour in a better way than the mean 5, and the differences between the individual birth–baptism gap and the median gap –1, –1, 0, 0, 42 represent the individual specificity in a better way than

If the clustered model increases the statistical performance of the individual model, and if the family-level connection between birth–baptism gap and the risk of dying is statistically significant, we test the importance of the unmeasured characteristics of the couple in contrasting neonatal mortality.

Finally, we fitted a last model L_{INT}, where age (as a discrete variable from 0 to 27 days) and the birth–baptism gap (as a discrete variable from 0 to 5 days) interact. The aim of this last model is to describe analytically how the risk of death changes with the birth–baptism gap, net of all other measurable characteristics.

5. Results

5.1 Preliminary analysis

The mean conditional probabilities of death on each day (excluding children without the indication of baptism, see Appendix) in the period from 1816 to 1870 in the province of Padua was greater than 30‰ in the first day of life, nearly 20‰ in the next six days, more than 10‰ in second week of life, and then it decreased steadily until it was less than 1‰ during the second and third months of life (Table 5).

While the probability of dying during the first day of life remains consistently high and broadly constant for most of the period, mortality in other age groups considered here begins to decrease during the 1830s. The decline during the first week of life (excluding the first day) is impressive: In the five years from 1866 to 1870, the probability of death is half compared to the 20 years from 1816 to 1835. This decrease was largely responsible for the sharp decline in the proportion of children who did not survive the first three months of life (from 310‰ between 1816 and 1835 to 200‰ between 1866 and 1870).[25]

the differences between the individual birth–baptism gap and the mean gap –5, –5, –4, –4, 38.) If the number of siblings is a pair, the median is calculated as the mean of the two values including the median.

[25] Table 5 shows a slowdown or an inversion of early mortality decline between 1846 and 1855 due to a mortality crisis between 1848 and 1849, strictly connected to the war that troubled the Veneto region (and a large part of Europe). Generally speaking, the CHILD archive may be useful for studying the effect on children's survival of the outbreaks of some important epidemics, often characterised by strong seasonal connotations.

Table 5: The mean conditional probabilities of death on each day during the first three months (‰) by decade in the province of Padua, weighted data, 1816–1870 (*)

Days	1816–1825	1826–1835	1836–1845	1846–1855	1856–1865	1866–1870	Total
0	37.9	38.6	35.7	39.3	33.9	30.3	34.0
1–6	22.7	21.4	18.6	17.2	13.3	11.1	18.3
7–13	13.6	13.1	11.3	12.5	8.5	9.7	11.7
14–20	4.5	4.7	3.7	4.3	3.2	2.7	4.0
21–27	2.2	2.1	1.6	2.5	1.5	1.3	1.9
28–89	0.9	0.7	0.6	0.7	0.6	0.6	0.7
Total 0–89	3.5	3.5	3.0	3.1	2.5	2.3	3.1
% of children dead during the first three months	31%	31%	27%	28%	22%	20%	28%
Number of births	6,001	6,119	6,174	5,777	5,881	2,579	32,541

(*) Only the children with both the day of birth and baptism are included.

The trends in birth–baptism gap from 1816 to 1870 are not very different from what we observed for early mortality, excluding the first day of life (Table 6). A certain lengthening is observed already by comparing the first three decades, but starting in the 1840s things changed more rapidly. Baptisms celebrated in the first two days of life, which were more than seven out of ten in the decade from 1816 to 1825, became less than four out of ten from 1866 to 1870. Conversely, baptisms after the 11thday of life, virtually absent in the first decade, were almost 18% in the last five years.

Table 6: Births by birth–baptism gap and period in the province of Padua, weighted data (column %)

	1816–1825	1826–1835	1836–1845	1846–1855	1856–1865	1866–1870	Total
Same day	34.1	32.9	28.7	23.2	21.1	16.4	27.4
Day following birth	39.5	35.6	35.4	33.0	26.0	22.4	33.4
2–5	20.1	22.9	24.7	27.8	29.8	29.1	25.3
6–10	4.1	5.8	6.9	9.4	13.3	14.0	8.2
11–30	1.3	2.2	3.2	5.5	8.5	14.3	4.8
>30	0.3	0.6	1.1	1.1	1.4	3.8	1.1
Total *(absolute value)*	6,001	6,119	6,174	5,777	5,881	2,579	32,541

The decline in early mortality is not the same for all groups (Table 7). The most interesting differences are by parish of birth and season. The trend of mortality is different if we look at the different groups. For example, although the trend by parish of birth is essentially declining for all the groups especially from the decade 1846 to 1855,

some parishes experience greater decline than the others. This is the case for Onara, Pernumia, Faedo, and Urbana. With regards to the season of birth, the relative decline of early mortality from 1816 to 1870 is similar in winter (–39%), spring (–33%) and autumn (–35%), whereas it is moderate in summer (–9%). The absolute decline is strong in winter, strong in spring and autumn, and moderate in summer.

Table 7: Percent of children deceased during the first month, by period and other characteristics. Province of Padua, weighted data

	1816–1825	1826–1835	1836–1845	1846–1855	1856–1865	1866–1870	Total
Sex							
Male	28	29	27	29	23	20	27
Female	27	27	253	25	18	16	24
Occupation of father							
Farmer	24	26	24	24	20	19	23
Craftsman and labourer	23	22	19	24	17	17	20
Merchant	25	25	23	25	21	15	23
Employee	22*	15*	20	28	21	19*	21
Servant	22	23	23	23	17*	22*	22
Land owner	17*	27	26	22	21	18*	23
Missing	53	51	57	53	32	17*	49
Parish of birth							
San Giorgio d. P.	23	21	20	22	15	17	20
Onara	26	31	21	22	17	13	22
Santa Sofia	18	22	20	20	14	13	17
Eremitani	26	26	25	27	20	19	24
Chiesanuova	21	23	22	22	18	17	21
Casalserugo	32	30	31	34	30	26*	31
Pernumia	38	39	35	32	22	not avail.	33
Faedo	41	38	43	36	27	26*	36
Valnogaredo	36	35	31	31	25*	not avail.	33
Pontelongo	29	28	24	27	23	not avail.	26
Urbana	36	37	34	32	21	not avail.	30
Season							
Winter	46	49	46	45	37	28	44
Spring	27	27	27	28	20	18	26
Summer	11	12	10	12	9	10	11
Autumn	26	27	25	24	18	17	23
Birth–baptism gap							
Same day	40	44	43	48	38	39	43
Day following birth	28	27	26	25	20	18	25
Day 2	17	21	19	21	16	17	19
Day 3	19	16	14	14	12	17	15
Day 4	12*	14	13*	17	14	12*	14
Day 5	6*	18*	9*	15	9	11*	12
TOTAL	28	28	26	27	21	18	25

(*) Number of death < 40

In each decade mortality sharply decreases with an increasing gap. This is in part obvious, as those baptised on day i^{th} must have survived the previous days. The

mortality by birth–baptism gap does not change much over the 55 years considered here: Even this preliminary analysis suggests that the sharp decline in early mortality is due to changes in composition according to the birth–baptism gap, rather than the decline of mortality of children with equal gap.

Table 8 shows how the practice of baptising a child immediately after birth evolved over time, in different categories. From 1816 to 1870 there were large differences in early baptism among farmers compared to all other categories: In 76% of cases, farmers brought the child to the church on the day of birth or the day after. This occurred only in 25% to 47% of births for all other couples (with the exception of missing, which almost overlaps with farmer).

Table 8: Percent of children baptised within the first two days of life, by period and other characteristics. Province of Padua, weighted data

	1816–1825	1826–1835	1836–1845	1846–1855	1856–1865	1866–1870	Total
Sex							
Male	73	68	64	56	48	40	61
Female	74	69	65	57	46	38	61
Occupation of father							
Farmer	83	83	79	73	64	56	76
Craftsman and labourer	56	44	36	29	21	17	35
Merchant	47	39	32	23	24	15	31
Employee	48	37	29	25	12*	12*	27
Servant	47	28	26	15*	12*	12*	25
Land owner	48	56	50	48	37	29*	47
Missing	82	73	80	76	62	51	74
Parish of birth							
San Giorgio d. P.	78	78	74	67	47	46	67
Onara	95	94	90	88	84	71	88
Santa Sofia	28	21	10	6	4*	5*	14
Eremitani	29	29	21	17	12	13	20
Chiesanuova	69	51	40	32	24	17	39
Casalserugo	88	83	68	65	49	38	69
Pernumia	86	72	78	83	76	no avail.	79
Faedo	88	91	92	93	69	64	85
Valnogaredo	84	93	91	80	65*	no avail.	85
Pontelongo	81	72	61	52	55	no avail.	64
Urbana	96	95	75	81	66	no avail.	80
Season							
Winter	73	70	65	57	53	41	62
Spring	77	72	68	62	51	44	65
Summer	73	66	63	54	44	38	59
Autumn	70	65	59	51	41	33	56
TOTAL	74	68	61	56	47	37	60

(*)Number of children baptised within the first two days of life < 40

In addition, the decline of early baptism starts later among farmers than in other categories, and at the end of the period considered here the level of early baptism is

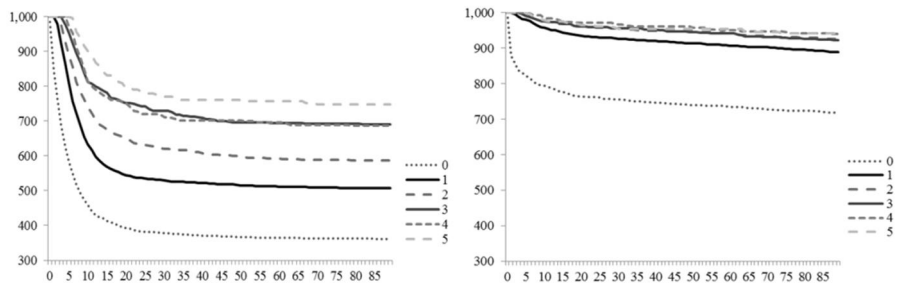
higher among farmers than the level observed among other couples 50 years earlier. With regard to other features considered here, the decline of early baptism is evident in every parish. However, differences across parishes can be noticed by comparing the city of Padua (Santa Sofia and Eremitani) and the hinterland parish of Chiesanuova with other parishes, where the frequency of early baptism was lower than in other parishes.

5.2 Life tables

Figure 4 shows the daily survival function of life tables during the first three months of life according to the day of baptism, for children born in winter or summer. This helps to clarify the enormous influence that the external temperature had on the survival chances of infants: Children born in winter and baptised on day 5 had the same chance of reaching their 90th day as children born in summer but baptised on day 0 (approximately 700‰).

Moreover, among those born in summer, there is much lower survival among children baptised on the first day of life (day 0), while only a slight disadvantage for children baptised on day 1 is observed. Among those born in winter, however, things are different as all the curves are well apart from each other (with the exception of those baptised on days 3 and 4).

Figure 4: The daily function lx of the life table by day of baptism, during the first three months of life; children born in winter and summer baptised during the first six days of life. Province of Padua, weighted data



Winter *Summer*

5.3 Logit regression models

When the birth–baptism gap is included as a covariate, the performance of the logistic model greatly improves (Table 9).[26] Moreover, the connection between the risk of dying during the first month and the time period is weaker in model L_1 than in L_2, if we look at the last ten year periods: From the statistical viewpoint, most of the decline of mortality in the first months of life during the period from 1856 to 1870 is absorbed by the decline of the practice of bringing children for baptism immediately after birth, and if the birth–baptism gap is included in the model, a declining trend of the ORs persists only for the children born in fall and winter.

Also the association between father's occupation and mortality is influenced by inclusion in the model of the birth–baptism gap. When the gap is included, all odds ratios compared to farmers are higher in L_2 than in L_1. This is because farmers continued to baptize early for a much longer time.

The spatial variability of early mortality is lightly mitigated if the birth–baptism gap is included in the model (the coefficient of variation between the odds ratios of the 11 parishes declines from 0.316 to 0.289). Moreover, the ORs of the two urban parishes (Santa Sofia and Eremitani) and the rural parishes of the district of Padua-(Chiesanuova and Casalserugo) increase in L_2 compared to those in L_1, while those of all other rural parishes decrease. Since these four parishes were the first to experience the practice of waiting a few days before baptising children (Table 9), this is additional evidence of the close statistical association between early mortality and early baptism.

In contrast, the association between early mortality and season does not change whether the birth–baptism gap is included or not in the model. This result is a clue to the presence of a spurious link between the decline of early baptism and early mortality (i.e., the fact that both phenomena are due also to other factors): If early baptism meant only increased exposure to cold temperatures, then its inclusion should "mess up" even the association between season and early mortality, but this is not the case.

[26] Models L_1 and L_2 are nested, and so the difference between the two LR reported in the last lines of Table 8 is distributed as a $Chi^2(5)$. This difference is 1,959, strongly significant from the statistical viewpoint ($p = 0.000$).

Table 9: Logit regressions modelling the risk of dying during the first 30 day of life in province of Padua. Odds ratio (OR) reported with p-value

	L_1		L_2		L_{WI}		L_{SP}		L_{SU}		L_{FA}		Multilevel L_{ML}	
	OR	P (*)	OR	P	OR	P	OR	p	OR	p	OR	p	OR	p
Birth–baptism gap (2)													MEDIAN	
0			2.835	0	1.845	0	2.801	0	8.372	0	3.267	0	3.480	0
1			1.794	0	1.393	0	1.754	0	4.286	0	1.968	0	1.899	0
3			0.765	0	0.705	0.001	0.798	0.009	0.953	0.853	0.817	0.164	0.723	0.003
4			0.760	0.001	0.676	0.001	0.725	0.046	0.694	0.267	0.672	0.029	0.694	0.001
5			0.637	0	0.643	0.005	0.677	0	1.039	0.901	0.520	0.005	0.622	0.001
Age in days	0.946	0	0.914	0	0.894	0	0.911	0	0.955	0	0.930	0	0.931	0
Gap from median (0)														
< 0													3.162	0
> 0													0.768	0.004
Parish (San Giorgio delle Pertiche)														
Onara	1.276	0	1.052	0.526	1.324	0.032	1.001	0.993	0.620	0.004	1.050	0.698	0.738	0.007
Eremitani	1.489	0	1.911	0	2.745	0	1.593	0.003	1.402	0.084	1.649	0.002	2.582	0
Santa Sofia	0.784	0.002	1.098	0.311	1.245	0.118	1.471	0.014	0.659	0.071	0.878	0.526	1.382	0.007
Chiesanuova	1.121	0.637	1.436	0	1.801	0	1.398	0.008	1.071	0.736	1.077	0.611	1.307	0.029
Casalserugo	1.963	0	2.021	0	3.548	0	2.005	0	0.903	0.659	1.539	0.002	2.104	0
Pernumia	0.819	0.014	0.769	0	1.156	0.298	0.768	0.027	0.433	0	0.618	0.001	0.463	0
Faedo	2.005	0	1.867	0	4.372	0	1.927	0	0.514	0.010	1.292	0.122	1.588	0.001
Valnogaredo	1.679	0	1.623	0	3.844	0	1.298	0.072	0.698	0.217	1.539	0.044	1.682	0.005
Pontelongo	1.468	0	1.451	0	1.690	0	1.303	0.028	1.012	0.993	1.501	0.003	1.415	0
Urbana	1.893	0	1.694	0	3.182	0	1.931	0	0.721	0.047	1.102	0.588	1.749	0

Table 9: (Continued)

	L_1		L_2		L_{WI}		L_{SP}		L_{SU}		L_{FA}		L_{ML}	
	OR	p (*)	OR	P	OR	p	OR	p	OR	p	OR	p	OR	P
Season (Winter)														
Spring	0.479	0	0.491	0									0.486	0
Summer	0.197	0	0.205	0									0.202	0
Autumn	0.412	0	0.460	0									0.454	0
Job of father (Farmer)														
Craftsman/ labourer	1.062	0.103	1.211	0	1.234	0	1.234	0.013	1.226	0.074	1.115	0.278	1.080	0.220
Merchant	1.193	0.001	1.395	0	1.426	0	1.365	0.002	1.501	0.007	1.244	0.043	1.135	0.022
Employee	1.074	0.399	1.176	0.089	1.256	0.075	1.065	0.638	1.313	0.382	1.047	0.813	1.173	0.312
Servant	1.178	0.048	1.351	0	1.308	0.035	1.603	0.001	1.211	0.480	1.094	0.627	1.227	0.069
Land owner	1.042	0.555	1.123	0.064	1.114	0.268	1.162	0.149	1.270	0.208	0.928	0.622	1.023	0.194
Missing	3.842	0	3.431	0	2.966	0	4.201	0	2.741	0	3.342	0	3.967	0
Decade of birth (1816–1825)														
1826-1835	1.048	0.263	1.087	0.018	1.144	0.016	1.049	0.436	1.069	0.532	1.091	0.222	1.030	0.034
1836-1845	1.009	0.287	1.077	0.044	1.102	0.108	1.110	0.040	0.966	0.770	1.034	0.528	1.132	0.527
1846-1855	0.991	0.072	1.106	0.007	1.108	0.096	1.167	0.016	1.245	0.059	0.985	0.830	1.079	0.150
1856-1865	0.775	0	0.876	0.026	0.789	0.044	0.934	0.308	1.000	0.999	0.783	0.010	0.823	0.052
1866-1871	0.774	0	0.891	0.047	0.811	0.031	0.907	0.816	1.139	0.422	0.891	0.404	0.858	0.149
Sex (Male)														
Female	0.926	0.001	0.928	0.001	0.975	0.037	0.882	0.003	0.801	0.002	0.962	0.467	0.932	0.017
Number of observations	544,274		544,274		98,984		176,532		149,491		112,967		489,326	
LR Chi^2 (Degrees of freedom)	6,715 (26)	0	8,674 (31)	0	2,766 (28)	0	2,191 (28)	0	910 (28)	0	1,098 (28)	0	5,857 (33)	0

L_{ML} : Number of groups 4,825. Number of units per group: Minimum 2, Medium 4.1, Maximum 17
(*) p=0 means that p<0.001

The colder the season, the weaker the statistical association between birth–baptism gap and the risk of dying before the first month of life (compare the four logistic models for children born in the four seasons). This result must be read together with the one illustrated in Figure 4. During the summer – even if the probability of early death is much lower than in winter – the relative mortality difference between children baptised on the first day and subsequent days of life is much broader than in winter: The ratio between the probability of dying before the end of the third month for children baptised on the first day and that of all other children is 2:1 in winter and 3:1 in the summer. Since in the summer there cannot be a direct effect of temperature on the risk of early death, the result of L_{SU} confirms the possible presence of the spurious effect and especially the reverse effect, namely the fact that many children were baptised just after birth because in danger of death.

Concerning the common individual variable (parish, season, occupation, period, and sex), the results of multilevel model L_{ML} are not very different from the ones of simple model L_2. However, both the median couple gap and the individual gap are strongly associated with the risk of dying. This means that the parents who delay (or anticipate) the moment of baptism tend to do it for all their children, and that the link between early baptism and early death is statistically strong at the couple level as well. This last result is a clue about the spurious effect, i.e., the fact that there are latent variables that act at the level of couple, influencing both the abandonment of early baptism and the increase in early survival for newborns.

Finally, Table 10 shows the interaction between age and the birth–baptism gap. The abnormal level of OR for children baptised during their first day of life and the relatively high level of risk at the day of baptism for children baptised at days 2, 3, and 4 suggest – again – the strength of the reverse effect. However, the most interesting result of Table 10 is the persistent higher risk of dying for children baptised in the first two days of life, at least during the first three weeks, confirming the results of Figure 4. For example, for a child baptised on day 5, the risk of dying on the day of baptism is 50–60% lower than the risk of dying at age 5 days for children baptised at age 0–1 days. It may be a clue of frailty: The less healthy the newborn is, the earlier the baptism.

Table 10: The interaction between age and the birth–baptism gap. ORs with reference group age = 2 and birth–baptism gap = 2 (*)

	Birth–baptism gap (days)					
Age (days)	0	1	2	3	4	5
0	7.38	---	---	---	---	---
1	1.98	1.36	---	---	---	---
2	1.64	1.18	1.00	---	---	---
3	1.33	1.00	0.59	0.67	---	---
4	1.17	1.02	0.63	0.45	0.70	---
5	1.27	1.02	0.79	0.53	0.57	0.52
6	1.22	1.07	0.77	0.43	0.53	0.49
7	0.84	0.81	0.53	0.72	0.49	0.37
8	0.74	0.76	0.53	0.41	0.58	0.23
9	0.75	0.64	0.53	0.21	0.19	0.38
10	0.57	0.53	0.53	0.33	0.19	0.21
11	0.37	0.38	0.30	0.19	0.34	0.31
12	0.50	0.38	0.29	0.29	0.26	0.21
13–17	0.25	0.23	0.18	0.19	0.14	0.12
18–22	0.19	0.11	0.10	0.08	0.10	0.14
23–27	0.07	0.07	0.06	0.09	0.06	0.04

(*) Logit model L_{INT} with the same covariates of model L_2 (see Table 8).

6. Discussion

During the 18th and 19th centuries in Europe, with a different timing and pace according to the area, the number of days between birth and baptism increased, despite the rules of the Church. In some places (such as England, Paris, and Rome) this change seems not to be related to the transitional decline of infant mortality. The first contribution of this article is to show that, on the contrary, in the province of Padua during the middle of the 19th century (1816–1870) there is a clear and strong statistical connection between the decline of early mortality and early baptism, in the sense that those social groups and those areas experiencing the most intense decline in early baptism were also those in which mortality during the first three months of life declined more. In particular, a gap opened between the behaviour of farmers and that of all other social groups: Among farmers – who represented the majority of the population of the province – the pace of both changes was much slower.

The strong connection between early baptism and early death could be direct (early baptism could increase the risk of death because of the premature exposure of children to unfavourable weather), reverse (children *in periculo mortis* were immediately baptized), or spurious (there were other changing variables related to both early baptism and early death). Our data does not permit us to separate the three components, but the data is rich enough to allow us to attempt to disentangle the components a little.

We first consider separately babies born in the summer – so it is unlikely we could assume a direct effect of the exposure to low temperature due to early baptism on the risk of death – or winter, when in contrast the cold weather could emphasize both the direct and the spurious effect. The absolute differences in mortality according to the different days of baptism were dramatically high in winter. In contrast, in summer the reverse effect dominated: The mortality rate was higher only for children baptised on the day of birth, while there were no significant differences among children baptised on the following days. A sign of the presence of a spurious effect is the fact that the association between early baptism and early death is strengthened because the children of the same parents tend to have the same gap between birth and baptism, and this common gap is strongly related to the survival of the children themselves. These indications of what we have called a spurious effect in the connection between early baptism and early death extend the interpretation of the high level of neonatal mortality already suggested by physicians and civil servants working in Veneto during the 19th century, since the indications emphasised only the direct effect of early baptism on early death.

The search for the meaning of this spurious effect will be the subject of our future analyses. At present we can only reject a hypothetical explanation and observe that another promising interpretation is possible.

Firstly, it is hard to imagine that there was any extreme improvement in living standards and nutrition of women, to reduce the anxiety of early baptism and increase the survival chances of children, returning to the decades of low Malthusian pressure following the last great plague in 1630 (back to Figure 3). No improvement in living standards has, in fact, ever been demonstrated in the historical or demographical literature, especially for the lower social classes. As far as we know, there is no systematic reconstruction of the evolution of the social and economic condition of the popular classes in the Veneto plain during the 19th century. However, many signs suggest that, at least until the 1880s, there were no significant improvements in poor nutrition and bad socioeconomic conditions among peasants and manual workers. The average height of conscripts remains constant between the cohorts of men born in the second half of the 19th century (around 166.5 cm, Sanna 2002); poor food consumption persists, based on corn polenta, with an almost complete absence of meat (Pescosolido 2011); the incidence of pellagra – a disorder of metabolism linked to a diet exclusively based on corn polenta – was very high and did not begin to decline prior to the 1890s, when it was still the leading cause of death for adults in many areas, also in the province of Padua (Livi Bacci 1986; 1991); hardly any houses were heated, neither in

the city nor in the country, and many homes were shacks with no floor, fireplace, or windows, where usually the men lived with animals (Lazzarini 1983).[27]

On the contrary, both the increase in the birth–baptism gap and the improvement of child survival may have been due to the increase in the specific activity of caring for the newborn. Many European sources agree, indicating that during the 18th and 19th centuries, the care of children became more of a priority. This was also the case in the Republic of Venice, starting in the 18th century with wealthy and educated couples, then spreading to the lower classes (Filippini and Plebani 1999). Historians have also suggested that the extension of the delay of baptism is a signal of a change in the general attitude of parents towards their children at the very beginning of the demographic transition (Zannini and Gazzi 2003). The historians connected the different timing of this change across Europe to different levels of social development (Gourdon 2006). Our results do not contradict this reading: We show how changes start from the higher social classes and initially in the cities, and – in the multilevel model – that changes are characterised strongly by the family ethos. It is, in fact, easy to imagine that a couple would extend the same care for the health of all of their children. This attitude of parents towards children might have been the same in winter or summer, but its effect on the date of baptism and – mainly – on the child's survival could be far more decisive in the cold season.

Our results and conjecture suggest three directions for future research. Firstly, our analysis should be deepened, extending the number of parishes and the control variables. The CHILD project has now been completed, with a database of 46 parishes, extended to the Veneto provinces of Padua, Vicenza, Verona, Treviso, and Venice, along with other variables (such as temperature, recorded daily in a systematic way in Padua for all of the 19th century [Dalla-Zuanna and Rosina 2011; Piccione 2016]), and with indicators referring to the parishes and/or the municipalities/districts to which they belong.

Secondly, it should be underlined that our research – in trying to explore the statistical link between early baptism and early survival in the Veneto region during the 19th century – does not cover the possible interpretations of the lengthening of the gap between birth and baptism which, as described in the first part of this article, in some contexts in the Christian Western countries between the 18th and 19th century, occurred well before a parallel decrease in infant mortality. As stated in the first part of this paper, reasoning about the cases of Paris and Rome, Gourdon (2006) mentions three contributing factors that may have interacted, forcing couples to delay baptism: changes in medical culture, secularization, and changes in social and family relations. The

[27] It is possible that the increase in neonatal mortality in Veneto during the 18th century was caused at least in part by the worsening food of the lower classes, mainly due to the spread of monocultures of corn and the related increase in the population, especially in rural areas (Dalla Zuanna and Rosina 2011).

baptism transitioned – from a strictly religious ceremony that certified the membership of the child in the great family of the Church (but which was also considered to bestow protection from disease and the 'evil eye'), where the involvement of blood relations was not required – to a private/public moment of initiation (i.e., the presentation of the child to relations and society) in which religion and superstition lost their centrality. In this context of multiform change, the delay of baptism also responded to practical needs, in order to allow the participation of both parents of the child and of relatives living further afield, as it became increasingly common to ask them to be godparents.

Thirdly, research needs to be expanded on the dissemination of good practices towards children, starting with the works of Pancino (1984), Corsini (1996), Filippini and Plebani (1999), and Derosas (2003). The analysis of manuals used in Italian schools of midwifery shows that in the first decades of the 19th century, recommended practices for the care of newborn babies and mothers in the first days of life were correct, almost identical to those adopted in the present day.[28] From the end of the 18th century, the gradual spread of schools of midwifery, licensed midwives, and doctors paid by municipalities may have contributed to the widespread dissemination of these practices, starting in the cities and among the wealthiest and most educated couples, and later spreading to all social strata (Pancino 1984; Forti-Messina 1984). The parallelism between changes in baptismal practices and child survival allowed us to trace this process, although it is not easy to understand how better care for children spread among illiterate peasants living in the remote rural villages. This silent change must be studied to understand the first stages of the vital revolution, in northeast Italy as elsewhere.

[28] These manuals are unanimous in suggesting that women should give birth in a heated room and in an aseptic environment; the umbilical cord should be cut in the correct way and with sterilised instruments; the baby should be washed with lukewarm water and dressed as soon as possible, covering the head with a woollen cap, etc. (Tasinato 2007).

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Appendix: Data quality

In this paper we consider only what we have defined as early mortality, i.e., the death registrations of 9,654 children aged 0–2 months. A small proportion of the death registrations (0.6% in the province of Padua, see column (e) of Table 3) are not linkable to a birth registration, as they concern children not born in the parish where their death is registered. Moreover, we were not able to link 306 of the 9,599 theoretically linkable death registrations to their birth registrations (3.2%, with large differences among the 11 parishes, see column (f) of Table A-1). Presumably, unlinked death registrations are due to discrepancies between name/surnames, errors of the priests, or errors during our data-entry process. Moreover, a small number of the children represented by the unlinked records may not have been born in the parish of death, but their parish of birth is not indicated in the register.

Since it is impossible to define the precise reason why we do not have the birth record, and in order to avoid a systematic under-estimation of mortality, we have reconstructed the birth registration for each of the 306 unlinked death registrations definitely born in the same parish, in order to calculate data on mortality in our 11 parishes (Piccione, Dalla-Zuanna, Minello 2014). We attributed a birth day compatible with the age at death noted by the priest, following a procedure similar to that used by Schofield and Wrigley (1979, p. 80, note 14) when reconstructing mortality in England during the 16th and 17th centuries. To avoid underestimating early mortality, the authors linked baptism and burial registrations by creating 'dummy births' (i.e., children who died in the first days of life found in the burial registers "which cannot be linked to preceding baptisms, but clearly belong to a given family"). Obviously, for these children the data reported on the birth registration (including the day of baptism) is unknown, and consequently that data is not included in the analyses of this paper, where we consider the date of baptism. Consequently, early mortality, in the present analyses, is slightly underestimated.

Furthermore, early mortality could be underestimated due to systematic undercollection of records for those children who died shortly after birth, as observed in other Italian and European contexts in similar or slightly earlier periods (see, e.g., Dalla-Zuanna, Rosina, and Rossi 2004; Dalla-Zuanna and Rossi 2010). However, in our parishes, the death records of these children could be collected with a good level of accuracy, as our data is consistent with good quality data reported in prior studies (e.g., Woods 2009). In our sample, 53‰ of newborns are classified as having died on the first day of life (see column (g) of Table A-1). Among these, 66% are identified as stillborn: defined as stillbirth in the register by the priest, and/or nameless on the registration of birth, and/or without the date of baptism reported in the birth registration (see column (h) of Table A-1). Our data does not allow a sure and definite estimation of stillbirths

because of the different ways used by priests for registering the phenomenon, and the intrinsic complexity of the measure of intrauterine death due to the difficulties in distinguishing between stillbirths, miscarriages, and births (Breschi and Pozzi 1997).[29] Moreover, data on stillbirths is difficult to use because the criteria employed to collect such information not only differed from the criteria used today but also varied from area to area of the Austrian Empire (Dalla- Zuanna and Rossi 2010). While in some parishes (mainly Urbana) stillbirths have been constantly reported in the parish registers, other parishes denote a lack of information, probably due to under-registration.

As a result, both the stillbirth rate and mortality rate on the first day in our parishes could be around 20‰ to 30‰, which is compatible with the rates suggested by Woods (2009) for the pretransition health period. Moreover, a probability of death on the first day of life, around 50‰, was recorded in the period from 1750 to 1810 in the sample of parishes used by the Cambridge group for the reconstruction of the British population. As in our sample, the records include stillbirths among those who died on the first day of life (Wrigley et al. 1997; Davenport 2010). Despite the impossibility of defining the real values of stillbirth and mortality on the first day of life in the Veneto region in the early 19th century, it seems highly unlikely that there is any dramatic underreporting in our data.

[29] The comments reported in the volume published in 1864 by the Italian General Direction of Statistics "Movimento della popolazione secondo lo stato civile" (Ministero d'agricoltura, industria e commercio 1864, p. XVIII) are worth being mentioned. According to the Ministerial Instructions, the "creatures coming to light already dead" should be considered as stillbirths. However, the indication was not enough specified, and our statistics cannot distinguish if a newborn died before or during the delivery. Moreover in some regions [before the unification of Italy in 1861] the law on Civil State prescribed that children had to be denounced to the Major in a three-day deadline, and all children who died during the first three days of life were registered as stillborn. Likely, where the Civil State was in the hands of the parish priests, they registered as stillborn all the children dying before the baptism. Consequently, it is difficult to compare data on stillbirths of different regions before the unification. ["Sotto la denominazione di Nati morti, secondo le istruzioni ministeriali, si trovano comprese le creature venute alla luce morte. L'indicazione non vi fu tuttavia abbastanza specificata; e però anche la nostra Statistica non può dire in quali casi la morte debba considerarsi anteriore e in quali simultanea al parto. In alcuni compartimenti la legge sullo Stato Civile prescrive che le denunzie delle nascite siano fatte ai sindaci nel termine di tre giorni. Quivi figurano come nati-morti tutti i nati che non giunsero in tempo per ricevere dall'Ufficio municipale la loro personalità. La stessa cosa si sarà probabilmente ripetuta in quei compartimenti, dove lo Stato Civile sta nelle mani dei parroci, i quali avran dato in nota tutti gli infanti la cui esistenza venne meno prima del battesimo. Tutto ciò mentre da un lato spiega le disformità che si rinvengono nei risultati delle nostre indagini, dall'altro lato ci obbliga alla maggiore parsimonia di considerazioni."]

Table A-1: Record linkage in the 12 parishes for deaths of children aged 0–2 months

Parish	Deaths aged 0-2 months (a)=(b+c+d)	No linked born elsewhere (b)	Linked to a birth-record (c)	"True" no linked (d)	No linked born elsewhere % (e)=(b)/(a)	"True" no linkage rate % (f)=(d)/(c+d)	Death probability First day ‰ (g)	Stillbirths on children dead on the first day % (h)
San Giorgio d. P.	712	26	625	61	3.7	8.9	61	55
Onara	642	9	618	15	1.4	2.4	46	75
Eremitani	1,205	7	1,122	76	0.6	6.3	76	64
Santa Sofia	1,123	0	1,117	6	0.0	0.5	58	85
Chiesanuova	852	0	842	10	0.0	1.2	48	74
Casalserugo	829	0	812	17	0.0	2.1	23	66
Pernumia	1,654	0	1,591	63	0.0	3.8	46	79
Faedo	436	8	403	25	1.8	5.8	40	62
Valnogaredo	256	1	252	3	0.4	1.2	43	90
Pontelongo	1,136	0	1,115	21	0.0	1.8	49	32
Urbana	809	4	796	9	0.5	1.1	39	48
Total (un-weighted)	9,654	55	9,293	306	0.6	3.2	53	66

Finally, our measures of mortality referring to the cohort born in a parish could be underestimated because of emigration, as some children born in the parishes considered here might have died (at ages 0–2 months) in other parishes, following the emigration of their parents, or they might have been foundlings. To have an idea of the extent of mobility in the parishes, we calculated the proportion of deaths of children aged age 0–2 months who were born in a parish other than the one studied (see column (e) of Table 1). As stated above, on average in the 11 parishes, that proportion is small (around 0.6%), although in three parishes (San Giorgio delle Pertiche, Faedo, and Onara) it is higher than 1%.

A final word about stillbirths. In the 11 parishes considered here, the proportion of stillbirths does not show any temporal trend (see Table A-2). Consequently, it is difficult to suppose any connection between stillbirths, early mortality, and the lengthening gap between birth and baptism.

Table A-2: The trend of stillbirths, early mortality, and the birth–baptism gap. Eleven parishes in the province of Padua (data unweighted)

	1816–1825	1826–1835	1836–1845	1846–1855	1856–1865
Stillbirths *(absolute value)*	230	223	209	194	144
Stillbirths on total births (%)	1.9	1.9	2.3	2.5	2.0
Dead in the first 3 months, including stillbirths (%)	32	31	27	28	22
Baptisms during the days 0–1 of life (%)	74	68	61	56	47