First signs of transition
The parallel decline of early baptism and early mortality in the province of Padua (North East Italy) 1816-1870

Alessandra Minello
European University Institute, Florence, Italy

Gianpiero Dalla-Zuanna
University of Padua, Italy

Guido Alfani
Bocconi University and Dondena Centre, Milan, Italy

Abstract

We analyse the parallel decline of early baptism and early death in eleven parishes in the province of Padua (North-East Italy) from 1816 to 1870, using a new individual nominative linked database of 33,000 births and 10,000 deaths during the first three months of life. The statistical connection is clear and strong: 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 (and mainly during the first weeks) declined more. Life-tables and regression models show that during the cold winter of the plan of Veneto, early baptism increased the risk of death dramatically. However, the connection between early baptism and the risk of early death persisted also during the summer, when the exposure to low temperature could not influence the risk of death, and a sort of reverse effect could prevail (children *in periculo mortis* were immediately baptized). Finally, a two-level logistic regression – where the children born to the same couple are clustered – increases markedly the statistical performance of the individual model, suggesting the importance of unmeasured couple behaviours in influencing both early baptism and early death.

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. We deal with individual nominative linked archives of births and deaths within the first three months of life in the province of Padua, in the Veneto region (North-East Italy), in the 19th century (1816-70). During this period in Padua and its surroundings, the risk of dying within the first three months of life (early mortality) declined from 300‰ to 200‰, while the proportion of children baptized in the first two days of life halved, dropping from 70% to 35% (Figure 1).[1]

Figure 1 about here

This statistical connection could be due to direct, reverse, and/or spurious factors. First, a direct effect could be surmised. 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 the 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" (p. 50). In 1826 Giovanni Contarini, a Venetian government adviser, wrote a report to Vienna indicating among the leading causes of

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

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 baptized (…); inasmuch as the Church, especially in the countryside, is far away and (inasmuch as) the child is usually insufficiently protected” (quoted from Residori 1984, p. 49). In a monograph of the *Inchiesta Agraria Jacini* (a nation-wide survey of the conditions of agriculture commissioned by the Italian parliament, published in 1884) for the province of Treviso (a few kilometres from Padua) it is written: “Infant mortality is frequent because of, not only 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” (quoted from Lazzarini, 1983, p. 219).

The association, however, could also be reverse: it may have happened that many children were baptized immediately when parents or other adults involved in childbirth perceived that the child was in danger. This probably happened in England during the 17th and 18th centuries (see note 9), but also the case of Battaglia (a parish in province of Padova) presented in Figure 2 (below) could be indicative of this phenomenon. Moreover, in the registers of births it is common to find notes like “baptized in the womb”, “baptized before birth”, “baptized by the midwife”, and so on for children baptized the same day of birth. Death without baptism was seen as exposing children to undue spiritual danger (more details in the next section).

Finally, there could be other variables that change over time, either related to the decline in neonatal mortality and/or in the increase of the birth-baptism distance: 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 distance 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 (1816-70) of early baptism and early mortality, and—finally—through the use of life tables and regression models we try to answer our second specific research question.

Baptismal practices in Western Europe: Ecclesiastic rules and real practices

Evolution of ecclesiastic rules

At the beginning of the 19th century in the Christian world, for religious reasons baptism was celebrated during the first days or weeks of the child's life. The presence of a non-baptized child or of a non-purified 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.

However, the rules governing the rite of baptism have 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 (Torquiebiau 1937, p. 164). This practice was seemingly well-suited to a period in

which baptism was given 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 it still survives in the rule of the Catholic Church that, whenever possible, adults are baptized 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 baptized *infra annum* (within a year of life), while adults could only be baptized on the two aforementioned days save 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 baptized (Bellamy 1932, p. 276; Corblet 1881, t.1, p. 493).

For the modern Catholic Church, it was the Council of Trent (1545-63) 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 given 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.* From the point of view of official Catholic prescriptions, no change in this is found in the following centuries, as the Code of Canon Law of 1917 still stated that "Infants have to be baptized *quamprimum*; and priests and preachers must frequently remind the faithful of this important obligation". 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—at the beginning—was trying to contrast.

The *quamprimum* formula allowed some space for interpretation, however, and following the Council of Trent more detailed formal rules were introduced. As soon as the Council had ended, the 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, 101-2). 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 it must take place within 24 hours of birth (Alfani and Gourdon 2012b, 40-41). Generally, Protestant churches were less strict than Catholic 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, especially after Trent, it tried very actively to do 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).

However, the Church also participated in the change of 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 twentieth 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 given within the first two to three days, and absolutely no later than the eighth day". However, it was also stated that "baptism could be conferred 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*" (Bollettino della diocesi di Padova 1917-18, 194-197). 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.

Empirical findings in Europe and Italy

Empirical studies on the long term birth-baptism distance in Europe show important differences, both in time and in space: let's 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 had to be

given on the Sunday following the birth, while in 1662 the rule became a bit 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 the British children born at the beginning of the 19th century were baptized even after the first month of life. These results for England are confirmed by other authors (see also for a review Dewurst and Hinde 1996). 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.

In France couples had to pay a fine if they did not bring the child to be baptized 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 North-West French regions of Bretagne and Anjou, the law was strictly respected, as 99% of children were baptized the same day of birth or the day after. The situation changed after the Revolution (1789) and the laicization 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 the baptism given in the first week of life was the exception, while in the 1850s was still the rule (Gourdon 2006, see Table 1).

In Italy as a whole—although the available data are 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 that 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 distance 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 were given on the first day of life, 90% within the first three days, and less than 1% of children were baptized after the first week of life (Basilico 2010). The same author shows that, at the beginning of the 18th century, the proportion of infants baptized 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 infants were baptized on the day of birth or the next day, and 99% within the first three days (Table 1). In the following decades, things started to change, with a strong acceleration after 1870, when Rome became the capital of Italy, against the will of the Pope (Gourdon 2006).

Table 1 about here

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 baptized in the first two days of life, and less than 1% of baptisms were given 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 given after the first week of life.

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 birth-baptism interval 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 country of Vicenza), discovered that the percentage of baptisms performed on the first day of life had decreased from 36% during the period 1824-33 to 25% between 1880 and 1889, without any change in mortality rate. On the other hand Boatto (1998), by comparing data from San Stino di Livenza (in the eastern country of Venice) in the periods 1816-20 and 1846-50, 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), analyzing 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 baptizing 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 distance (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 per 1,000 in the 1800s (Figure 2a-2b). The secular trend of neonatal mortality observed in Battaglia (Figure 2a-2b) is similar to that of many parishes of Veneto (for an extensive description see Dalla Zuanna and Rosina 2011).

Figure 2a-2b about here

Data and variables

Data

We focus on 11 parishes in the province of Padua, in the central part of the region of Veneto (Table 2).[2] 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

[2] During the time considered, Veneto was first a region of the Habsburg Empire (1816-66) and later became part of the Kingdom of Italy (1866-70). 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 organization and severe taxation. Land organization was based on medium and large estates assigned through sharecropping, rent, or a mix of the two. The landscape of the region was therefore characterized 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 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, p. 88). About agrarian innovation and Malthusian dynamics in northern Italy during the Modern period, also see Alfani 2013.

two small parishes: Valnogaredo and Faedo. The parish of Pontelongo represents the two neighbouring districts of Conselve and Piove di Sacco.[3]

Table 2 about here

Our analysis has been developed using unpublished nominative data. They have 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 by the frequent stamps on the pages of the pre-printed registers. These Civil Registers and/or their copies—not to be confused with the less-structured traditional Ecclesiastic Registers—are preserved (in single or double copy) in the Parish Archives and/or in the Diocesan Archive. Records from 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 analyze 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

[3] 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 characterized 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).

of life.

Each death act has been connected with the corresponding birth act 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 interval between birth and baptism. The quality of linkage is good, as already tested in a previous article on six parishes throughout the region (Piccione, et al. 2014). For information on quality of data on the 11 parishes here analyzed, see the Appendix 1.

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 4). When both pieces of information are available, we see that the job of the father is practically always the same in the birth and in the death act. 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, Heines 1995, Fure 2002). The occupation of fathers has been divided into eight categories: farmers (mainly peasants, tenant farmers), craftsmen or working class, merchants, employees or civil servants, servants, land-owners, and skilled or well-to-do workers. The last category—"unknown"—includes those jobs 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 contest of Veneto during the XIX century: it includes, in fact, the most diverse and relevant occupations and related social groups. Second, international classifications of occupations (like HISCO) are not still available for the Italian contest, and hardly reliable for the data we are studying. Most of the occupations are reported in our registers using dialect and obsolete terms, hard to recode following the international standards. Due to the characteristics of the area, most of the fathers of the newborn are farmers (71%, excluding unknowns), 10% are craftsmen or belong to the working class, and 8% are merchants. Only 1% of fathers were employees or civil servants, 2% servants (mainly in the urban houses), 5% land owners (who, mainly in the rural parishes, are usually farmers with a small or very small property), and 1% skilled or well-to-do workers. Unfortunately, it is not possible to divide farmers into subcategories (distinguishing between day labourers, landless stable, tenants, sharecroppers, and small owners, etc., as suggested by Lazzarini, 1983), because the priests almost always use the term "villico" (farmer), without further specification. As these data come from birth acts, 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 working class, merchant, employee and civil servant, servant, land owner, and missing. The

category of unknown jobs (7% of the sample) includes many parents of stillborns (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 act"), 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. 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, servant, land-owner, and skilled and well-to-do are little represented, especially in the country parishes, their total numbers are large enough to include them in the analysis as specific groups.

Table 3 about here

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 (27%), 1 if the child has been baptized the day after birth (33%), 2-5 if the time lapse is from the third to the sixth day (22%), and so on with 5-10 (11%), 11-30 (5%), and >30 days (1%). Stillbirths and children who did not receive baptism have been excluded in the

present analysis (see Appendix 1).

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 have been integrated with those 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 as 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 distance between birth and baptism is included as the median among birth-baptism distances of siblings in the family. In this multilevel model we also included as a first level (individual) variable the difference between the individual birth-baptism distance

and the median distance between birth and baptism of the siblings in the family of origin. We consider the distance from the median as <0, 0, or >0.

Methods

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

During the warm season, the connection between the birth-baptism distance and the probability of dying during the first weeks cannot be due to cold.[4] 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 do 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

[4] 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 (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 analyzed in detail the close connections between winter outside temperature and risk of neonatal mortality in Veneto.

baptismal behaviour of the couple and the neonatal mortality of their children. We observe if, net of all considered variables, couples who tend to increase the interval between birth and baptism for their children, are at the same time couples 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 behavior of couples who decide to postpone the baptism of all their infants could also be important, identifying part of what we called spurious effect.

The detailed analysis is the following. First, in a preliminary analysis we calculate the probability of dying during the first three months in the province of Padua and the distribution of births by birth-baptism distance, showing the trends from 1816 to 1870 by sex, season, occupation of father, and parish. This article does not give particular emphasis to mortality differences by sex, birth order and distance 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 distance does not change between boys and girls. Differences by birth-order and birth-distance will be analyzed in further research.

Second, we calculate the life table during the first three months of life according to the day of baptism, for children born in winter or summer. Third, we perform some logit models to define the risk of dying before the third month of life, considering sex, parish of birth, season of birth, socioeconomic condition, and period as covariates. Our regression models consider only children baptized within the first six days of birth—it is more than 85% of the total administered baptisms in our 11 parishes between 1816 and 1870. This choice focuses the analysis on the change in baptismal practices occurred in

that period in the province of Padua, namely the transition from the first two days of life to those immediately following. The birth-baptism distance is excluded (model L_1) or included (model L_2) as explanatory variable, in order to define its statistical connection with the probability of dying, controlling for the above-mentioned covariates. To observe the connection between birth-baptism distance and survival in absence or at different levels of the presence of the direct effect, model L_2 is then performed separately on births in the four seasons (models L_{WI}, L_{SP}, L_{SU}, L_{FA}). In the following model, L_{ML}, we restrict the data set, selecting only the births with at least one sibling (identified using the names of father/mother and the day of marriage), and performing a 2-level model, with the child as the first level and the couple as the second level. The birth-baptism distance is included as both couple-variable (the median among birth-baptism distances of siblings) and birth-variable (the difference between the individual birth-baptism distance and the just-defined median distance).[5] Both indicators are then used to study the variability of the individual response. If the clustered model increases the statistical performance of the individual model, and if the family-level connection between birth-baptism distance and the risk of dying is statistically significant, we have a clue about the importance of the family baptismal behaviour in influencing neonatal mortality.

The above-described logit models are not the only possible option for studying the

[5] For an extensive description of the technique of centering predictor variables in multilevel models see Angels et al. (2005), 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 distance (e.g., let's consider the sequence 0, 0, 1, 1, 43 for five children of the same couple: in our opinion the median 1 represents the family behavior in a better way than the mean 5, and the differences between the individual birth-baptism distance and the median distance -1, -1, 0, 0, 42 represent the individual specificity in a better way than the differences between the individual birth-baptism distance and the mean distance -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.

connection between the birth-baptism distance and the risk of early death. In Appendix 2 we also include some Cox regression models applied to the same data-set. The results show some differences in detail, but are robust in general terms. We report and describe here the results of the logit models, because the multilevel approach is more easily applied and more simply interpreted.

Results

Preliminary analysis

The daily probability of dying (excluding children without the indication of baptism) 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 the second week of life, and then it decreased steadily until it was less than one per 1,000 during the second and third months of life (Table 4).

Table 4 about here

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 spectacular: in the five years from 1866 to 1870, the daily probability of death is half compared to the twenty 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).

The trends in birth-baptism distance from 1816 to 1870 are not much different from what we observed for early mortality, excluding the first day of life (Table 5). 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 eleventh day of life, virtually absent in the first decade, were almost 18% in the last five years.

Table 5 about here

The decline in early mortality is not the same for all groups (Table 6). The most interesting differences are by occupation and season. Apart from the residual category of missing, for all professions mortality decreases greatly, with the exception of farmers, i.e., the larger group. The decline is very strong in winter (from 50% to 30%), strong in spring and fall (from 30% to 20%), and moderate in summer (from 16% to 12%).

In each decade mortality strongly decreases with increasing distance. This is in part obvious, as who was baptized on day i^{th} must have survived the previous days. The mortality by birth-baptism distance 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 distance, rather than the decline of mortality of children with equal distance.

Table 6 about here

Table 7 shows how the practice of baptizing a child immediately after birth evolved over time, in different categories. From 1816 to 1825 there were large differences in early baptism among farmers compared to all other categories: in 83% of cases, farmers brought the child to the church on the day of birth or the day after. This occurred only in 45% to 50% of births for all other couples (with the exception of missing, which overlaps with farmer). Also, always among farmers, the decline of early baptism starts later than among others, and among them at the end of the period considered here the level of early baptism is higher than that observed among other couples 50 years before. 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 and the hinterland parish of Chiesanuova with other parishes, where the frequency of early baptism was lower than in other parishes.

Table 7 about here

Life tables

Figures 6a and 6b show 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 baptized on days 3 and 4 had the same chance of reaching their 90^{th} day as children born in summer but baptized on day 0 (approximately 700‰).

Moreover, among those born in summer, there is much lower survival among children baptized on the first day of life (day 0), while only a slight disadvantage for children baptized 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 baptized on days 3 and 4).

Figure 6a- 6b about here

Logit regression models

When birth-baptism distance is included as a covariate, the performance of the logistic model greatly improves,[6] and the connection between risk of dying during the first three months and the time period disappears: The decline of mortality in the first months of life during 1816-70 is totally "absorbed" by the decline of the practice of bringing children for baptism immediately after birth. In other words, from the statistical viewpoint, if in the province of Padua from 1816 to 1870 the birth-baptism distance had not changed, the mortality rate in the first part of life would not have diminished.

Also the association between father's occupation and mortality is "shaken" by inclusion in the model of the birth-baptism distance. When the distance is included, all odds ratios compared to farmers are higher than one. This is because farmers continued to baptize early for a much longer time (Table 7). In other words, from the statistical viewpoint, had farmers baptized their children with the same timing as other professions, they could have obtained lower early mortality levels than those of other classes.

Table 8 about here

[6] The 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 1,187, strongly significant from the statistical viewpoint ($p = 0.000$).

The spatial variability of early mortality is lightly mitigated if the birth-baptism distance is included in the model (the coefficient of variation between the eleven odds ratios declines from 0.333 to 0.295). Moreover, the ORs of the two urban parishes (Santa Sofia and Eremitani) and the rural parish located near the city walls (Chiesanuova) increase in L_2 compared to those in L_1, while those of all other rural parishes decreases. Since these three parishes are those that first experienced the practice of waiting a few days before baptizing children (Table 8), 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 when the birth-baptism distance is or is not included in the model. This result is a clue about 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).

The colder the season, the weaker the statistical association between birth-baptism distance and the risk of dying before the third 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 6. During the summer—even if the probability of early death is much lower than in winter—the relative mortality difference between children baptized on the first day and subsequent days of life is much broader than what happens in winter: The ratio between the probability of dying before the end of the third month for children baptized 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

baptized immediately after birth because they were in danger of death (see Figure 3).

Finally, 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, the fitness of the L_{ML} improves greatly, and both the median couple distance and the individual distance 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.

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 central part of the 19th century (1816-70) 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 precocious 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 do not permit to separate these three components. However, they are rich enough to try to unravel the skein.

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 baptized on the day of birth, while there were not significant differences among children baptized 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 siblings of the same couple tend to have the same distance between birth and baptism, and this common distance is strongly related to the survival of the set of children themselves. These clues of what we called 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: they emphasized 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. Nowadays we can only reject a hypothetical explanation and observe that

another promising interpretation is possible. First, it is hard to imagine that an extreme improvement in living standards and nutrition of women intervened, relaxing the anxiety of early baptism and increasing the survival chances of children. 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 not a systematic reconstruction of the evolution of the social and economic condition of the popular classes in Veneto during the 19th century. However, many signs suggest that, at least until the 1880s, there were not significant improvements in poor nutritional status 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, flattened on corn polenta, with the almost complete absence of meat (Barbieri 1961, 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); almost no 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). Moreover, it is possible that the increase in neonatal mortality in Veneto during the 18th century was at least in part caused 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).

On the contrary, the increase in the birth-baptism distance and the improvement of child survival may have both 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, care of children strongly increased. The process also took place in the Republic of Venice, starting in the 18th century with wealthy and educated couples, then spreading into 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). They 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 characterized strongly by the family point of view. It is, in fact, easy to imagine that caring for a child's health was extended to all the a couple's children. This attitude of parents toward children might have been the same in winter or summer, but its effect on the date of baptism and—mainly—on the child survival could be far more decisive in the cold season.

Our results and conjecture suggest three directions for future research. Firstly, our quantitative analysis should be deepened, extending the number of parishes and the control variables. The project IMAV (Infant Mortality in Asburgical Veneto) 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), and with indicators referring to the parishes and/or the municipalities/districts to which they belong.

Secondly, 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 and mothers in the first days of life were correct, almost identical to those adopted in the present day. These manuals suggest 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 sterilized instruments; the baby should be washed with lukewarm water and dressed as soon as possible, covering the head with a wool cap, etc. (Tasinato 2006-07). 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 remarkable parallelism between changes in baptismal practices and child survival allowed us to trace this diffusion process, although it is not easy to understand how better care for children spread among illiterate peasants living in the most remote rural villages. This silent revolution must be studied carefully to understand the first stages of the vital revolution, in North-East Italy as elsewhere.

Thirdly, it should be underscored 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 distance between birth and baptism that, 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 baptism—from a strictly religious ceremony that certified the membership of the

child in the great family of the Church but that was also considered to bestow protection against diseases and "evil eyes", where the involvement of blood relations was not required—became 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, as well as of relatives not living near the home of the couple, who were increasingly being asked to be godparents. Therefore, a careful study of all that revolves around baptism in Veneto as elsewhere may allow the accumulation of new clues on children's places in the broader context of the modernization of family and social relationships.

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