

WHAT CAN DADE REGISTERS TELL US ABOUT INFANT MORTALITY IN THE LATER EIGHTEENTH CENTURY?

Alysa Levene

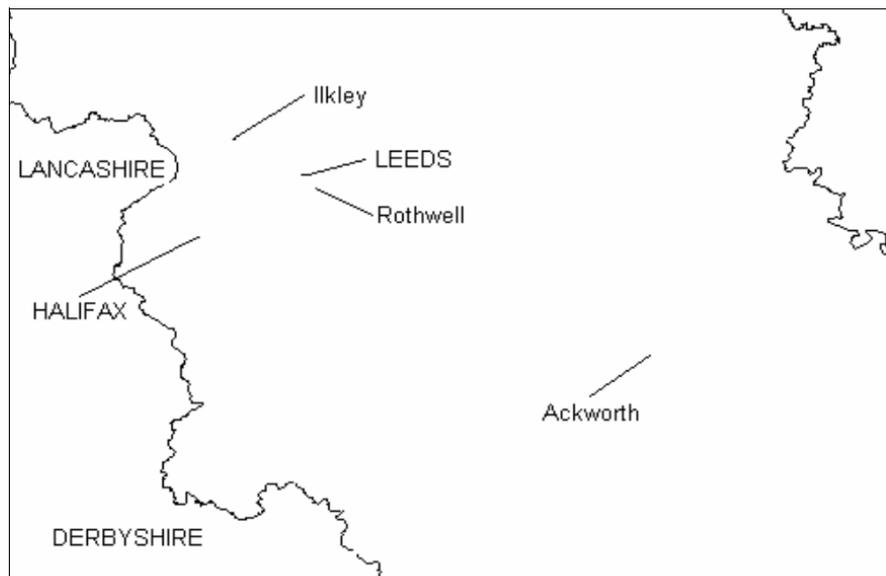
Dr Alysa Levene is an Academic Fellow in Early Modern Urban Studies at Oxford Brookes University. She has recently completed a study of infant and child health and mortality at the London Foundling Hospital, 1741–1800.

Introduction

In recent years, population historians have drawn our attention to the potential for study in a corpus of highly detailed parish registers for Yorkshire and other areas of the north of England.¹ The order for fuller registration was given by Archbishop Markham of York in 1777, following the ideas of a local clergyman, William Dade, apparently to improve the quality of parish records as legal evidence.² The fullest of the registers which are collectively given Dade's name contain considerable detail on the genealogy of each subject, and most record dates of birth as well as baptism in baptismal registers, and causes and ages of death in burial registers. They thus offer particular potential for the calculation of accurate infant mortality rates, which are prone to distortion by the usually undisclosed time elapsing between birth and baptism. Babies who died during this interval (which appears to have been lengthening over the eighteenth century), were not recorded in baptismal registers, while those who died around a year after their baptism may in fact have been considerably over a year in age.³ The impression of fuller coverage, and the inclusion of corroborative age information in Dade registers, should improve our ability to reach accurate measures of infant mortality. This is valuable to improve our understanding of one important aspect of past demographic trends, and also because infant mortality is frequently taken as an indicator of socio-economic conditions in local communities.⁴ Death rates for early age categories, therefore, have great significance for our ability to assess the healthiness (or otherwise) of English communities, and to predict wider demographic trends. In this article, data from three West Yorkshire parishes are scrutinised to investigate how much the additional Dade-type details add to our understanding of infant mortality. Ultimately, several ways in which the registers appear, in fact, to be defective in coverage are highlighted, to degrees which differ considerably from parish to parish.

That Dade registers present problems for historical demographers is not a new finding, and may stem from the aim to improve the registers as legal evidence rather than to establish universal registration. Although Roger Bellingham,

Figure 1 The West Riding of Yorkshire, showing case study parishes



Source: EDINA UKBORDERS with the support of the ESRC and JISC, using Kain and Oliver historic boundary material which is copyright of the AHDS History (University of Essex), Humphrey Southall, Nick Burton and the University of Portsmouth.

who first drew attention in print to the nature of the records, presented them as full of potential, more recent studies have discovered incomplete coverage of infant deaths. In a recent article in *LPS*, Chris Galley highlighted problems of coverage in Dade's own parish of St Olave, York, and work by Stuart Basten at the Cambridge Group for the History of Population and Social Structure has also produced what seem to be unfeasibly low infant mortality rates (IMRs) in eight parishes which kept Dade-style registers.⁵ My own work has uncovered similar problems in two Yorkshire parishes being investigated for other purposes.⁶ The authors of these studies concur in suggesting that certain infants escape registration altogether in these parishes, so that although the registers are notably detailed, they do not cover the whole resident population. Whether the missing infants represent a particular sub-population is, however, extremely hard to determine. Galley has suggested that they might comprise nonconformists, illegitimate children, or the very young, all of whom had a raised risk of not being baptised, or were baptised outside the Church of England. All of these suggestions are eminently sensible, and there is some limited evidence of under-registration of illegitimates in St Olave York. Galley's, Basten's and my own work all also point to a lack of coverage of deaths at very young ages. This article will also consider what types of infants were missed from registration. Before this, however, it will address how the additional information contained in three Dade registers affect the resulting IMRs which can be calculated. It will also consider how this compares with the

earlier, non-Dade period.

The three parishes selected for investigation here are Ackworth, Ilkley and Rothwell, all in the West Riding of Yorkshire (see Figure 1). All three show elements of Dade characteristics in their registers, although to differing extents. Ilkley began to record a greater level of detail from 1777 onwards, but in Rothwell, Markham's instructions on Dade's ideas did not take effect until 1782, and then somewhat patchily. In Ackworth, however, a greater level of detail had been recorded in the ecclesiastical registers for some time prior to 1777, at the instigation of an efficient incumbent, the Reverend Timothy Lee. In this parish, the 'Dade' period is taken to begin in 1755, although ages at death were recorded in the burial register from 1744. None of the three parishes recorded extensive details on genealogy, but all include dates of birth, ages at death, and causes of death for at least part of the later eighteenth century.

Data for all three parishes were recorded in databases for the period 1748 to 1801, and family reconstitutions were carried out in each case. This produced IMRs for the whole period, and also for shorter time spans such as the Dade period (different in each parish). Although the data could be treated in near-identical ways, it is important to record at the outset that the three parishes were quite different in terms of size, location, and socio-economic circumstances, which might lead us to expect that they might have different levels of infant mortality. Indeed, they were deliberately chosen for their differences in these respects. Ackworth was a rural village in the south of the West Riding, numbering 1,432 souls in 1801. Ilkley was an even smaller community and a market town to the north-west of Leeds, housing 426 people in the parish itself in 1801, although another 300 lived in the adjacent townships of Middleton, Nesfield and Langbar (and registered their vital events at the Ilkley parish church). Rothwell was substantially larger, south of Leeds, and today part of its inner suburbs. The parish housed 4,776 people in 1801, matched by the numbers in surrounding townships. This profile alone might lead to *a priori* expectations that infant mortality in Rothwell would be higher than in Ackworth and Ilkley, given its proximity to Leeds and the industrialised cloth-making belt of the West Riding. Ackworth and Ilkley were, in contrast, more isolated, and Ackworth in particular, was noted for its healthfulness.⁷ These *a priori* assumptions will be a valuable consideration in assessing the accuracy of IMRs calculated for the respective parishes.

Calculating infant mortality via family reconstitution

Family reconstitution is the most commonly accepted method of calculating mortality rates for individual parishes, by linking burials recorded in parish registers to baptisms via parental marriages.⁸ Deaths of people who registered no other vital events in the parish are thus not included, providing a clearly defined 'at-risk' population. Although this has the disadvantage of not considering transient migrants, resident people who cannot be linked to a marriage (such as the never-married, or illegitimates), and non-Anglicans who did not record their vital events in the church registers, it does provide rates for the settled, Anglican population. In the absence of Dade-type information,

Table 1 Infant mortality rates (IMRs) per 1,000 live births for Ilkley, Ackworth and Rothwell, 1748–1801

Parish	IMR (1q0)	N baptisms
Ilkley	65.4	1,101
Ackworth	78.1	1,229
Rothwell	70.2	6,179

Source: Parish reconstitutions

Note: These are valid baptisms only, discounting those of illegitimates, those with missing information on child's forename or surname, or father's name, and any obvious duplicate entries.

the age of the deceased is reached by subtracting the date of baptism from date of burial. Although this has little impact on the age at death calculated for adults, as noted above, for infants it may produce a significant underestimation of age. A child who died two months after baptism may, in fact, have been four months old, if the interval between birth and baptism was itself two months. More importantly in this case, a child who died 11 months after baptism and therefore counted as an 'infant' for the purposes of calculating mortality rates, may actually have been 12 or 13 months, and not properly an infant ('infant' being conventionally defined as 365 days or under). Nonetheless, baptismal dates are frequently the only available proxy for age, and initial rates for the three parishes considered here were calculated in this manner to preserve comparability.

The IMRs for the three parishes for the period 1748 to 1801 are presented in Table 1. It is immediately apparent that all are low for the second half of the eighteenth century, although the period of coverage means that any change in registration in the Dade period cannot be entirely responsible. Wrigley *et al* have calculated a rate of 162.8 deaths per 1,000 live births for the period 1750–75 in 26 English parishes, and the lowest of the 26 rates taken individually was 92, which is still notably higher than those found here.⁹ Two of the 26 parishes were located in Yorkshire, and both did have relatively low IMRs compared to the group as a whole, but again they were significantly higher than those for Ilkley, Ackworth and Rothwell: 134 per 1,000 in Methley, and 128 in Birstall.¹⁰ A range of corrections have been suggested by historical demographers to compensate for deficiencies in parish registration, which would raise the rates reported here.¹¹ Nonetheless, infant mortality as calculated by family reconstitution was notably low in these three Dade parishes, even when the period is extended back in time to the mid-eighteenth century. The sense of unease over these figures is compounded when we consider the types of parishes under scrutiny. While we might be happy to accept that a small rural parish like Ackworth really did have a benign mortality regime for infants, it seems less likely that a more densely populated parish like Rothwell, which was in an industrialising area of the West Riding, had IMRs as low as 70 per 1,000. For comparison, Steven King suggests levels of 170–180 per 1,000 for the industrialising West Riding township of Calverley-cum-Farsley.¹² Given that

Table 2 Infant mortality rates (IMRs) per 1,000 live births for Ilkley, Ackworth and Rothwell, by period

Parish	Pre-Dade	Dade	1748–1801
Ilkley	82.5	48.5	65.4
Ackworth	113.9	76.4	78.1
Rothwell	69.1	70.0	69.5

Source: Parish reconstitutions

Note: See note to Table 1.

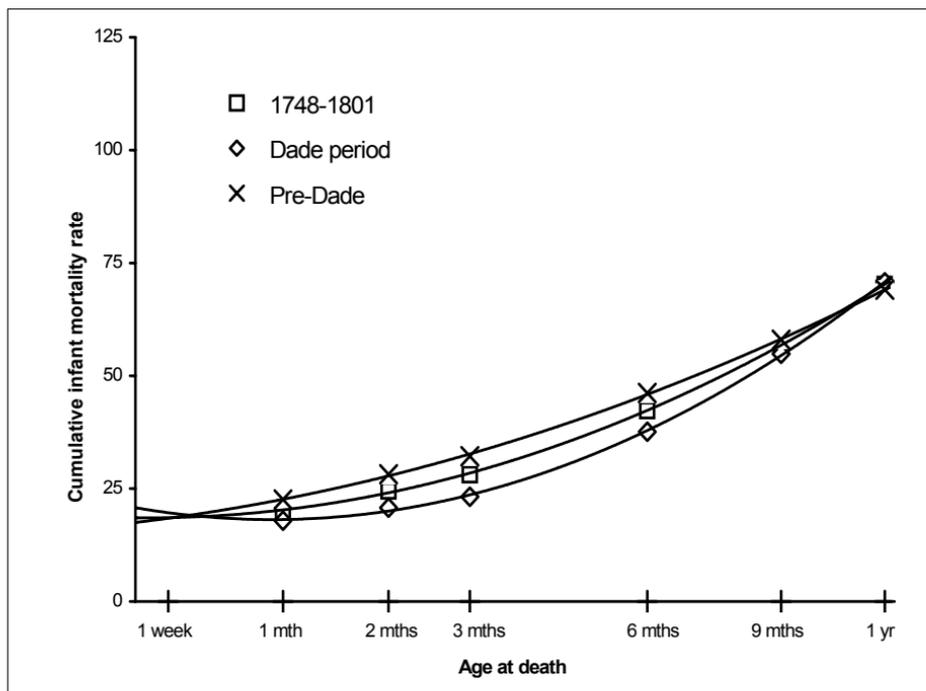
Basten's work on Dade parishes has also returned low rates from the late 1770s onwards, we will now proceed to consider if, and how far, the Dade period of registration affected the rates presented here.

Table 2 presents IMRs for the pre-Dade and Dade periods separately. It should be remembered that these time-frames are different in each parish: in Ackworth the 'Dade' registration starts in 1755, in Ilkley in 1777, and in Rothwell in 1782.¹³ The early recording of extra details in Ackworth means that the pool of baptisms in the earlier period is very small (79 cases), and the IMR for these years should be treated with caution. In all cases, IMRs in the pre-Dade period are somewhat higher than for the whole period, although in Rothwell the difference is extremely small. The trend is complicated, however, by the fact that this was a period of falling infant mortality nationally.¹⁴ Since the Dade period started late in Rothwell in particular, the pre-Dade measure may be depressed by capturing part of this fall. In the other parishes, the lower IMRs for the Dade era may reflect a genuine fall in infant mortality. It is also possible, however, that Dade's ideas did change the process of registration, resulting in less complete coverage and unrepresentatively low IMRs for this period.

Certainly, the Dade period of registration in Ilkley produced extremely low IMRs of 48.5 per 1,000. For this parish, therefore, there is some evidence to suggest that the Dade process of registration did produce a lower level of coverage of infant burials, although some of the fall may be due to lowering infant mortality more widely. In Rothwell, however, there was no notable fall in IMRs coincident with the Dade period, despite the wider mortality shifts. In all cases except Ackworth, where numbers of baptisms were small before the more detailed registers started to be kept, IMRs were below those found for the 26 parishes reconstituted by Wrigley *et al*, even prior to Markham's instructions.

This comparison of mortality during different periods of registration has, therefore, muddied the waters somewhat. It seems that the situation was not as clear-cut as considerations of the Dade period alone have suggested, and that IMRs were either extremely low, or suffering from under-registration, earlier in the half-century also. This is explored further in Figure 2, where data on cumulative infant deaths over the first year of life have been plotted using the

Figure 2 Cumulative infant mortality in Rothwell, 1748–1801



Source: Parish reconstitution

logarithmic transform first put forward by Bourgeois-Pichat.¹⁵ The method was originally used to differentiate between mortality caused by endogenous factors, which were already carried by the infant at birth (such as congenital disease, prematurity or the result of birth trauma), and exogenous causes such as infectious disease. More recently, scholars have pointed out that the method of regression used may have an impact on the level of endogenous mortality returned, and that we should be cautious in interpreting the results of this type of analysis.¹⁶ On a more straightforward level, however, the Bourgeois-Pichat method indicates the rate at which deaths accrued over the first year, and can point to deficiencies in registration. Classically, the trend line produced by this method lies close to a straight diagonal. A curved line may indicate under-registration, where deaths fail to accrue at the predicted level. Figure 2 shows data for Rothwell, distinguishing between registration periods.

It is interesting to note that in all three periods (Dade, pre-Dade and total) the mortality rate at the end of the first year is very similar in this parish, indicating that, in sum, neither registration nor levels of mortality changed much over time. It is possible that a fall in infant mortality was compensated for by more accurate recording of infant burials during the Dade period, but

this runs counter to all other evidence on the impact of Dade registration. Over the course of the first year, however, the accumulation of infant deaths differed between periods. In the earlier registration phase, deaths accrued at the standard rate; the trend line is close to a straight diagonal. This implies that there was not unexpected under-registration at particular ages; if deaths were missed, it was at a constant rate over the first year. During the Dade phase, however, death rates were lower than expected in all the early age categories, indicated by the curved shape of the line at the left-hand side. The data for the period as a whole lie somewhere between the two sub-periods. The data for Rothwell, therefore, suggest that, despite a concurrence in overall IMRs, there was indeed under-registration of burials during the course of the first year of life in the later period, and especially in the early part of the first year. This is not necessarily the case elsewhere, however: in Ackworth, infant mortality during the Dade period does conform to a straight line when plotted, albeit at a considerably lower level than that for the full period. This may again be related to the dominance of the Dade period over the full time-frame in this parish. The issue of differences in different parishes is one to which we will return. In the meantime, we leave the discussion of varying levels of mortality calculated in the traditional manner, to examine the impact of the uniquely Dade-type information on IMRs.

The impact of Dade registration on infant mortality calculations

It has already been noted that the principal features of Dade-style registration, in terms of its impact on infant mortality, are the recording of ages at death and dates of birth. These details are not unique to Dade registers, as the fact that they were recorded several decades before 1777 in Ackworth shows, but their presence in a large number of registers in one part of the country may be very significant for our impression of regional mortality. What impact do these pieces of information have on infant mortality calculations?

I: Date of birth

In order to test this question, IMRs were recalculated, using dates of birth to determine age at death, rather than dates of baptism. It will be remembered that this creates a more accurate picture of age at death by confining the pool of 'infant' deaths to those who truly were infants. Some Dade registers (including Ackworth's) record dates of death as well as burial, but these tend to be only a few days apart, as opposed to potentially several months in the case of births and baptisms. For the Dade period, the recalculation produced IMRs of 44.7 per 1,000 for Ilkley, 73.8 per 1,000 for Ackworth, and 48.2 per 1,000 for Rothwell. In Ilkley and Ackworth, this is only a few points lower than the rate calculated using dates of baptism.¹⁷ This is the direction of change which would be expected from the fact that some infants are now found to be too old to count in IMR calculations, albeit perhaps only by a matter of weeks. In Rothwell, the discrepancy is much greater: 70.0 using date of baptism, 48.2 using date of birth. This may be related to two factors. The first is that the lag between birth and baptism was considerably longer there than in the other two

parishes. In Ackworth, an average of 34.3 days passed between birth and baptism, and this was relatively unchanging over the last three decades of the century. In Ilkley, the lag was higher in the 1770s and 1780s (79.2 and 69.8 days), but had fallen by the 1790s to 40.2 days. In Rothwell, however, the average time elapsing was 62.2 days, and was still in the mid-60s in the 1780s and 1790s, albeit reduced from the 1770s. This means that a greater number of young deaths will be found not to have occurred under the age of one year, and the resulting reduction in mortality may be real in that it reflects the use of more accurate information. The second factor to be borne in mind for Rothwell, however, is that dates of birth were never recorded as consistently as they were in Ilkley and Ackworth. It is not clear why some baptisms had a date of birth recorded and some did not; it may be as simple as the clerk or minister not always remembering to ask the parents when their baby was born. If we confine the calculation of mortality only to the pool of baptisms where a date of birth was recorded, however (since entries without this information by default cannot produce an age at death), the IMR emerges as 60.5 per 1,000. This is much closer to the rate produced using dates of baptism, and represents a more appropriate at-risk population. Using the date of birth information in Dade registers, therefore, lowers IMRs slightly, and has highlighted the importance of considering local factors to do with registration on a parish by parish basis. The latter point continues to stand when we use the age at death information recorded in the burial registers.

II: Age at death

In this case, burials are not linked to corresponding baptisms; instead deaths recorded as being of infants age one or under are related simply to the number of valid baptisms. This is clearly a much simpler method of calculating mortality, since the record-linkage process is a relatively time-intensive one, and may represent a significant advantage of Dade registers. It does, however, produce a less tightly defined pool of infants, since 'one year' was a far more likely age label than 364, 365 or 366 days. This will be discussed further below. The method produced IMRs for the three parishes which were generally higher than the original rates calculated via reconstitution and using dates of baptism: 83.5 in Ilkley, 95.8 in Ackworth, and 52.4 in Rothwell. Again, the numbers of infant burials involved are relatively small: 43 in Ilkley, 109 in Ackworth and 149 in Rothwell, which raises the need for caution in accepting the exact levels produced. It is noteworthy, however, that the rates in two parishes are now higher: have we picked up some previously missing burials?

Unfortunately, it seems unlikely that matters are this straightforward. Firstly, it is possible that some of these infant burials were not of infants born in the parish, which confuses the definition of the 'at-risk' population. If some of these newly-included infant burials do not appear in the baptismal register because they died before they had been baptised (or had been baptised elsewhere), they ought to be added to the 'at-risk' population, or they represent the death of someone who was never counted as present in the first place. Secondly, much depends on the accuracy of age-at-death information. In all cases, comparison with ages calculated by linking dates of birth and death

shows that there is relatively little discrepancy between what the clerk recorded and the child's true age. The largest margins of error tended to be of children recorded as age one, who were actually either considerably younger, or nearer to the age of two. In Ilkley, for example, three infants who were allegedly one year old at death were in fact 48 days, 91 days, and 587 days old respectively. Generally speaking, however, discrepancies are not large, although they might affect relatively large numbers of children: in Rothwell, 54 children labelled as dying at age one or under were actually past their first birthday when they died. Age at death information does, therefore, increase the numbers of visible infant burials, but there are doubts over how this affects the accuracy of resulting IMRs.

Conclusions

It is clear that few of the estimates of mortality made here approach the range of values found in national studies. We should beware of dismissing low levels of infant mortality as deficient out of hand, but the use of parishes of very different sizes and socio-economic profiles should perhaps make us suspicious of near-uniformly low levels as have been reported here. Ultimately, the evidence does point to some under-registration of infant deaths in these parishes, as has been found for others in the Dade group. Gloomy though this sounds, there are several positive outcomes to emerge from this study.

The first and most simple is the ease that the increased detail lends to the process of family reconstitution. This may seem somewhat ironic, since the evidence suggests that we must be cautious in how we interpret the results of reconstitution in these parishes. Nonetheless, the inclusion of maternal names in particular, as well as corroborating information on ages, makes the reconstruction of families very much easier. These details are not unique to Yorkshire, although they are particularly concentrated there. The second positive conclusion of the study is the way that it has highlighted the importance of the state of individual registers, even within the Dade-style corpus. The registers for Rothwell were never as uniformly well-kept as those for Ilkley, for example, while those for Ackworth were particularly detailed. Ironically, the Ackworth registers were not improved because of Dade's influence; the increased level of detail from mid-century seems to have been the result of internal decisions. This affects how much can be added to the accuracy of IMR calculations, especially where, as in Rothwell, extra detail is patchy. This was highlighted when information on date of birth was used: in Rothwell, attention had to be paid to the definition of the pool of baptisms which could be related to infant deaths. Different parishes may have taken up Markham's Dade instructions to varying degrees, and from varying dates, and we cannot assume that they represent anything like a homogeneous corpus of registers.

The third positive conclusion of this study is that the extra details provided by the Dade-style registers do allow us to refine and broaden the pool of infant deaths. This enables us to be more accurate in writing about the mortality of

certain groups of the population, most notably infants who were buried unbaptised. Figure 2, however, illustrated that there does seem to be deficient registration of infant burials. Galley's suggestion of missing illegitimates, nonconformists, or unbaptised infants all stand in the current case also. Illegitimacy rates are not unduly low in these parishes; nor were the baptisms of illegitimate infants marked out with particular disapprobation (further than the marker 'base born'). Occasional mention of the appearance of Quaker or Catholic infants suggest that non-Anglicans used the parish church to register certain events, although we cannot tell how uniformly this was true. Several examples from the Ilkley registers illustrate some of these scenarios. William and Mary Blacoe registered their marriage in the parish church during the Dade period, and the burials of three children. None of the three children was baptised in Ilkley, but at least two were infants when they died. It is possible that this couple were simply not very active Anglicans; marriage and burial were, after all, the two vital events which could scarcely be avoided through lack of participation in church life. Alternatively, they may have been nonconformists, with facilities for their own baptismal arrangements, but not for burials. Finally, the Blacoes may simply not have had time to register their children's baptisms before they died. This seems to be a likely group of infants to be missed from baptismal registers, especially where birth-baptism intervals were long. Other missing baptisms may indicate migration: David and Mary Curtis, for example, first appear in the Ilkley registers burying their eight-month old daughter, Martha, in 1789. They went on to baptise four more children in 1790, 1792, 1793 and 1795. This family may have moved to Ilkley after their marriage and Martha's birth, and then continued to participate in community life. Alternatively, Martha may have died very soon after birth, and was never baptised. It should be noted that unbaptised babies under Anglican doctrine were not seen as sharing the fate of Catholics, who would go to limbo in eternity. There was, therefore, less imperative to rush the baptism of a sick baby, although there is evidence that this did sometimes happen.¹⁸

We may never know what types of infants were omitted from baptismal registers in these parishes, or if there was even this amount of method to it. Galley noted in his study of St Olave that the greater detail characteristic of the Dade parish registers was not there to improve the state of knowledge about the population. The evidence used for the current study confirms this, and suggests that it may have been particularly true for infants and young children. In Rothwell, for example, only 22 per cent of infants identified as dying under one year by linking baptisms and burials were given an age in the burial register: the majority of infant burials thus provide no information on their age. This was less true in Ilkley and Ackworth, where 75 and 83 per cent of infant burials respectively were labelled as being one year or under. It is quite possible that clerks were more concerned to record the details of adult burials, especially since Markham's instructions on the state of the registers stated that his intention was to improve their reliability as pieces of evidence. It was much less likely that information on a child burial would be called upon in a court than that of an adult, and Dade may have changed the priorities of parish clerks in this part of the country in pressing for registration reform.

Is it possible, therefore, that Dade registers may tell us more about adult burials than those of children? Calculating adult death rates is a much more complicated process than for infants, and local historians and historical demographers may be put off the task. It may, nevertheless, be a fruitful avenue of research. We should continue to bear in mind the state of individual registers, however. The Ackworth burial register covers a wide range of adult causes of death: for example, from old age, through consumptions and fevers, to killings, dropsy, childbed and diabetes. In Rothwell, in contrast, it was only the most 'interesting' deaths which were described: almost all of the 30 adult deaths with a cause ascribed were the result of accidents. We must conclude that Dade registers were neither uniform in coverage nor complete. This should not, however, deter us from using them to discover more about local epidemiology, record-keeping, lineage, inheritance and migration; we must simply be careful about the assumptions we make as to representativeness.

NOTES

1. See, in particular, R.A. Bellingham, 'The Dade parish registers', *Family History: News and Digest*, 10 (1995), 76–9; R.A. Bellingham, 'Dade parish registers', *Local Population Studies*, 73 (2004), 51–60.
2. Bellingham, 'The Dade parish registers'; Bellingham, 'Dade parish registers'; C. Galley, 'An exercise in Dade parish register demography: St Olave, York, 1771–1785', *Local Population Studies*, 74 (2005), 82.
3. On the lengthening birth-baptism interval, see R.S. Schofield and B.M. Berry, 'Age at baptism in pre-industrial England', *Population Studies*, 25 (1971), 453–63.
4. E.A. Wrigley, R.S. Davies, J.E. Oepfen, and R.S. Schofield, *English population history from family reconstitution, 1580–1837*, (Cambridge, 1997), 207.
5. Galley, 'An exercise'; S. Basten, 'The environmental and economic context of infant mortality: Yorkshire, 1777–1812', (unpublished MPhil thesis, University of Cambridge, 2002).
6. A. Levene, 'Left to the mercy of the world': childcare, health and mortality at the London Foundling Hospital, 1741–1800 (Manchester University Press, forthcoming), esp. chapter 8.
7. J.L. Saywell, *The parochial history of Ackworth, Yorkshire* (London and Pontefract, 1894), 1.
8. Wrigley *et al*, *English population history*, 12–17. For an account of the mechanics of manual reconstitution see E.A. Wrigley, 'Family reconstitution', in D.E.C. Eversley, P. Laslett and E.A. Wrigley (eds), *An introduction to English historical demography from the sixteenth to the nineteenth century* (London, 1966), 96–159.
9. Wrigley *et al*, Table 6.4, 226 and Table 6.16, 270–1. The lowest rate was found for Bridford in Devon, and is for the period 1675–1749.
10. Wrigley *et al*, *English population history*, Table 6.16, 270–1. The rates are for the period 1675–1749. Basten, 'The environmental and economic context' also found extremely low rates of infant mortality in eight Yorkshire parishes with Dade registers.
11. For example, R.E. Jones, 'Infant mortality in rural north Shropshire, 1561–1810', *Population Studies*, 30 (1976), 305–17, and 'Further evidence on the decline of infant mortality in pre-industrial England: North Shropshire, 1561–1810', *Population Studies*, 34 (1980) 239–50; E.A. Wrigley, 'Mortality in pre-industrial England: the example of Colyton, Devon, over three centuries', *Daedalus*, 47 (1968), 546–80.
12. S. King, 'Dying with style: infant death and its context in a rural industrial township, 1650–1830', *Social History of Medicine*, 10 (1997), 3–23.
13. In each case, the pool of baptisms is one year shorter than that of burials, to ensure that the deaths of infants born in the final year are captured.
14. Wrigley *et al*, *English population history*, 222–29.
15. J. Bourgeois-Pichat, 'La mesure de la mortalité infantile', *Population*, 6 (1951) 233–48 and 459–80. See E.A. Wrigley, 'Births and baptisms: the use of Anglican baptism registers as a source of information about the numbers of births in England before the beginning of civil registration',

Population Studies, 31 (1977), 281–312, for a fuller explanation and demonstration of the method.

16. See, for example, C. Galley and N. Shelton, 'Bridging the gap: determining long-term changes in infant mortality in pre-registration England and Wales', *Population Studies*, 55 (2001), 65–77. They note that the use of quadratic regression (the most common method, and that used here), may over-state endogenous mortality, compared with a linear regression. Galley and Shelton also note that there may be more meaningful explanatory age categories when considering early mortality than endogenous and exogenous, such as neonatal and post-neonatal. For all these reasons, precise age categories are not given much weight here.
17. The number of linked infant burials is small when broken down by time-frame, so we should not place too much weight on the exact levels produced here. The number of infant burials in Ilkley was 23, in Ackworth 84, and in Rothwell, 137.
18. See, for example, Wrigley, 'Births and baptisms'.