Data Mining Family History Society Burials

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CWPESH no. 34

UNIVERSITY OF CAMBRIDGE

Abstract: Part I of this paper describes a new 'Big Data' resource for historical mortality research, the Family History Society burials dataset. This comprises 8.9 million individual records harmonised from Family History Society transcriptions of burial records in 4,200 English places with varying coverage dates spanning from about 1500 to 2000, and concentrated in the period 1600 to 1850. Adult and child burials have been separately identified using family relationship information, and post-1812 more precise age information is stated. Part II presents an exploratory analysis of burial seasonality and age at death using the Family History Society burials dataset. The seasonality of birth and baptism, which impacts on infant burial seasonality, is also considered using a subsample of four English counties (Suffolk, Cambridgeshire, Nottinghamshire and Lancashire). This research forms part of a Wellcome Trust funded research project led by Richard Smith at CAMPOP entitled 'Migration, Mortality and Medicalisation: investigating the long-run epidemiological consequences of urbanisation 1600-1945'.

Part I: Introduction to the data

England has a number of family history societies (FHS) that have transcribed parish registers to aid their members in finding ancestors in historical records. We approached the largest such societies to request permission to use any burial (and baptism) register transcriptions held in electronic format that they were willing and able to give, and thus obtained the kind cooperation of nineteen county-based societies to use all or some part of their data (with grateful thanks to: Suffolk FHS, Kent FHS, Manchester and Lancashire FHS and Lancashire Online Parish Clerks, Cambridgeshire FHS, Hampshire Genealogical Society, Norfolk FHS, Buckinghamshire FHS, Nottinghamshire FHS, Shropshire FHS, Northamptonshire FHS, Bedfordshire FHS, Leicestershire and Rutland FHS, Devon FHS, Derbyshire FHS, Gloucestershire FHS, Northumberland and Durham FHS, Cumbria FHS and Wiltshire FHS).

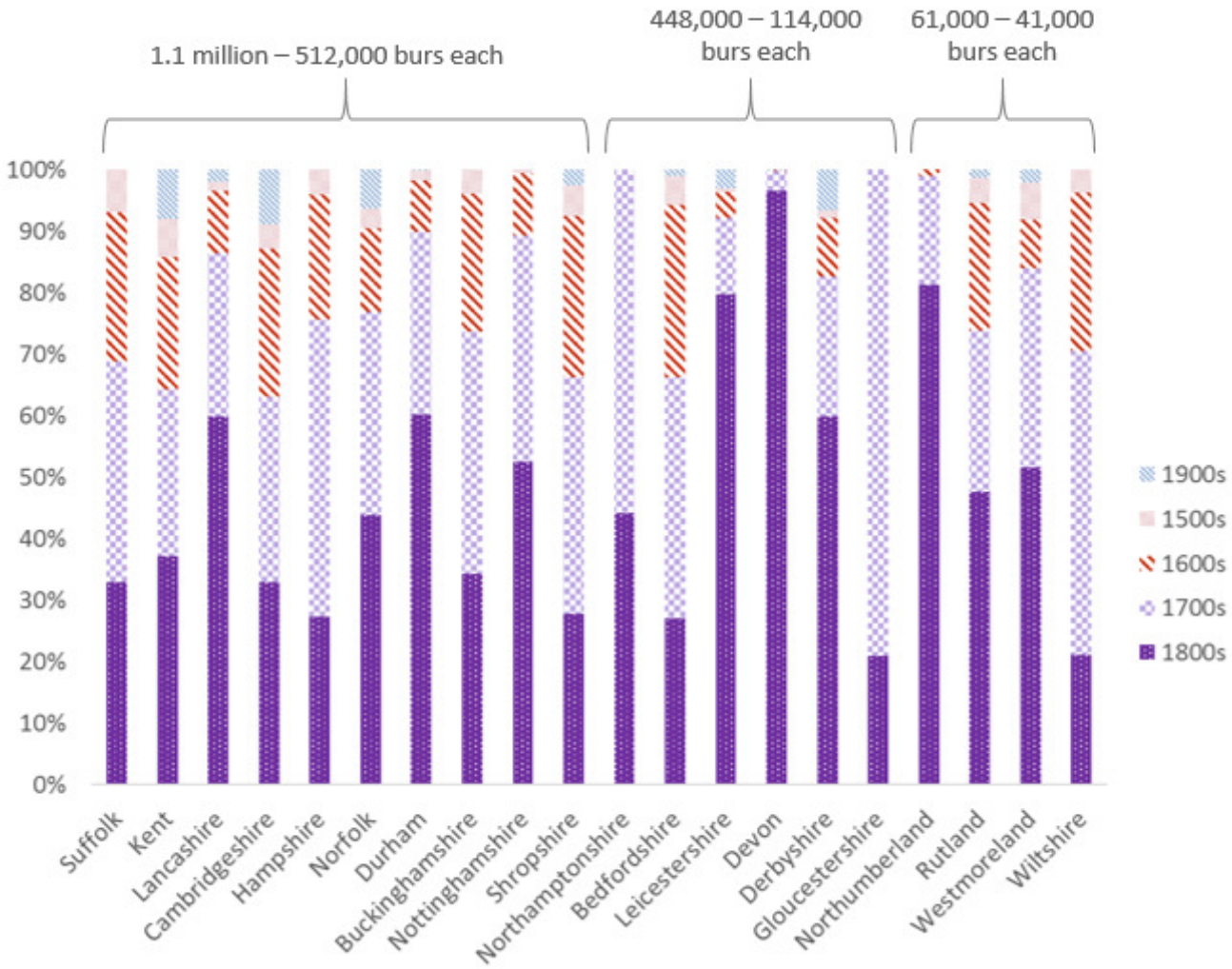
These data obtained from FHSs were harmonized into a maximal useable FHS burials sample of just under nine million (8,862,656) burials from four thousand (4,246) English parishes/places. Useable means those burials with date year and month that can be spatially matched to our historical place GIS, which is most of them, but a further 153,721 burials were detected but unusable. Wrigley and Schofield's *Population History of England*, by comparison, was based on 2,704,920 million burials in 404 parishes intended to be representative of England as a whole.[1] The coverage dates for each of the Wrigley and Schofield parishes was relatively uniform since only places with consistently high quality parish registers that began in or before 1662 and ended in or after 1811 were used and all events within the period 1538 to 1837 were counted with any minor gaps later interpolated, with quality checks on the consistency of reporting and accuracy of counting.[2] By contrast, the FHS burials sample simply represents whatever has been transcribed and made available to us, with the crucial difference that individual entries were extracted, permitting the division of burials into adults and children (or more nuanced age categories), rather than only overall counts of burials. Although a longer period is observed in the FHS burials overall, the coverage dates of individual places may be much shorter. This is a principal driver of the fact that the number of places in the FHS burials sample is ten times as large as the Wrigley and Schofield dataset, but the number of burials only

[1] 404 English parish aggregative analysis dataset total number of burials without interpolation.
[2] Wrigley and Schofield (1981), p. 19-23.

seven times as large, although it should also be noted that Wrigley and Schofield identified a bias towards more populous parishes in their sample.[3]

The FHS burials sample chronological coverage by county is shown in Figure 1 and Table 1, arranged in order of the size of each county's useable burial set. Eighteenth and nineteenth century records constitute the vast majority of burials in every county, with most counties also covering at least some sixteenth century burials (nearly all post 1538 when parochial registration began), and a minority of counties extending coverage well into the twentieth or even twenty-first century. When broken down further into half century periods as in Table 1, it is apparent that 1750-99 and 1800-49 yield the most burials.

Figure 1: Chronological distribution of FHS burials by county



Source: FHS burials database burials with known year and month and spatially matchable location (see Geographical Coverage section below)

[3] Ibid. p. 35-36, based primarily on 1811 parish populations.

Table 1: Chronological distribution of FHS burials by county in fifty year periods 1550-1999

	50 years beginning									
County	1500	1550	1600	1650	1700	1750	1800	1850	1900	1950
Suffolk	5,706	72,758	121,543	151,327	196,339	209,452	242,183	130,978		
Kent	2,590	48,379	88,623	88,494	96,132	126,490	170,238	135,853	54,514	10,718
Lancashire	486	11,129	35,555	39,523	55,491	141,160	289,219	155,819	12,904	1,169
Cambridgeshire	1,377	27,576	83,599	94,214	113,032	108,267	128,865	112,999	48,902	16,098
Hampshire	2,444	26,042	53,458	88,029	141,820	195,048	190,683	14		
Norfolk	1,716	20,509	33,846	59,851	101,158	127,182	180,774	121,056	32,435	10,692
Durham	298	11,182	24,550	30,826	57,645	139,719	237,564	163,670	100	
Buckinghamshire	1,106	20,837	57,818	68,169	105,276	116,679	132,194	61,601		
Nottinghamshire	266	2,528	8,826	46,643	83,672	117,277	195,991	91,099		
Shropshire	335	25,558	56,046	78,185	97,799	99,195	130,788	11,359	7,716	5,108
Northamptonshire					116,711	133,104	146,440	51,297		
Bedfordshire	1,084	16,178	44,727	55,500	69,478	71,493	83,340	13,450	2,280	1,075
Leicestershire		1,369	4,661	5,636	11,391	18,633	90,593	102,536	6,954	270
Devon				247	1,154	6,021	216,728	1,340	157	91
Derbyshire	121	1,939	5,422	12,144	19,150	22,166	38,049	71,077	12,120	21
Gloucestershire				2	2	89,893	23,949	2		
Northumberland				563	1,659	9,171	44,400	5,077		
Rutland	1	1,771	3,724	5,307	5,625	5,784	10,913	9,776	472	66
Westmoreland		2,590	234	3,152	7,686	6,241	20,111	2,105	423	483
Wiltshire	105	1,416	3,672	6,965	9,134	11,216	8,736			
ALL COUNTIES	17,635	291,761	626,304	834,777	1,290,354	1,754,191	2,581,758	1,241,108	178,977	45,791

Source: as Figure 1

It is important to stress that these variations in data coverage by county do not reflect availability of manuscript parish registers, nor are they driven solely by population differences. This is conveniently demonstrated by the fact that two of the largest county samples are from Suffolk (circa 1.1 million burials) and Lancashire (circa 750,000 burials), although in 1801 Lancashire's population at 703,056 was more than three times as large as that of Suffolk (223,856 persons).[4] Moreover, Lancashire's growth rate was higher than any other county in both 1750-1801 and 1801-1851, whereas Suffolk ranked only in the middle third of counties in 1750-1801 and had sunk to the bottom third by 1801

[4] Wrigley (2011), Table A2.6.

to 1851.[5] To these population differences may be added differences in sample size and coverage. For Lancashire we obtained burials data only for Manchester, its hinterland and a sample of other settlements whose names begin with the letters A to D, constituting 91 places in total, but the Suffolk data are more geographically comprehensive, constituting 616 places in total (see also Figure 3). The Suffolk sample has no burials post 1870, whereas more than half of Lancashire places continue beyond 1870 although only a few continue into the twentieth century.

The observed variations in data coverage by county are thus mainly the result of variations between different FHS's holdings and what portion of those they were prepared to share with us, but also in a more general sense the transcription priorities of genealogists. Family historians usually begin tracing ancestors backwards in time from individuals in living memory, initially by using the population censuses. The earliest English census where records with named individuals survive for the whole country is 1841, and for births, deaths and marriages centralised indexes may be consulted after 1837 when civil registration of vital events began. For genealogical purposes, it is therefore necessary to turn to other sources such as parish registers primarily for the pre-1840 period, and it is early nineteenth century or late eighteenth century records that (in the case of baptisms and marriages) may be more readily linked with later census appearances of the same individuals. Records from this period may also be easier to read and therefore more widely accessible than earlier ones. Baptisms and marriages are often transcribed before burials, partly because they give more information on individuals, but also perhaps because they facilitate more positive research experiences than establishing the details of an ancestor's death. Smaller settlements with a single church rather than large towns with their many hundreds of thousands of individual events recorded in multiple churches may prove most amenable to volunteer transcription, since larger towns are likely to require coordination of many volunteers.

Besides these unavoidable variations in the sample by county, the major underlying demographic differences that affect the county distribution of all recorded burials potentially available for transcription are uneven population growth during the industrial revolution, and the geographical distribution of densely populated urban centres where the rate of in-migration is often high, life is more hazardous, and, in short, more people die. To illustrate these underlying differences, Table 2 gives the 1801 population of each county for which we have FHS burials, in order of their population growth rate in 1801-1850, showing also their population growth rate rank fifty years earlier in 1751-1800. Notwithstanding the presence of (part of) the leading growth rate county of Lancashire, counties ranking below median growth rates are disproportionately well-represented. However, since the earlier population geography of England was very different to that during the industrial revolution, this is not necessarily a significant cause for concern, and the spatial spread of counties is actually quite good.

[5] Ibid. Table 4.2, p.108-9

Table 2: 1801 total population of counties in FHS burials dataset with growth rate ranks

		Growth rate rank (of all 41 counties)	
County	1801 population	1801-51	1750-1801
Lancashire	703,056	1	1
Durham	167,690	2	22
Cambridgeshire	93,378	10	26
Kent	322,525	11	5
Bedfordshire	66,190	13	31
Nottinghamshire	146,619	15	8
Hampshire	229,221	17	12
Derbyshire	168,829	19	11
Gloucestershire	261,473	20	27
Northumberland	163,857	21	36
Leicestershire	135,818	22	16
Devon	355,935	26	37
Norfolk	285,408	28	34
Northamptonshire	137,569	31	40
Suffolk	223856	32	18
Buckinghamshire	112,544	35	24
Westmoreland	42,575	36	39
Shropshire	182,705	37	20
Rutland	17,029	38	25
Wiltshire	193,268	39	41

Source: Wrigley: Early English Census, Tables A2.6 and 4.2. The spatial distribution of places within each county is shown in Figure 3 below.

Data mining method

Our intended purpose was to analyse seasonal variations in burials that might help illuminate the geography and timing of changes in the structure of mortality, in connection with research on the epidemiological changes of urbanisation,[6] dividing the burials into those of adults and those of children using ages or relationships such as 'son of', 'daughter of' and so on. Ages are not routinely stated in burial registers until after 1813 when Rose's Act reformed the content and structure of parochial registration, making age declarations in burial registers standard, but typically at the

expense of family relationships. Before this date we can infer adult or child status from relationships ("son of", etc), or status words such as 'infant'. Thus, age and relationship or status are key variables that complement each other: if age is stated we probably will not have relationship, and vice versa, although any overlaps that do exist are useful in gauging the meaning of relationship descriptors in age terms, and stated ages are more precise than family relationships as an indicator of age.

Other variables key to our purposes are dates, especially year and month, and parish/place. Fortunately our interests and those of genealogists intersect in dates and places and these are relatively well and comprehensively represented in the source datasets, albeit in every conceivable format. Ages are also well-represented. We did not make use of names of individual burial subjects and in many cases were not given them since they have commercial value to the FHSs. Most problematically, relationships that are critical to our purpose in most data before 1813 are less well represented and considerably more difficult to identify and extract from the transcriptions, presumably because they are less or no use in finding individual ancestors and thus transcribed only as an afterthought, as frequent dumping of this information into 'Notes' or 'Comments' fields attests. Much of the data mining effort was concentrated on finding and parsing relationships, especially where they were entangled with other sorts of information and/or abbreviated.

The FHS burials data were received from county societies gradually in response to our enquiries over a period of more than two years, with no fixed end date. They were not all processed at the same time, but since it was clear at the start of processing that more burials data was likely to arrive, the original intention was to create an algorithm capable of parsing whatever data structure had been used by the FHS sufficiently well to detect, retrieve and standardise dates, places, ages and relationships, without further human input beyond an initial conversion into delimited text files from the various file formats supplied (mainly Microsoft Excel spreadsheets and Access relational databases, with some CSV and other delimited text formats). The initial file conversion required checking and light data cleaning to ensure the choice of field separator did not overlap with data values, and that special characters such as carriage return or other line end markers within the data values were not disrupting the intended burial-record-per-line in both input and output, but was otherwise straightforward.

It quickly became apparent that a 'one-size-fits-all' approach would not succeed. Data values for relationships were most problematic, and more varied than it was possible to predict from one batch to the next. Some inputs had more than one date field (eg of burial and also of death), or several age fields expressed in different ways, or in different states of standardisation. Relationship and age-indicative status descriptors such as 'infant' were often present in one of several possible candidate fields, some or all of which might also contain other types of information potentially confusable with relationships. Field names were not a reliable guide to field contents, nor were field names standard or predictable (although on first inspection they might appear to be), both within batches and from one batch to the next. Manual inspection of samples of the data was thus the only safe way to determine what portions of the input burial records of each batch were necessary to our purposes, and which were not.

In consequence the processing algorithm forked specifically to each FHS input batch, most importantly differing per batch in terms of which fields to search for which of the desired output variables, and in what priority order, but also varying significantly in terms of what input to find and

parse into the singular standard output format constructed for all data batches. The algorithm was written in Python, initially building on and repurposing code written for parsing dates in another context.

Relevant input was searched for by the Python algorithm in two main ways: as exact strings, and as regular expressions that each specify patterns of characters of interest. Regular expressions were coded as lists of tuples specific to each batch, so that values could be searched for in a particular sequence starting with the commonest and most unambiguous values. Dictionaries (associative arrays) were used to code simpler pairings between exact (sub)strings and standard output values, again specific to each batch.

What to search for was determined iteratively by inspection of the data, separately for dates, ages, relationships and place names. For relationships, much use was made of word boundaries as a means of differentiating between abbreviated forms of relationships and the same character strings occurring as parts of other words. The first few words of longer strings were most important, as relationships information tended to occur at the beginning of notes or comments fields containing other data. The most common values of relevant fields (or parts of fields) were extracted repeatedly and *ad hoc* for inspection during development, using the Unix shell commands cut, sed, sort, uniq. New regular expression tuples or dictionary key/value pairs were coded (and where necessary irrelevant values added to an 'ignore' list) until a high proportion of field values were successfully parsed. This process of inspection of values and coding continued until at least 95% and a preferred 98% of values were accounted for, in fields wholly or largely thought to contain relevant data values. Fields where only occasional values were relevant were particularly difficult and time-consuming to address. In these cases, short samples were drawn from different random locations in the batch to find the most common relevant values, and regular expressions and dictionary values added as before. This was repeated until about 90% of relevant data values in the samples were successfully parsed.

Dates were the simplest values to parse, since there are a limited range of possibilities for expressing years, months and days (although there were some idiosyncratic abbreviations such as "Mch" for March that it was important not to miss to avoid skewing the monthly totals of burials that could be analysed, given that investigations of seasonality would follow). Date information in the input was mostly present as strings already split into day, month and year but in some input files date formats were used, and in others (perhaps inadvertently) partial dates were stored as timestamps, which required further processing to reunite day and month with year. Calendrical differences entailed by the switch from Julian to Gregorian calendar in 1754, which moved the start of the year from 25 March to 1 January and changed the definition of leap years, were assumed mostly to have been resolved upstream of our processing during transcription by the FHSs, but some earlier dates in Old Style/New Style form, for example as "1567/8" were present, and these were resolved to the New Style year, ie 1568 in this example. All dates with year values lower than 1400 or greater than 2014 were eventually disregarded, and for some later batches more stringent limits were applied, with an earliest permissible year value of 1538 and latest of 2000, because a handful of genuine burials pre- or post- those years were outweighed by many more obviously erroneous date year values. Burial records with unparseable dates were left in the output dataset but are not useable for analysis. In general, unparseable data of any kind except wholly empty records were left in the dataset, and

records with no age/status, relationship or entire date that could be detected or parsed were flagged.

Ages, expressed in words, as whole numbers, as decimals, or some combination thereof, in various units of time ranging from hours (and even minutes in a few cases) to years were also expressed in a more tractably limited, albeit large, number of forms. These were resolved to one common unit: years (including fractional years: days were represented as 1/365.25 years, months as 1/12 years, weeks as 7 x days, hours as day/24 and so on). Field names for ages were relatively consistent, and this information was infrequently combined with other data in the same field.

Place (parish) names could often be extracted from filenames, but specificity and uniqueness varied. In the most specific cases the name of the saint to which the parish church was dedicated was also given, with the place name (eg Wisbech St Mary) or separately. In other cases geographical qualifiers such as proximity to another location distinguished places of the same name, but in others no distinguishing information was present and was later inferred from manual inspection of contextual information. In a few batches there were genuine duplicate locations, which could be for different or overlapping chronological periods, or might originate from different sources (Bishop's/Archbishop's transcripts as well as parish registers), or existed for unknown reasons. These were eventually resolved to one set of burial data per location, as described in the section on GIS spatial matching below.

Relationships were most difficult to detect with confidence, for two main reasons. Firstly, even where consistently present in the data there will be many records that legitimately have no relationship to detect, being adult males, making it harder to evaluate how successful parsing of relationships has been, and hence when it is appropriate to stop iterative development of the algorithm's search patterns on the basis that most relationships that are present in a batch of data are being parsed. Secondly, relationships information was in several batches relegated to a 'catch-all' additional information or notes field, jumbled with other data irrelevant to our purposes. It was often abbreviated, reducing informational redundancy that might otherwise help in distinguishing it from other irrelevant information. The worst cases combined highly abbreviated or idiosyncratic and hence difficult to predict relationship indicators, such as "w" for widow(er) in some inputs or wife in others, or "daw" for daughter, with lengthy textual commentary or notes verbatim from the source in the same field. Longer text has a greater likelihood of containing the same characters or strings that denote relationships but with different, non-relationship meanings (eg "w" for weeks or West; the name "Daw(e)"). Extreme such cases are not always possible to interpret confidently even by human inspection of the entirety of individual burial records, which would in any case be an intractable task to perform for much of a dataset of this size. Sometimes relationship words were present in isolation, but in other cases additional text besides the relationship word that gave the names of parents, spouses or other relatives proved useful in differentiating relationship strings from other types of notes and comments. For the most ambiguous portions of one later batch it even proved necessary to construct a shortlist of the most common fathers' names that might occur immediately following a relationship word. In parts of some batches, no relationship word was present in the strings contained in any field, but the existence of a relationship was nonetheless implied by the format of named relatives. A simpler and more generalised extension of the relative name method of relationship detection just described identified pairs of words (ie strings of characters bounded by whitespace, non-alphanumeric characters or start/end of string) conjoined

by “and”, a pattern indicative of both parent forenames as for example “John and Mary”, but this could only be applied cautiously to parts of batches where it was clear from inspection that no other meanings were represented by the same pattern. In general, more effort was made to detect child relationships such as these than less common, typically adult relationships such as kinsman, on the expectation that nearly all children will be ascribed some relationship in burial registers before Rose’s Act of 1813, but no similar expectation exists for adults. Little could be done where it was suspected the transcription, at least in the form available to us, may not have fully retained relationship information, for example in Hampshire which had the lowest overall proportion of child relationships for its pre-1813 burial, at below 20 per cent (77,848 Hampshire child relationship burials of a total of 451,688 pre-1813 with no stated age).

The extent of variation in relationships and age status indicators was markedly different per batch, and sometimes for portions of data within batches. For some batches, such as Suffolk, fewer than ten regular expression patterns sufficed to parse almost all relationships. For others, such as Hampshire, hundreds of dictionary entries and regular expression tuples were needed to capture a high proportion of relationships. The size of the batch in terms of number of burials had some bearing on the extent of variation, but a more powerful indicator was the number of input files supplied to us, and batches with more fields also tended to greater variation, with the caveat that some batches with few fields amalgamated relationships with other information, making them more difficult to detect, as discussed above. How consistently fields were named and whether they contained data of the same data type (ie, numeric or character strings) throughout also gave some indication of the amount of effort likely to be needed to process a new batch. All these factors may be presumed to proxy the amount of data harmonization undertaken by the FHSs upstream of our efforts, although not necessarily all forms of harmonization were helpful to our purposes.

The coverage per county of each of the key variables extracted, together with context on the proportion before and after Rose’s Act of 1813 that required ages but denigrated relationships is presented in Figure 2, with the counties in order of the proportion of burials that are counted as children using relationship, status or age information. Thus it can be seen that the proportion of burials that are of children ranges from about a fifth to half of all burials available from each county. The definition of child used is any of the standardised relationships and status values listed in Table 3 below as “child”, or an age of 14 years and under. Similarly, adults were also positively identified as burials with relationships and status values listed in Table 3 below as adult, or an age of 20 years and over, disregarding for this positive identification method adults implied from lack of any relationship or age information because of the nature of burial recording of male adults. Where age would otherwise have made an individual an adult despite a child relationship/status, the individual was left a child so as to be consistent across all burials, given that for the majority age and relationship/status are not co-present.

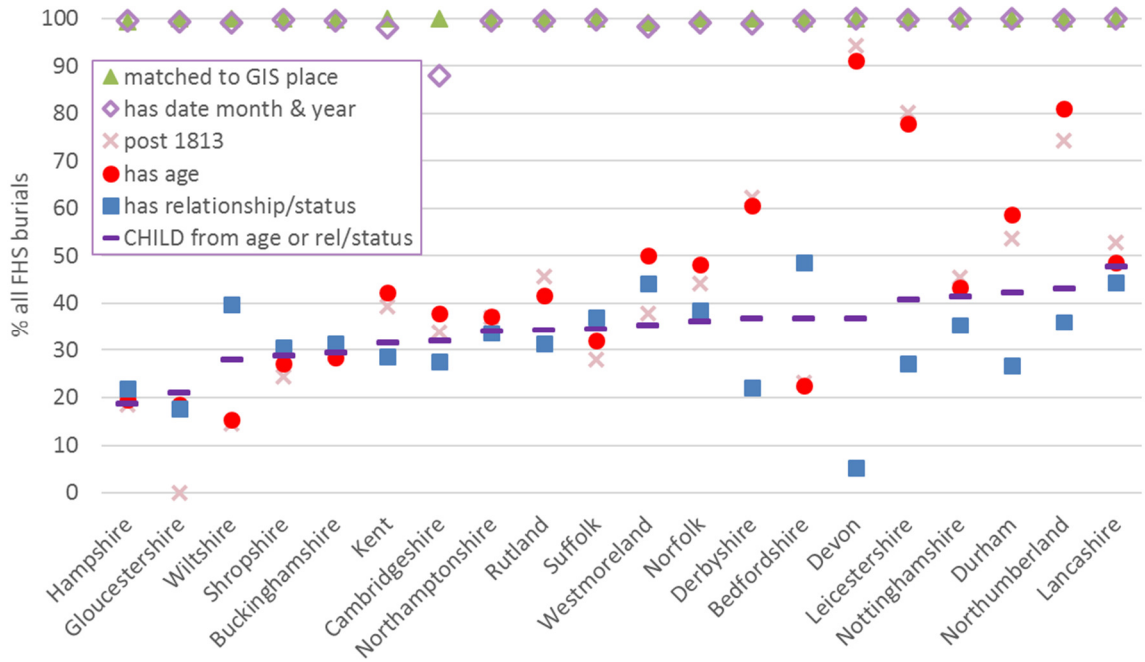
Table 3: Status and relationship values characteristics

rel	n burials	n with age	mean age/years	adult or child
SON	847,901	133,458	6.9	child
DAUGHTER	771,994	118,914	6.0	child
WIFE	581,984	84,134	49.6	adult
WIDOW	169,768	36,419	72.3	adult
CHILD	35,130	4,066	6.8	child
INFANT	29,633	1,757	1.6	child
HUSBAND	16,964	*36*	*56.5*	adult
WIDOWER	15,082	8,121	72.2	adult
SPINSTER	11,031	5,287	46.4	adult
SPOUSE	6,372	3,275	44.1	adult
INFANT SON	3,698	*87*	*0.6*	child
SENIOR	2,925	110	75.0	adult
INFANT DAUGHTER	2,900	*36*	*0.6*	child
MARRIED	2,716	1,137	48.3	adult
Status	n burials	n with age	mean age/years	adult or child
INFANT	383,040	188	0.5	child
CHILD	38,369	254	2.0	child
WIDOW	23,286	932	73.7	adult
SENIOR	3,763	105	75.7	adult
SPINSTER	2,571	224	48.9	adult
ILLEGITIMATE	1,294	*95*	*2.0*	child
JUNIOR	1,276	*47*	*25.7*	adult
GENTLEMAN	1,095	*34*	*72.3*	adult
STILLBORN	1,020	*0*		child

Source: standardised relationships and status values from FHS burials output, excluding those applying to <1,000 burials. NB some values appear in both halves of the table, reflecting the fact that they may be family relationships or status depending on how and in which field they were extracted from in the original data.

In Figure 2, only Cambridgeshire deviates from the near-universal presence of place with identified GIS location, date year and month. The Cambridgeshire FHS batch was one of the first to be data mined, and although ostensibly structured in the same way with the same variables throughout, it became evident that a portion of the data for some places did not have the same fields values under the same field headings as the rest, presumably as a result of having been transcribed differently. In subsequent batches greater efforts were made to capture divergent data structures where several existed, but since there was one dominant data structure that accounted for the majority of the Cambridgeshire batch places, and as the omissions affected whole places, rather than potentially biasing it by affecting particular periods or types of burial, no further action was taken to process the remainder in this instance.

Figure 2: Presence of key variables



Quality check

The FHS burials samples were created by family historians over a long period of time in ways outside our control. But we can assess how accurate the monthly coverage is for those places that were also separately abstracted and counted as part of the 404 parishes used to construct Wrigley and Schofield's population history of England. There are 179 Wrigley and Schofield parishes that are also places in the FHS burials dataset. Taking the years that overlap between the two, but disregarding the first and last year of the overlap since it may start or end mid-month, all these 179 places together yield a total of 237,393 year-month comparison pairs.

The results of this check are reassuring. 88 per cent of comparison pairs (208,955) are exactly identical. A further 10 per cent are correspond within two burials (20,036 +/- 1 burial and 4,621 +/- 2 burials). There is one further issue to consider: how independent these two parish register-sourced datasets are, since Wrigley and Schofield's counts of parish register events were abstracted largely by volunteer family historians. However, there are several reasons to expect that the new FHS burials data are independently derived for those places in both datasets. Firstly, the FHS dataset originates in records of named individuals taken from parish registers rather than abstracted counts of events into pro forma tabulations as Wrigley and Schofield's work demanded. Secondly there is the elapse of time since Wrigley and Schofield's original volunteer abstractions, which began in 1964 and were completed by 1981, before the advent of personal computers and thus before persistent electronic datasets created and managed outside of large institutions or corporations. It is true that a quarter of the 404 English parishes were abstracted not from the original register but from a pre-existing printed transcript that could potentially be a common source to both datasets, but the

difference in coverage dates for nearly all places points to the likelihood that the FHS burials dataset transcriptions are new ones.[7]

Since large urban areas are an important part of the FHS burials dataset, we also checked more specifically the correspondence between the number of FHS burials and the Wrigley and Schofield 404 parish dataset burial counts for Norwich and Ipswich. These two cities are major multi-parish contributors to the urban settlement type (see below and Table 4b). In Ipswich the eight Anglican parishes of St Clement, St Lawrence, St Mary Elms, St Mary Stoke, St Matthew, St Nicholas, St Peter and St Stephen were cross-compared for whole years ranging from an earliest date of between 1558 to 1662 and an end date of 1836 or 1838 (the FHS burials for Ipswich continue to later dates but no parish in the 404 parish dataset extends beyond 1839). This produces 2039 parish-years of cross-checkable counts, and little difference was found between the total burials, with 39,065 burials in the 404 parish dataset, and 39,753 burials in the FHS dataset, a discrepancy of 1.8%. In Norwich the FHS dataset coverage is geographically more comprehensive but chronologically more patchy. Only the five parishes of St Benedict, St Giles , St James with Pockthorpe, St Margaret and St Saviour that are Norwich's representatives in the 404 parish dataset could be cross-compared, for whole years starting between 1539 to 1790 and ending in 1811 to 1838, with gaps for periods omitted because there was no FHS burials transcription available. In total this produced 566 parish-years of cross-checkable counts, and again there was little difference between the total burials. In the 404 parish dataset there were 16,819 burials, and in the FHS dataset 16,561 burials, a discrepancy of 1.5%. In both Ipswich and Norwich, annual discrepancies were not confined to particular parishes or time periods (except in the sense the absence of FHS data in some periods for Norwich parishes already mentioned), and are assumed to be the result of random error.

Geographical coverage

The FHS dataset identifies 4,246 named locations, which are mostly the names of parishes but also include some nonconformist churches and cemeteries. In a few cases there is more than one instance of the same place in slightly different name form, for different coverage dates. The originating FHS supplied files also included some place instances that were both chronological and spatial duplicates of each other, for unknown reasons or because Bishop's transcripts of parish registers had been transcribed as well as the original register. In such cases the instance having the longest coverage period and maximum number of burials has been retained and others discarded, after brief inspection to check that relationships and ages were not better recorded in the instance(s) discarded.

All the FHS named locations were spatially matched by name to the CAMPOP occupations project parish, township and place GIS, which is a revision of Kain and Oliver's sub-parish 1851 ancient administrative units made more accurate to the administrative and population geography of 1831.[8] This spatial matching task used a linked dataset, Peter Kitson's Parish Register Codebook units for 1813-20 parishes, as a stepping stone to speed up the process since these Codebook units, like

[7] Wrigley and Schofield (1981), p.18 Table 1.2 indicates 92 of 404 abstractions were sourced wholly from printed transcripts

[8] Satchell, M., Kitson, P.M.K., Newton, G.H., Shaw-Taylor, L., and Wrigley E.A. (2016): 1851 England and Wales census parishes, townships and places shapefile

nearly all FHS named locations, represent Anglican parishes.[9] Nonconformist burial registers were matched to the Anglican unit(s) covering the same settlement if this could be ascertained, or if this was not possible or practical, as in the case of Quaker registers which often cover whole counties, no spatial match was made. In total there are 26 FHS named locations for which burials data have been retained but no spatial match made. 16 of these did not have intelligible place names, nine are Quaker registers and one a refugee camp of indeterminate location.

The wide chronological coverage of the FHS burials dataset means that there are a number of places that refer to (usually ecclesiastical) administrative units that did not yet exist in 1813-20, or no longer existed, as population changes induced a great deal of shifting of administrative boundaries. In the former case, the place was matched to the mother parish, although this proved especially problematic in Lancashire both due to the scale and speed of change and because the underlying administrative geography includes many chapelries. In the latter case where the unit no longer existed, which was far rarer, a match was made direct to the CAMPOP parish, township and place GIS.

The process of spatial matching aligns locations within the FHS dataset to common boundaries and thus involves some degree of spatial aggregation. It results in 3,555 distinct non-overlapping mappable units built up from the CAMPOP parish township place GIS polygons, and their distribution in English counties is shown in Figure 3. Many of these are still a single settlement, but in urban and urbanising areas boundary change over time and hence the degree of unavoidable aggregation tends to be greater.

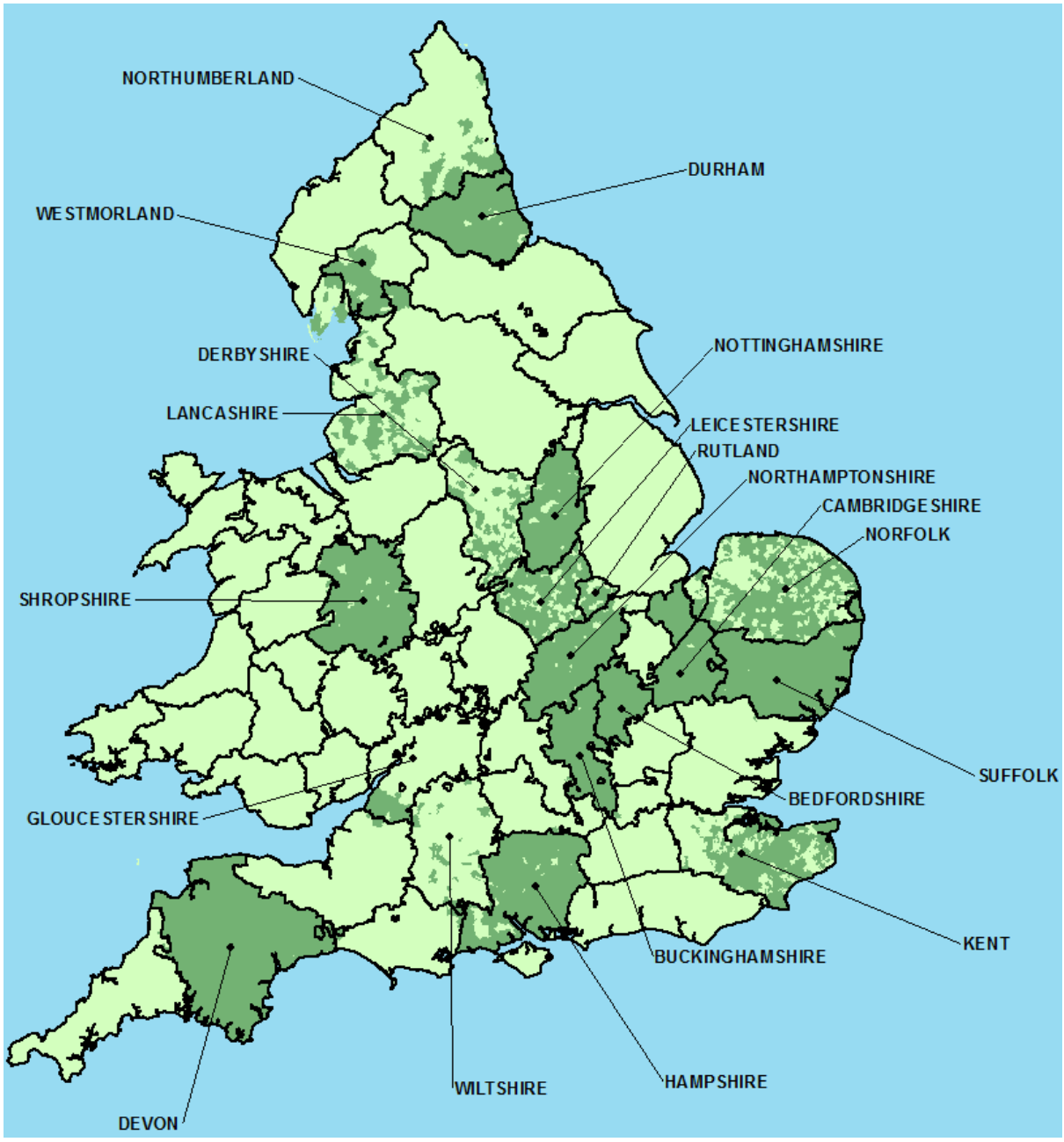
Taking an example from Lancashire, we can see better the problems posed by chapelries, their relation to parishes, and change in boundaries over time. The town of Ashton in Makerfield originated as a chapelry in the parish of Winwick. The parish of Winwick had a dispersed settlement pattern, comprising multiple hamlets which fused and in some areas grew into towns. Ashton-in-Makerfield was one of four chapelries that Winwick parish spawned, two of which had already become ecclesiastical parishes in their own right by 1800 (the town of Newton in Makerfield, and Lowton). In the FHS burials dataset there are 6 distinct sources ultimately spatially matched to Winwick. Five of these sources are Anglican or nonconformist burial registers from Ashton in Makerfield and the sixth is from the sometime rural hamlet of Croft. Fortuitously perhaps, the sample of Lancashire burials available to us did not include any of Winwick's other constituent parts, but when cross-compared to other spatially matched datasets such as censuses these other parts are sometimes unavoidably entailed by the spatial matching of those datasets, which have different administrative boundary divisions. This means that within the FHS burials dataset Croft and Ashton in Makerfield remain separate settlements, but are both assigned to urban types.

It should be possible to discern from the example of Winwick that settlements cannot always be kept uniform after spatial matching. While the problem is at its most acute in Lancashire (which is, in the pace of its population and economic development, markedly atypical of England as a whole), this does have general implications for the settlement typology discussed below. Ultimately the effect is to subdue the number of 'rural' places available for scrutiny, since those that are entangled with otherwise urban places or places which became urban will generally be so categorised. While 'urban'

[9] Peter Kitson and Leigh Shaw-Taylor (2010): Codebook of Anglican Registration Units database

places may thus contain some rural portion, the disparity between urban and rural population sizes means that this typically only has a small diluting effect on the 'urbanness' of places categorised as urban, but the number of rural areas reduces, and so rural areas may be less well represented.

Figure 3: FHS burials dataset coverage by county



Part or all of 20 counties are covered by the FHS burials dataset, roughly half of all English counties. London and its hinterland are not represented but we have other sources of data for them, including Bills of Mortality and our own transcripts or extractions from London and Middlesex parish registers. There are no Welsh burials, nor any from Yorkshire, but coverage is reasonably comprehensive for a range of settlement types and includes arable and pastoral agricultural regions, mining areas, variations in topology and climate, and areas with very different rates of population, industrialisation and economic growth.

Settlement typology

A settlement typology was constructed, intended primarily to distinguish urban and rural places, using information on whether or not contemporaries viewed the settlement as a town, population, acreage and occupational structure from other datasets also linked to the CAMPOP parish, township and place GIS. These additional datasets comprised population totals from the 1801 Census, population totals and occupations from the 1881 Census, and parish register baptism fathers' occupations from 1813-20. Characteristics of the FHS place settlement typology are summarised in Table 4, and a full description of the criteria used in assigning them to this typology is given at the end of this section.

This settlement typology was made possible by the spatial matching exercise described above, and also by linkage of FHS places by name to entities in the CAMPOP Towns database, which brings together various gazetteers, trade directories and other lists of towns compiled by contemporaries, to represent a maximal definition of places that were ever considered urban between about 1550 and 1900. However, presence in the Towns Database is not sufficiently discriminatory taken on its own to define urban locations, partly because of change over time, but also because statutory definitions of townhood often differed from the reality of settlement function.

Places were assigned first to one of ten subcategories, in two phases. The subcategories can also be further grouped into three overarching categories of urban, rural and other, and ultimately these are the distinctions used in the exploratory analyses performed in Part II of this paper. However, defining the subgroups is necessary to give full rational justification for decisions made in attaining that three way split, and there remains the potential to use the subcategories in further work.

In the first phase, those FHS places that could be linked to a settlement understood in some pre-twentieth century period to be a town as evinced by a listing in a gazetteer, trade directory or similar (that is, settlements present in CAMPOP's Towns database) were assigned to a category. In the second phase, the remaining FHS places were assigned to a subcategory. First phase places were not necessarily categorised as urban: other conditions of population density and size were imposed, since in some Towns Database sources there is no distinction between places that were once markets and those continuing to function as towns, and in other cases a place only became urban at a very late date.

First phase places were often in reality groups or clusters of places, since larger and/or long established towns typically consist of more than one parish. Cross-comparing these FHS places to census and parish register sources of population and occupational information through spatial matching enforced aggregation in many cases, but where parts of the same-named town identified in the Towns Database remained separate, the part with maximum population or population density or occupational diversity was used as a proxy for the whole town. This assumes that where the FHS burials dataset comprised only a subset of all parishes within a town, at least the largest or most complex of those parishes was reasonably representative of the whole town, but the potential difference in coverage dates between places makes this a somewhat risky assumption.

In a more general sense, attempting to classify places over such a long period as 1538 to 1900 is fraught with problems where the place has urbanised or otherwise transformed economically over time. The population and occupational sources used in assessing how to categorise a place are all

nineteenth century, because these are reliable estimates with full geographical coverage, and there are no data of comparable quality prior to 1801. They are sufficient to inform us whether a place is or became urban, but rural proto-industry and smaller scale economic changes at earlier dates will not necessarily be captured. For these reasons, the settlement typology is best thought of as indicative rather than prescriptive.

Per mappable unit, the following measures were constructed for the settlement typology: population in 1801 and 1881, population density in 1801 and 1881, occupational diversity in 1813-20, whether a mining community in 1813-20 and 1881 and whether an agricultural community in 1881. Occupational diversity was defined as the number of distinct occupations constituting at least two thirds of baptism fathers' occupations (excluding those of no stated occupation from numerator and denominator). Mining communities were defined as those with >=30 persons and >=10% adult males over 20 years in the PST occupational classification scheme mining and quarrying group, or >=50 persons and >=4% adult males over 20 in PST mining and quarrying, or >= 5 persons and >=20% adult males over 20 or all baptism fathers in PST mining and quarrying. Agricultural communities were defined as those with at least 60% of the adult male over 20 population in the PST agriculture group.

The criteria used to define each subcategory in the settlement typology were as follows, with assignment of places starting from the first-listed subcategory and progressing in order through the other subcategories, and in almost all cases once a place was assigned to a subcategory it was not reassigned.

Phase 1: subcategory assignment of places in Towns Database

small town

- max part population 1881 < 10000 and persons per acre 1801 < 0.5 OR
  max part population 1881 < 2000 and persons per acre 1801 <0.5
- max part population 1881 / max part population 1801 < 2
- not mining 1813-20
- not mining 1881

urban: new late C19th

- max part population 1881 / max part population 1801 >2
- persons per acre 1881 / persons per acre 1801 >2
- max part population 1801 < 5000
- max part population 1801 > 2000
- occ diversity 1813-20 <=10 OR
  mining 1813-20 OR
  mining 1881

urban: first tier

- persons per acre 1801 > 1 and persons per acre 1881 > 1 and max part population 1801 > 5000 and max part population 1881 >10000 and occ diversity 1813-20 > 2 OR

  persons per acre 1801 > 10 and persons per acre 1881 > 10 and max part population 1801 > 5000 OR

  persons per acre 1881 > 0.5 and max part population 1801 > 5000 and occ diversity 1813-20 > 10 OR

  persons per acre 1881 > 0.5 and max part population 1881 > 10000 and occ diversity 1813-20 >10

urban: second tier

- max part population 1801 > 5000 and max part population 1881 <=10000 and persons per acre 1801 > 0.5 and persons per acre 1881 > 0.5 OR

  max part population 1801 <5000 and max part population 1881 > 2000 and persons per acre 1801 > 0.5 and persons per acre 1881 > 0.5

urban: third tier

- occ diversity 1813-20 > 5 and max part population 1881 > 2000 and persons per acre 1881 > 0.5
- previously assigned to small town and max part population 1881 >5000 and occ diversity 1813-20 >5 OR
  previously assigned to small town and occ diversity 1813-20 > 5 and max part population 1801 > 5000 OR
  previously assigned to small town and max part population 1881 > 2000 and occ diversity 1813-20 >5 and persons per acre 1881 > 0.5
  previously assigned to small town and max part population 1881 > 2000 and occ diversity 1813 > 5 and persons per acre 1801 > 0.5

small settlement undefined

- not otherwise classified above after manual check

Phase 2: subcategory assignment of FHS Places not in Towns Database:

rural: agriculture

- persons per acre 1801 < 0.4
- persons per acre 1881 < 0.4
- agriculture 1881

rural: other

- persons per acre 1801 < 0.4
- persons per acre 1881 < 0.4
- not agriculture 1881

urban: new C19th

- not agriculture 1881
- population 1881 / population 1801 > 2
- persons per acre 1801 < 1
- persons per acre 1881 > 1 and population 1881 > 2000 OR
  persons per acre 1801 > 0.5 and population 1881 > 5000

urban: suburban

- persons per acre 1801 > 1 and persons per acre 1881 > 1 OR
  persons per acre 1881 > 0.5 and population 1801 > 5000 OR
  persons per acre 1881 > 0.5 and population 1881 > 5000

nonurban: mining

- mining 1813-20 OR
  mining 1881

small settlement undefined

- population 1881 < 5000 and population 1801 < 2000 OR
- not otherwise classified above after manual check

Special characteristics of the urban settlement type

In the analyses of Part II of this paper it is sometimes expedient to consider Manchester and other major towns as standalone cases or separately from other urban settlements.

The composition of the urban settlement type is particularly affected by the changing nature of the sample over time since some urban places are far larger than others. As we saw from the Lancashire example of Ashton in Makerfield, in the Geographical coverage section above, some aggregations to the ecclesiastical parish are unavoidable in the long-run spatial comparisons with other datasets that form the basis for the settlement typologies, depending on the nature of boundary change over time. However, within the FHS burials dataset towns are usually distinct entities often comprising several FHS place subparts, distinguishable from other settlements that they may be administratively yoked to by virtue of their town name.

Considering the largest urban contributors to FHS burials, Manchester is highly prominent, as can be seen from its placing in the top ten urban places in most fifty year periods (see Table 4b below). Manchester unquestionably becomes an enormous urban centre as industrialisation proceeds, but in earlier periods the large contribution it makes to urban burials requires further explanation.

Manchester is unique in representing an agglomeration of FHS-derived and other burials that were abstracted in previous work on the parish and township of Manchester by Romola Davenport at CAMPOP, and parishes consisting of townships like Manchester present special problems of distinguishing rural from urban because they retain administrative boundaries that reflect earlier dispersed patterns of settlement. The Manchester burials are nominally for Manchester township but this comprises a large land area that is late to subdivide and in consequence is not necessarily wholly urban in every period. The maximal conception of Manchester this enforces contrasts with other towns in the FHS burials, where each church is in observation for whatever period of time burials have been transcribed and made available, and the town is potentially represented by only a subset of churches available to residents of the urban centre.

For example, Newcastle-upon-Tyne is represented in the FHS burials only between 1798 and 1859, by three churches: the cathedral church of St Nicholas, its chapelry All Saints, and St Anne, a chapel of ease of All Saints. Other chapelries of the mother church of St Nicholas whose churches were also situated in Newcastle, namely St Andrew and St John, are not represented, and Newcastle is not in the top 10 contributors to urban burials shown in Table 4b. The more distant chapelry of Gosforth, a suburb of Newcastle, is accounted a separate settlement (and in the settlement typology assigned to subtype urban: new late 19th century, type urban). Gosforth has 570 burials in the half century before 1800 but more than five times as many in the following half century after 1800, and Newcastle itself is represented by 8,500 burials in the same period. The still more distant chapelry of Cramlington is not present in the FHS burials dataset.[10]

To take another example, Nottingham is one of the largest urban burials contributors as Table 4b attests. It is more comprehensively represented than Newcastle for a longer period between 1623 and 1869, by St Mary, St Nicholas, Holy Trinity which was created from St Nicholas, and St Peter; and also the non-Anglican churches of Castle Gate Independent, Friar Lane Independent, George Street Baptist, St Barnabas Roman Catholic and St Patrick Roman Catholic.[11] Other Anglican or nonconformist churches founded in Nottingham in the nineteenth century are not present in the FHS burials dataset. St Mary was until 1771 a chapelry of the parish of Sneinton, but this mother parish is a separate settlement within the FHS burials dataset. It is assigned to the urban: new late 19th century subtype in the settlement typology, part of the overarching urban type used for analysis in later sections of this paper. While "urban" may be a questionable representation of Sneinton in early periods, notwithstanding the influence of proximity to Nottingham, the effect its assignment has on this settlement type overall is very limited because Sneinton has only a few hundred burials in each half century from 1650 to 1800. Nottingham has at least 5,000 burials rising to approaching 30,000 burials in the same pre-1800 periods. Even if some of Sneinton's residents buried their dead in Nottingham at its churches, this can have little diluting effect on the large town population.

Details of Newcastle-upon-Tyne churches and chapelries from Young (1991), p. 339; see also Neat and Mason (1984) p. 64-67.

[11] Details of Nottingham churches and chapelries from Young (1991) p. 364-5.

Table 4a: Settlement Typology: characteristics of each type and subcategory

		averages					place counts				
Type	**Subcategory**	**1813 Occ Diversity**	**1801 Persons/Acre**	**1881 Persons/Acre**	**1801 Population**	**1881 Population**	**FHS places**	**1813 Mining**	**1881 Mining**	**1881 Agriculture**	**FHS burials**
URBAN	urban: first tier	23.5	12.2	28.6	18,878	44,275	259	14	9	0	**1,968,334**
URBAN	urban: second tier	13.7	3.1	4.1	2,582	4,498	113	4	9	0	**517,977**
URBAN	urban: third tier	8.9	0.4	0.7	4,005	6,961	34	2	4	0	**235,568**
URBAN	urban: suburban	10.0	3.1	14.5	12,395	28,376	48	10	19	0	**192,669**
URBAN	urban: new late C19th	5.7	0.6	4.3	4,385	20,011	279	75	144	2	**1,132,652**
OTHER	small town	4.9	0.3	0.4	1,481	1,997	217	0	0	30	**855,742**
OTHER	small settlement undefined	3.5	0.5	0.8	1,675	1,642	327	4	15	28	**677,656**
OTHER	nonurban mining	3.8	0.2	0.4	1,476	1,660	144	40	134	1	**205,011**
RURAL	rural: other	2.5	0.2	0.2	477	604	1254	0	0	0	**1,487,268**
RURAL	rural: agriculture	1.9	0.1	0.2	335	395	1545	2	1	1545	**1,737,121**

Table 4b: Composition of FHS burials urban settlement type in each 50 year period, showing top 10 ranked by number of burials

Rank	1550-1599	n	1600-49	n	1650-99	n	1700-49	n
1	NORWICH	5,911	MANCHESTER	14,148	NORWICH	15,854	NORWICH	31,100
2	MANCHESTER	5,700	CAMBRIDGE	13,537	CAMBRIDGE	12,737	MANCHESTER	18,528
3	BURY ST EDMUNDS	4,451	BURY ST EDMUNDS	7,424	MANCHESTER	11,526	NOTTINGHAM	16,019
4	OSWESTRY	4,267	SANDWICH	6,495	IPSWICH	10,064	CAMBRIDGE	13,237
5	SANDWICH	4,116	IPSWICH	6,429	BURY ST EDMUNDS	9,347	IPSWICH	11,864
6	IPSWICH	3,862	NORWICH	6,406	SHREWSBURY	7,706	LEICESTER	11,407
7	CAMBRIDGE	3,589	WISBECH	5,549	MAIDSTONE	7,692	PORTSMOUTH	11,394
8	WISBECH	3,233	MAIDSTONE	5,469	WISBECH	7,606	BURY ST EDMUNDS	10,833
9	LUDLOW	2,927	LEICESTER	4,693	ELY	7,230	GOSPORT	10,396
10	MAIDSTONE	2,761	CRANBROOK	4,540	NOTTINGHAM	5,904	WISBECH	9,239
total n urban settlements		19		91		125		183
total urban burs		98,364		208,972		294,778		481,366
% total urban burs in top 10		41		36		32		30

Rank	1750-99	n	1800-49	n	1850-99	n	1900-49	n
1	BRISTOL	59,796	MANCHESTER	74,891	BLACKBURN	25,552	NORWICH	17,005
2	MANCHESTER	56,956	NOTTINGHAM	49,963	CAMBRIDGE	25,525	CAMBRIDGE	9,990
3	NORWICH	42,248	NORWICH	41,348	SUNDERLAND	21,303	DEAL	8,703
4	NOTTINGHAM	27,264	NORFOLK	34,477	NORWICH	20,148	LOUGHBOROUGH	5,259
5	PORTSEA ISLAND	22,016	BLACKBURN	34,009	IPSWICH	16,977	WHITCHURCH	3,350
6	LEICESTER	18,638	PORTSEA	25,112	LOUGHBOROUGH	16,224	ASHTON IN MAKERFIELD	3,129
7	SUNDERLAND	18,222	SUNDERLAND	22,327	NOTTINGHAM	15,383	BOLTON	2,584
8	PORTSMOUTH	16,039	ECCLES	22,298	DOVER	14,045	NEWPORT (SHROPSHIRE)	2,121
9	GOSPORT	14,745	SOUTH SHIELDS	21,738	MARGATE	10,555	ASHTON UNDER LYNE	2,071
10	CANTERBURY	14,704	GREAT YARMOUTH	21,735	ASHTON IN MAKERFIELD	10,310	SOHAM	1,799
total n urban settlements		207		187		67		22
total urban burs		823,070		1,349,837		647,689		92,323
% total urban burs in top 10		35		26		27		61

Part II: Analysis

Age distribution of burials and trends in mortality

Age reporting in burial records was not required until Rose's Act came into force in 1813. The effect of Rose's Act on the presence of age information can clearly be observed in the FHS burials dataset. In 1812, before the Act came into force, less than half of all burials, or 47 per cent, give age information, whereas in 1813 this rises to 87.7% of burials. Age reporting remains at high levels thereafter, reaching 95% by the 1880s and 98% after 1900. Age reporting begins in a systematic way in a few places in the second half of the eighteenth century, but may be restricted initially to a scatter of burials of very aged adults or those dying in unusual circumstances. It is also liable to exaggeration or error resulting from lack of widespread numeracy in this earlier period. The 1750s are the first decade in the FHS burials dataset with more than five thousand burials with stated ages in total, but the 6,742 such burials in this decade still only represent less than 2.5% of all burials. Nonetheless, this proportion, and in consequence the representativeness of the stated ages, rises rapidly in each successive decade before Rose's Act, as can be seen from Table 5 below.

Table 5: Decadal proportion of burials with stated age in FHS burials dataset, 1700 to 1950

decade beginning	n burials	% with stated age
1700	222,570	0.7
1710	233,576	0.9
1720	294,297	1.0
1730	266,992	1.1
1740	281,545	1.5
1750	279,917	2.4
1760	342,523	3.5
1770	347,373	6.1
1780	393,765	14.5
1790	398,227	24.7
1800	419,563	40.9
1810	486,715	76.6
1820	574,850	88.2
1830	639,365	88.9
1840	468,286	88.8
1850	433,214	90.7
1860	415,837	93.2
1870	168,192	93.6
1880	125,744	95.6
1890	102,208	97.5
1900	64,127	98.3
1910	40,679	98.4
1920	28,971	98.4
1930	25,726	98.5
1940	21,085	97.8

Source: FHS burials dataset

While changes in mean age reported at burial are far from ideal data for investigating changes in the level of mortality since nothing is known of the age structure of the population at risk among the population sample represented by the FHS burials dataset, it is nonetheless interesting to compare reported ages from the FHS burials per decade by settlement type. Mean age at burial for adults aged 14 years and over in each decade from 1750 to 1949 is shown in Figure 6a, dividing the FHS burials dataset into the three settlement typologies of rural, urban and other.

It is prudent to disregard fluctuations in the initial four to five decades since at this time only a small and probably unrepresentative sample of burials have ages (see Table 5). The number of burials with ages in observation is indicated on the secondary axis of Figure 4a for reference: after 1870 the sharp decrease reflects the diminishing number of FHS places in observation, but those that remain continue to report very high proportions with ages (see Table 5). Throughout the period 1780 to 1949, urban ages at death are consistently lower than other and rural settlement types, with rural inhabitants typically three to five years older at death, until the gap rapidly closes in the twentieth century interwar period, concurrent with a well-known period of rapid and sustained improvement in adult life expectancy.

The timing of observable later nineteenth century changes in reported age at burial differs by settlement type, with adults in rural and other settlements dying at older ages after 1840, whereas urban age at burial trends upwards only post 1860 (this does not imply no improvement in mortality before 1840 or 1860 had taken place: see below). The asynchronicity of rural and urban ages at death in the mid-nineteenth century contrasts with the timing of the huge post World War I gains in age at burial by settlement type. After 1910 all three settlement typologies are affected simultaneously, with the urban series making the fastest gains both initially and in the interwar period, driving a convergence in age at burial by settlement type by 1949.

This is interesting to observe with such large numbers of burials behind it, and the emerging convergent trend in age at burial by settlement type is suggestive, but conclusions on trends in the level of mortality that may be drawn are severely limited by hidden factors that complicate interpretation. Firstly, observed differences between urban and rural burial ages will be affected by migration and urbanisation. Supposing that younger adults are more likely than other adults to move from villages to towns, the age (and sex) structure of rural and urban adult populations must differ and a more youthful adult population in towns will depress urban mean age at death, while the reverse applies in rural areas. A second hidden factor results from the changing size of the population as it grew through natural increase. At the national level fertility in England was rising between about 1750 and 1830.[12] At the same time, child mortality began to fall. This means that, as increasingly large cohorts come to adulthood, the average age of the adult population will fall. This in turn necessarily exerts downward pressure on mean adult age at death, potentially counteracting mortality gains from one decade to the next that might otherwise be observed.

The period for which we have least demographic information on adult mortality from other evidence is that prior to the first census that yielded the age structure of the population, which took place in 1841, and from which, in conjunction with ages at death summarised from centralised civil

[12] See for example Hinde (2003), Table 11.2 p. 186.

registration (begun in 1837), English life tables were inaugurated. This robust decennial source of period life expectancy for all age groups including adults spans from 1841 to the present, although the English life tables do not distinguish urban and rural populations. Prior to this, until 1809 there are family reconstitution-derived adult life expectancy estimates at age 25, produced from a small but high-quality evidence base of a sample of 26 English parishes, but only nationally rather than for individual settlements or settlement types.[13] From the family reconstitution estimates it is apparent that rapid and revolutionary gains in adult life expectancy had already been made in the first half of the eighteenth century.[14] After 1809 until the 1841 Census permits the construction of life tables, there is limited evidence on how adult life expectancy changed, and direct evidence comes only from socially selective groups. [15] It is thus useful to assess what, if anything, mean age at death in the FHS burials data set can suggest about adult mortality in the period 1810 to 1840 in particular, notwithstanding the difficulties of interpreting this crude measure.

Figure 4b compares trends in mean age at burial from the FHS dataset with overall adult life expectancy from 1780 to 1949, both sexes combined, at age 25 (e25).[16] For the central three series on the plot, comparing trends in rural, overall and urban ages at death with adult life expectancy, the FHS burials sample here differs from that in Figure 4a in that it has been restricted to those aged 25 and over at death. The addition of 25 years to e25 to indicate probable death age induces equivalence of scale between this and mean age at death for convenience. However, it should be remembered that age at death is necessarily a reflection of the actual experience of a cohort of persons who have experienced and survived through the decades preceding that in which death is reported, and not a hypothetical period measure of prevailing levels of mortality at a given point in time, as with e25. Unlike family reconstitution evidence, but akin to life tables, average age at death relies upon reported ages, the accuracy of which improves with literacy and numeracy advances over time.

From Figure 4b, it is apparent that after 1780 there are improvements in life expectancy at age 25 that do not show up in mean age at burial of rural, urban or all individuals dying at age 25 and older, and conversely there are older mean ages at burial after 1840 not echoed by later improvements in e25 until after 1870. What are we to make of this? Changes in fertility since 1750 discussed above that are starting to affect the age composition of the adult population may be producing it. Two further series on the plot, for wives and widows, help to test this idea and related implications. Widows' ages may in fact provide clearer evidence of adult mortality trends implied by burial ages among those dying in the early decades of the nineteenth century than the FHS burials dataset as a whole.

Wives and widows are indicative of younger and older adult cohorts respectively, relative to all individuals aged 25 and over as a whole. Relationship descriptors of any kind are less frequent after the changes of registration practice in 1813, and so as plotted on Figure 4b the average death age for wives and widows has been restricted to decades where the sample size was at least 300

[13] Reported in Wrigley et al (1997), Table 6.19 p. 290.
[14] Wrigley et al (1997), Chapter 6 especially p. 283-285 and p. 349
[15] Smith and Oeppen (2006), p. 70-72; see also Wrigley et al (1997) Figure 6.14 p.281 for a graph of indirect estimates of life expectancy at age 25 through back projection estimates of adult life expectancy, using birth and death totals in combination with later census-derived age structure of the population.
[16] See source statement for Figure 6 for details

individuals (and up to nearly 9,000 individuals) with reported ages per relationship and settlement category. Since it is the earlier decades that are of most interest and it is the later decades which are lost to small numbers, this curtailment is fortunately of little consequence. The number of observations in each of these crucial decades runs to the thousands for urban wives and widows, and is at minimum 720 for their rural counterparts, and thus forms substantially sized subsamples, albeit only a small portion of the tens or hundreds of thousands of burials of all ages that can be observed. Male relationship equivalents are too seldom reported to be similarly treated, but in any case it is important to remember that the status of being a wife or widow is partly contingent upon mortality of male partners. Counter-intuitively perhaps, this means ages at burial of wives and widows do not relate solely to female mortality experience. However, the age group that widows in particular represent, and their implied birth cohorts, is useful.

Widows died on average aged 70 to 74 years. While we do not know their age range in the population at risk of dying, it is safe to say that a greater proportion of them than is true for the totality of all adults over 25 years will be drawn from smaller cohorts born prior to the post-1750 fertility increases and child mortality improvements – perhaps most of them before 1820, in fact. This means there should be little or less downward pressure on widows' average age at death that might otherwise suppress observable mortality improvements, as seems to be the case for all individuals taken as a whole, discussed as a hidden factor above. Wives, by contrast, are potentially included in those dying from as young as 14 years (though almost no women married under 18 years) so already even in 1780, the inclusion of larger cohorts born post-1750 has the potential to increase the number of wives dying at younger ages and drag down the observed wife age at burial.

Between 1780 and 1810, widows show an improvement in age at burial that follows the upward trend in e25 estimated from family reconstitution, including a sharp improvement in widow's age at death in urban areas in particular that serves to reduce the gap between rural and urban widows. Most of the urban improvement in widows' age at death is sustained until at least 1830, as is the more modest improvement for rural widows. Between 1830 and 1840 there is a divergence in urban and rural trends, with urban widows dying at younger ages and rural widows at older ages.

By contrast, urban wives show no change in age at death at all between 1780 and 1820, then a slight deterioration, and only after 1790 is there a slight upwards trend for rural wives. Wives do not display an exaggeration of the downward trend in age at burial that exists for all rural and all urban individuals over 25 that might be expected from their younger age composition, which suggests there are other factors at play besides the suppression of mortality improvement induced by the presence of larger cohorts born post 1750. Unfortunately it is impossible to tell from the FHS dataset the relative importance of age or sex differences to changes in adult mortality, although other evidence suggests women may have experienced continued improvements in mortality in the early nineteenth century that men did not enjoy.[17]

[17] See Smith and Oeppen (2006).

Figure 4a: Adult mean age at burial by settlement type 1750-1949

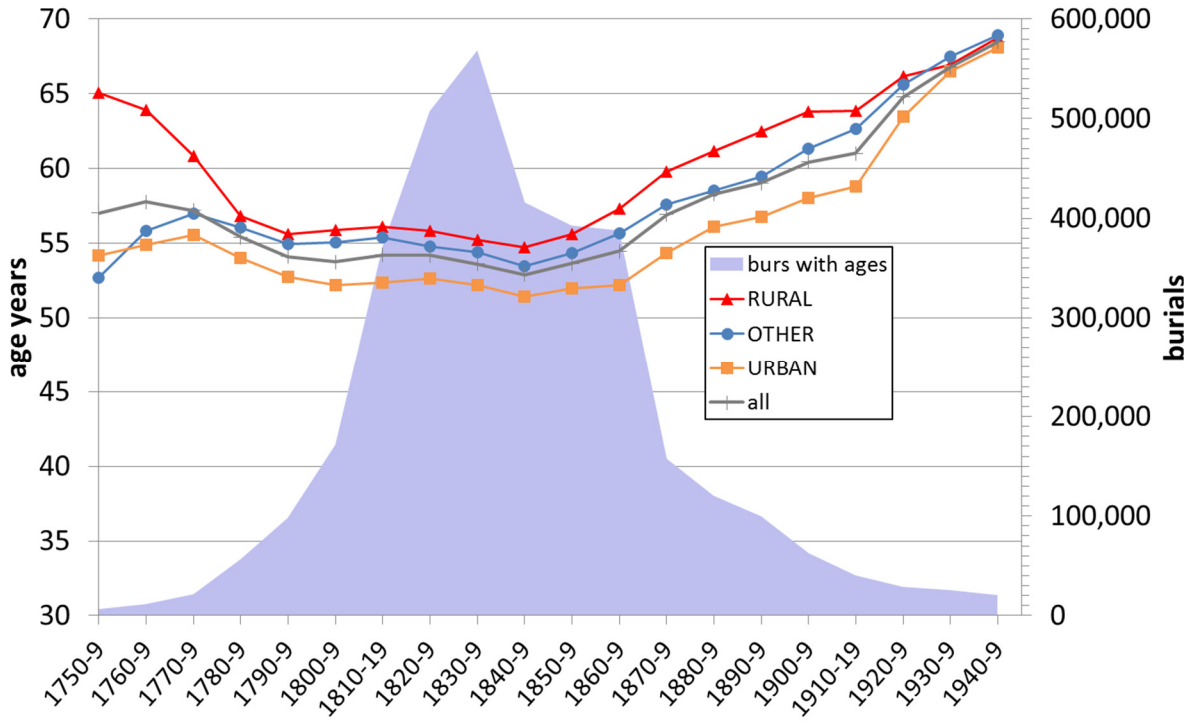
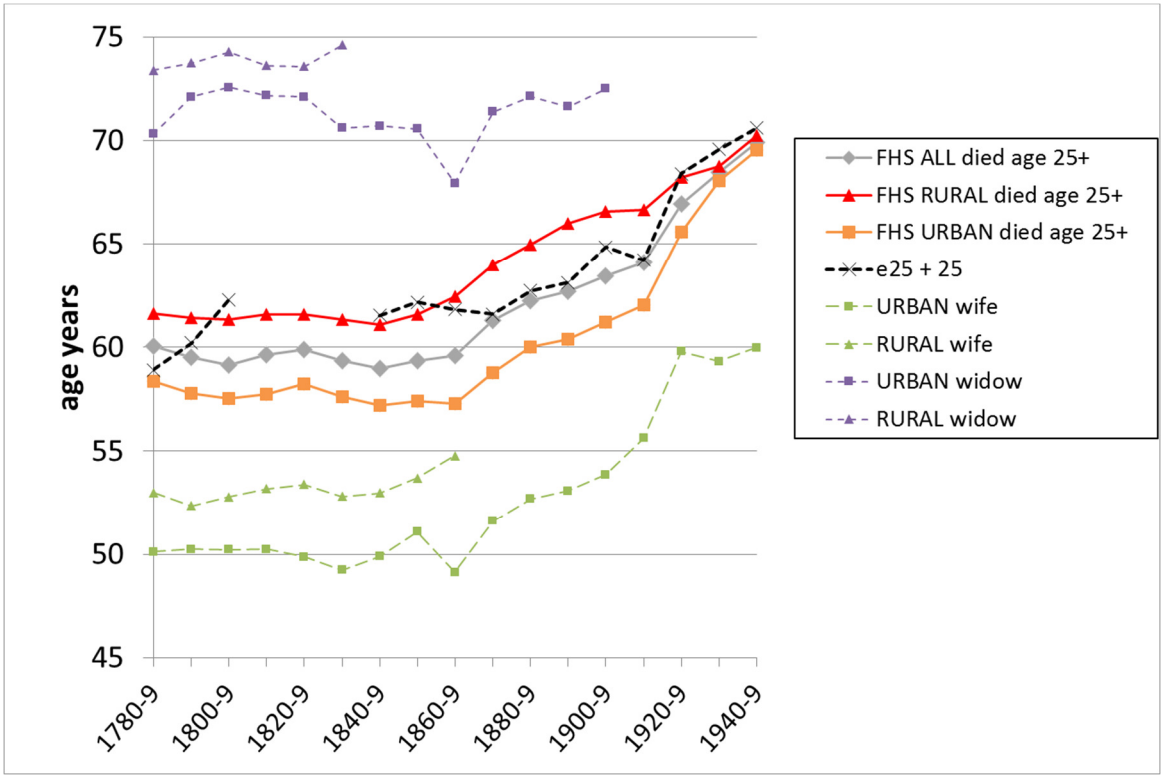


Figure 4b: Life expectancy and mean age at burial compared, 1780-1949

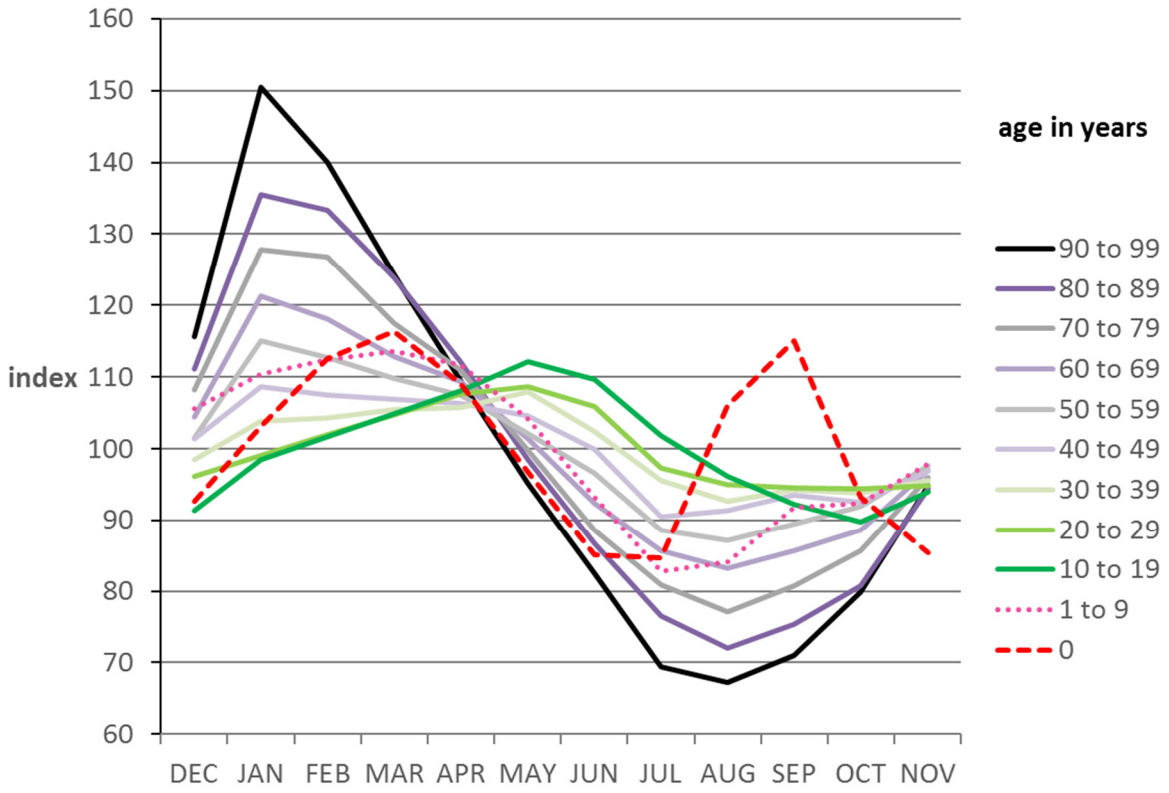


Sources: all FHS burials dataset except e25 taken from: Wrigley et al (1997), p. 290 and p. 281; and Human Mortality Database 1x10 table for England and Wales 1841-1949 (total for both sexes), last modified 27 July 2015.

Seasonality by age group

In countries such as England that are situated at high latitudes, temperature and light or day length vary considerably with the seasons, changing energy inputs available to all biological systems, including humans and their pathogens, over the course of a year. There is considerable variation in mortality in each month of the year. There are sufficiently sizeable numbers of burials with ages in the FHS burials dataset to make it practicable to evaluate burial seasonality by decade of age in years for the period 1750 to 1899. Over this period there are at minimum 200,000 burials in observation per ten year age group except for the oldest, 90 to 99 year olds, of whom there are 37,839. The results of this exercise are presented in Figure 5. Since calendar months are of varying lengths in days, an adjustment to the raw counts of burials per month has been made to inflate or deflate the total to what it would be if each month notionally consisted of 30.4375 days, one twelfth of the 365.25 days in a year. These revised totals have been indexed so that 100 represents the expected number of burials if they had been evenly distributed over the twelve months of the year, for ease of cross-comparison. Rather than beginning with January, the months are ordered to start with December so that the winter months of December, January and February appear together at the left of the plot, followed by spring, summer and autumn months successively.

Figure 5: Seasonality of burials by age group, 1750-1899 (see also Table 6)



Source: see Table 6

Table 6: Seasonality of burials by age group indexed to 100, 1750-1899

Age group	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
no age	99	110	111	113	112	105	96	86	87	93	93	95	2,198,609
0	93	103	113	116	109	97	85	85	106	115	93	85	473,402
1 to 9	106	110	112	114	112	104	93	83	84	92	92	98	657,713
10 to 19	91	98	102	105	108	112	110	102	96	92	90	94	222,833
20 to 29	96	99	102	105	108	109	106	97	95	95	94	95	278,046
30 to 39	98	104	104	105	106	108	102	96	93	94	94	96	231,153
40 to 49	101	109	107	107	106	105	100	91	91	93	93	97	222,374
50 to 59	102	115	113	110	107	102	97	89	87	89	92	98	248,110
60 to 69	104	121	118	113	109	101	92	86	83	86	89	97	344,870
70 to 79	108	128	127	118	111	100	89	81	77	81	86	96	411,969
80 to 89	111	136	133	124	112	98	87	77	72	75	81	94	252,115
90 to 99	116	150	140	124	109	95	83	69	67	71	80	95	37,839
100 to 109	122	147	131	125	115	107	79	62	62	65	81	104	1,749
110 to 119	250	36	118	107	148	36	74	72	143	37	143	37	33

Source: FHS burials dataset

It is strikingly apparent that in older age groups burial seasonality is most marked. In adulthood, with every successive decade of age post 30 years, the winter peak in burials intensifies, with a correspondingly deepening summer trough. January, February and March are the most hazardous months for older adults, following the coldest and darkest part of the year. April or May are pivotal, and the warmest and sunniest months of July, August and September least hazardous for older adults.

A late winter to early spring excess of burials is apparent to some extent in every age group, but among young adults the extra hazards of January and February all but disappear in favour of a spring to early summer peak. Seasonality is overall much flatter among young adults. May is the peak month for those aged between 10 and 39 years, and this peak is most prominent in the 10 to 19 years age group.

Burials of children under ten, and especially infants, display a curiously distinctive seasonal pattern. For children aged 1 to 9 the peak is in March, with excesses in the winter months of December, January and February building up to this peak. For infants the distribution is bimodal, with peaks in both March and September. As the immediate neonatal period is by far the most hazardous for infants, the seasonality of birth, or baptism as a proxy for birth, is highly relevant to this pattern, and this will be discussed in later sections. Most of the large no age category in Table 6 originate in the period before 1813 when ages are not widely stated. The seasonality of mortality for this group is closest to that of non-infant children, which is unsurprisingly considering the large portion of all burials that children represent. 36 per cent of burials with known ages in this 1750-1899 period are of children under 14 years, with 22 per cent aged 1 to 13 years (see Figure 2 and also Table 22 for a sense of the proportions who are identifiably children in the FHS burials dataset in different counties and time periods).

Part of the purpose in presenting this information is to underline that the seasonality of burial is age-specific, with notable transitions from infancy to older childhood and childhood to early adulthood

especially, but also from early adulthood to older adulthood. The size of the FHS burials dataset permits greater nuance and separation between adult age groups, but the outline of these results confirms the earlier findings of Wrigley et al, who observed the distinction between different age groups in English burials from a smaller dataset derived from family reconstitution.[18] Wrigley and Schofield's analysis of death seasonality by age group was calculated from 75,398 family reconstitution burials linked to baptisms from a longer but earlier period of 1538 to 1837. They used five age groups but the much larger number of 3.3 million burials ages observed here permits a detailed view using 11 age groups, which as well as illustrating the progressive increase of the winter mortality burden with every successive decade of adult life also reveals important differences in early childhood between infants and older children.

For the earlier part of the period covered by the FHS burials dataset this sort of detailed breakdown by age is not possible because there are no or very few stated ages. Child and adult are broad age categories that will be used subsequently of necessity for fuller chronological coverage. In reality these two categories are most closely representative of infants or young children under 5 years and older adults respectively because life is a great deal more hazardous for these age groups and they therefore constitute the largest portions of burials within each category. Due to improvements in mortality after 1750 we can expect the age composition of those categories to be changing over time, with the concentration on the oldest adults and youngest children intensifying.

As can be seen from Table 6, over the period 1750 to 1899 young adults aged 10 to 29 year constituted less than a third of all burials of persons over the age of ten. Over the same period, 473,402 or 42% of burials aged 0 to 9 years were of infants under 1 year, and a further 497,718 or 44% were of children aged 1 to 4 years, so children aged 5 to 9 are little represented. But if we consider (in Table 7)the three half century subperiods within this separately, the proportion of children aged 0-9 who are infants increases substantially, from 32% in 1750-99 to 39% in 1800-49 and 43% in 1850-99. The middle and late periods dominate because there are substantially more burials with ages after 1800. The contribution of children 5 years and over to the 0-9 age group is consistently minor but does also change, from 19% in 1750-99 to 12% in 1850-99.

If we separate out the child burials aged 0 to 9 into three age groups for infants, 1 to 4 year olds and 5 to 9 year olds and do so over 50 year periods continuing to 1949 rather than the period 1750-1899, as shown in Table 7, it becomes clear that the secondary September peak in child burials is consistently a feature of infant burials. After 1750, for all settlements in aggregate there is, in contrast, no September peak in burials of children aged 1 to 4 or 5 to 9 years, except post-1900 for the older of these two age groups, although by this date the numbers are small and there are few parishes still in observation. This of course does not preclude the possibility that there is an elevated autumn burden of childhood deaths at ages beyond infancy in particular town, cities, or regions.

[18] *EPH* p. 325-330 especially Table 6.33 p.326.

Table 7: Child burial seasonality in 50 year periods 1750-1949, indexed to 100

Age group and period	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
0 in 1750-99	94	101	107	103	105	97	89	89	104	117	101	93	15,190
0 in 1800-49	91	103	115	119	113	100	88	83	100	111	94	84	257,099
0 in 1850-99	95	103	110	113	105	93	81	87	114	121	92	86	201,113
0 in 1900-49	93	112	135	120	99	86	78	77	100	120	96	83	19,552
1-4 in 1750-99	107	114	104	106	106	106	98	88	85	93	97	97	23,369
1-4 in 1800-49	103	111	113	116	115	106	94	82	82	91	92	95	309,132
1-4 in 1850-99	111	111	115	115	109	98	87	78	85	97	93	102	165,217
1-4 in 1900-49	97	114	144	139	120	99	84	72	79	86	74	92	8,880
5-9 in 1750-99	99	104	100	108	112	109	108	94	87	95	88	95	9,089
5-9 in 1800-49	106	109	110	111	109	108	99	89	87	87	88	97	100,933
5-9 in 1850-99	107	107	110	107	106	103	93	86	87	91	97	106	49,973
5-9 in 1900-49	108	110	122	114	101	99	82	78	89	107	102	88	3,432

Source: FHS burials dataset

Baptism seasonality and infant burials

The dual peak in FHS child burials may be compared to the seasonality of baptisms observed in Wrigley and Schofield's 404 English parish sample, which in Table 8x have been recalculated from the raw event totals without weighting for population size or correcting for under-registration to make them directly akin to FHS-derived data.[19] There is a considerable degree of correspondence between the peak months of infant burials and those of baptisms, but also some notable differences. The 404 parish baptism peak in 1800 to 1834 occurred a month later that the peak in infant burials, in April rather than March. A secondary autumn peak in baptisms is evident only in the earliest periods, and begins in September, a month after the infant burial peak (see Table 7.5).

Table 7.5: Baptism seasonality in Wrigley and Schofield's 404 English parish dataset, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n baps	mean absolute deviation	SD	ratio Max/Min
1538-49	91	107	117	121	107	89	82	82	89	104	103	107	11,219	11.1	13.1	1.48
1550-99	95	107	120	119	110	90	83	80	90	103	101	101	246,558	10.2	13.0	1.50
1600-49	97	111	123	123	110	93	83	78	86	98	99	99	480,590	11.2	14.5	1.58
1650-99	97	106	119	120	115	97	86	83	84	96	99	98	498,322	10.2	13.1	1.46
1700-49	97	107	116	116	112	100	91	87	86	94	97	97	590,863	8.6	10.6	1.36
1750-99	98	104	107	109	115	105	101	94	87	93	94	92	808,442	6.8	8.1	1.31
1800-39	96	95	102	103	112	106	107	100	96	98	95	89	747,287	5.0	6.3	1.25

Source: R S Schofield and E A Wrigley (1998), Population History of England Database uncorrected baptism event counts, Cambridge Group for the History of Population and Social Structure

[19] See Wrigley and Schofield (1981) Table 8.1 and Figure 8.1, p.287-288 for their original tabulation based on corrected data, which is very similar to Table 8x above

There is a lengthening gap between birth and baptism in the eighteenth and nineteenth centuries that reached a median of 30 days by 1791 to 1812.[20] This explains why there might be a lag of about a month between infant burial peak and baptism peak after 1700, but cannot apply in the earliest periods where the autumn secondary baptism peak nonetheless follows rather than anticipates the secondary infant burial peak. However, September peaks in infant burials may be indicative of increased hazards at weaning, most likely to be visible as an excess of burials about 5-6 months after the peak baptism month.

Wrigley and Schofield observed that the seasonality of baptisms is flatter after 1750 than in earlier periods, and suggest a possible link between the seasons of the agricultural year and conception, although noting that seventeenth century London obeys the same seasonality despite its lack of agricultural workers.[21] Dyer's analysis of earlier rural and urban baptism seasonality from 1580 to 1620 attributed the much stronger spring peak and more pronounced summer and autumn trough found in rural parishes than towns of all sizes (but especially cities) to patterns of agricultural work and leisure[22]. Any such connection may be assumed to erode as urbanisation proceeds, and a smaller proportion of the population engage in agricultural work. The seasonality of baptism is in turn potentially related to that of marriage, since marriage marked the usual onset of childbearing, though conception was often anticipated by several months resulting in prenuptial pregnancy, which accounted for nearly two fifths of all births by the early nineteenth century and never fell below 15% in the parish register period.[23] Kussmaul's analysis of English marriage seasonality suggests two regimes of spring and autumn marriage originating in rural areas of differing types of land use, corresponding roughly to arable and pastoral, and a third, indeterminate seasonality regime primarily evident in areas of rural industry.[24]

Obtaining baptisms data from the Family History Societies was secondary to the main objective of burials data, and in consequence is not available or extracted for all counties with FHS burials data. Seasonality of baptisms from the Family History Societies can at present be analysed from a four-county sample, consisting of selected parishes in Lancashire and most parishes in Suffolk, Cambridgeshire and Nottinghamshire, generally consisting of the same locations as form these counties' share of the burials data but not always with the same coverage dates. The Nottinghamshire and Suffolk baptisms end in 1869 or 1870 in all settlements, but in Cambridgeshire and Lancashire selected settlements are available through to 1899 (and beyond). The Lancashire portion of these baptisms has the advantage of many dates of birth, making it possible to circumvent the problematic and growing lag between birth and baptism. The seasonality index of Lancashire births by settlement type is given in Table 8a. The general pattern, as with the Wrigley and Schofield baptisms for their all England sample, is of winter excess and a summer lull in births. Parallel to the peak months observed in all FHS burials of infants, February to March rather than April are the peak baptism months in both rural and urban Lancashire in the first two periods of 1750 to 99 and 1800 to 49. In rural settlements the birth peak pushes later into spring after 1800. In urban settlements

[20] Midi Berry and Schofield (1971), Table 2 p. 11.
[21] Wrigley and Schofield (1981), p.291-292.
[22] Dyer (1981).
[23] Wrigley et al (1997) p. 421-2; Adair (1996),Table 3.1 p. 100.
[24] Kussmaul (1990), p. 3-4.

(these birth date data do not include Manchester[25]) there is little seasonal variation in births after 1850, and the erosion of the previous late winter to spring peak is accompanied by a slight rise but no index values above 100 in August births. Other settlement types show some signs of a late autumn to early winter peak in November and December that pushes earlier into autumn after 1850, but the numbers of baptisms with a known date of births in observation outside urban areas are small, making the index values more volatile.

Table 8a: Lancashire birth seasonality by settlement type, 1750-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
Rural 1750-99	102	113	112	120	105	97	95	86	91	90	89	101	3,784
Rural 1800-49	97	98	124	118	110	103	100	85	92	95	86	91	6,813
Rural 1850-99	106	99	110	105	106	110	102	90	87	104	85	97	3,975
Urban 1750-99	99	108	114	114	112	101	92	89	89	94	94	95	18,464
Urban 1800-49	102	101	111	118	115	106	99	91	87	91	87	93	73,264
Urban 1850-99	101	99	104	106	103	104	100	96	99	98	94	95	132,523
Other 1750-99	109	117	110	109	102	103	89	89	79	94	83	116	953
Other 1800-49	121	96	114	107	102	82	89	90	89	101	102	106	4,311
Other 1850-99	115	98	103	107	101	99	89	94	88	88	110	106	3,259

Source: FHS baptisms dataset

The August and September secondary peaks observed in all infant burials in the same fifty year periods are little in evidence as secondary peaks in these Lancashire births. However, it must be acknowledged that in demographic and economic terms Lancashire is atypical of England as a whole during the period 1750 to 1899. Furthermore, we have a limited number of Lancashire sample parishes in observation, though more with baptism dates (see below). Lancashire may be a valuable case study of urban seasonal patterns that are becoming increasingly representative of the country as a whole, but problematic as a guide to rural birth seasonality, especially in the latest period after 1850: there are only seven Lancashire FHS places with birth dates that are classified in the settlement typology as rural, and five of those do not continue all the way through to 1899.

Lancashire baptism seasonality is broadly similar to birth seasonality, but can be observed for more FHS places over the full period 1550-1949 since the numbers are larger than the limited subset with birth date. For two periods, 1750-99 and 1800-49, we can also observe the seasonality of Manchester's very populous urban centre, in addition to other urban Lancashire parishes.[26] Considering the full period allows the reduction in winter baptisms over the long run to be observed. In earlier periods the peak period begins earlier in the year, producing a broader-based winter to

[25] The largest urban settlements in the Lancashire sample with birth dates are Blackburn, Burnley, Colne, Chorley, Ashton in Makerfield and Accrington. See Table 8b for Manchester baptism seasonality.

[26] Represented by Manchester Collegiate Church baptisms, which include a portion of individuals residing distant from the urban centre but within Manchester Township who might be better characterized as rural, but these are impossible to separate. However, it is estimated that *c.* 80% of the baptisms are from the town itself and so give a good indication of baptism seasonality for urban Manchester (Romola Davenport, personal correspondence).

spring peak that extends from January or February to April (see Table 8b). In rural Lancashire even after 1800 this peak remains spread over roughly the same period, taking into account the increasing birth to baptism lag, of February to May, albeit reduced in amplitude. In urban areas and Manchester, by contrast, the winter/early spring component of this peak in February and March erodes faster, from 1750 onwards, and subsides after 1800.

Table 8b: Lancashire baptism seasonality by settlement type, 1550-1949 indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
RURAL 1550-99	108	118	124	117	92	85	72	69	91	103	106	113	1,005
RURAL 1600-49	88	112	138	141	114	95	89	85	77	88	91	83	4,878
RURAL 1650-99	102	110	116	124	108	93	73	87	89	105	111	82	2,938
RURAL 1700-49	89	103	141	118	94	91	95	92	81	108	99	88	5,789
RURAL 1750-99	100	107	119	120	114	94	96	91	90	94	89	86	8,868
RURAL 1800-49	89	103	113	116	116	102	101	88	94	92	94	92	20,483
RURAL 1850-99	90	87	108	109	114	105	106	102	97	100	95	88	16,840
RURAL 1900-49	87	86	113	91	128	105	106	93	99	92	94	107	791
URBAN 1550-99	93	100	113	119	111	100	86	79	89	106	98	105	1,364
URBAN 1600-49	94	111	127	133	112	95	87	81	78	94	88	100	2,096
URBAN 1650-99	93	102	116	124	116	103	96	86	84	92	93	95	1,554
URBAN 1700-49	91	105	117	119	113	105	95	91	86	90	96	92	3,091
URBAN 1750-99	91	104	107	115	118	105	103	90	89	93	94	90	5,408
MANC. 1750-99	95	97	104	112	115	106	101	96	92	96	93	92	67,725
URBAN 1800-49	85	91	96	106	122	106	112	102	100	99	96	85	10,814
MANC. 1800-49	102	86	89	91	115	105	107	104	107	105	102	87	205,623
URBAN 1850-99	93	88	99	105	113	104	101	100	98	106	103	92	7,498
URBAN 1900-49	87	89	103	107	104	111	100	98	102	104	102	93	1,571
OTHER 1550-99	91	109	117	125	81	88	85	91	95	114	111	92	3,678
OTHER 1600-49	87	118	136	131	110	97	81	71	81	100	93	95	14,583
OTHER 1650-99	107	102	124	119	112	91	90	79	97	90	100	91	24,478
OTHER 1700-49	89	113	109	124	115	95	94	95	90	98	96	83	44,970
OTHER 1750-99	98	104	108	117	113	104	97	92	91	86	104	85	86,567
OTHER 1800-49	91	95	102	108	110	108	103	99	101	98	96	87	193,896
OTHER 1850-99	82	84	93	102	114	109	110	105	105	103	106	86	213,605
OTHER 1900-49	88	113	79	101	142	121	108	98	85	91	92	82	18,586

Manc. = Manchester Collegiate Church

Source: FHS baptisms dataset

Suffolk, unlike Lancashire, remains a largely rural county. Urban baptisms are concentrated in just two large towns: Bury St Edmunds and Ipswich, accompanied by around 30 considerably smaller towns including Woodbridge, Sudbury and Stowmarket. Nearly all places in Suffolk are included in the FHS burials set, the same for both baptisms and burials, but with different coverage dates so that for the baptisms, especially the urban baptisms, there are only sufficient numbers for a shorter period of observation from 1750 to 1899. It is worth noting that the Suffolk urban places are

predominantly well-established settlements with longstanding populations of town dwellers, whereas most Lancashire urban areas are newer settlements formed of rural incomers that grow rapidly over the late eighteenth and nineteenth centuries. If the propensity to bear children or marry and begin procreation at particular times of the year (or not) is socially influenced by neighbours and peers, this has important implications for the exposure of Lancashire urbanites to alternative behaviours: they are less likely than Suffolk town dwellers to encounter others following established urban patterns of behaviour, and may perhaps be more likely to retain aspects of the behaviour of the rural culture of their birth as a result.

Using 1851 Census data as provided by the ICeM project we can make an illustrative comparison of the birthplaces of adults then resident in Blackburn and Bury St Edmunds, two Lancashire and Suffolk towns respectively that are major components of the urban baptism seasonality series for their counties. Even at this relatively late mid-nineteenth century date, there were indeed a greater proportion of adults living in their home town in the Suffolk town of Bury St Edmunds than in Blackburn, Lancashire. Blackburn parish in 1851 had a total adult population over 18 years of 47,562 individuals, of whom 13,066 or 27.5% claimed Blackburn itself as their birthplace.[27] The two urban parishes of Bury St Edmunds, St James and St Mary, on the other hand, comprised 8,170 persons over 18 years in 1851, of whom 3,124 or 38.2% said they were born in Bury St Edmunds.

The seasonality of Suffolk baptisms is quite different to that of Lancashire births or baptisms in some respects, notably more marked late summer/autumn peaks of greater amplitude after 1750, as can be seen in Table 9. Suffolk and Lancashire (Table 8b) baptisms also differ particularly in urban areas, where seasonality is flatter in Suffolk than in Lancashire. As suggested above, this may be related to the necessarily high rural migrant proportion of Lancashire's new towns compared to Suffolk's more established town communities. Differences between Suffolk and Lancashire baptisms and how these change from 1750 to 1899, during the population redistributions of the Industrial Revolution, may be observed more clearly in the urban and rural plots graphed in Figure 6. The baptisms sample in Figure 6a has been enlarged to encompass two further counties with comprehensive locational coverage, Cambridgeshire and Nottinghamshire, thus forming with Suffolk and Lancashire a notional southeast to northwest transect of England, to gain a preliminary sense of how far putatively geographical differences between Lancashire and Suffolk extend to other counties.

[27] 1851 Census Enumerators' Books data from ICeM database. Allocation of persons to parishes is known to be wrong in some cases as a result of missing or misinterpreted data on enumeration geography, but allocation to the next largest administrative unit of Registration Subdistricts has been corrected in a revised version currently only available at Campop. From this corrected version, in Blackburn subdistrict there were 13,336 Blackburn born of 50,302 Blackburn resident persons over 18 years, or 26.5%. The two Bury St Edmunds parishes together constitute Bury St Edmunds Registration Subdistrict.

Table 9a: Suffolk baptism seasonality by settlement type, 1750-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
RURAL 1750-99	90	106	107	112	116	115	112	94	84	88	90	87	135,541
RURAL 1800-49	90	86	99	103	110	120	120	102	93	102	94	82	201,030
RURAL 1850-99	83	69	81	94	109	123	128	111	105	123	95	79	85,572
URBAN 1750-99	107	107	103	97	103	107	107	97	89	88	102	94	41,597
URBAN 1800-49	97	98	107	106	102	103	107	100	99	96	97	88	72,018
URBAN 1850-99	84	88	93	104	106	105	109	97	112	115	100	87	33,385
OTHER 1750-99	94	109	106	112	110	110	111	94	86	88	95	86	43,076
OTHER 1800-49	95	90	101	100	112	113	117	103	93	97	96	84	55,235
OTHER 1850-99	83	74	88	93	110	127	126	108	100	116	91	84	22,141

Table 9b: Cambridgeshire baptism seasonality by settlement type, 1750-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
RURAL 1750-99	89	91	95	103	108	125	124	104	78	99	101	83	66,209
RURAL 1800-49	90	82	97	105	111	116	119	113	93	95	95	82	104,020
RURAL 1850-99	81	73	86	99	112	112	125	116	102	110	99	85	90,840
URBAN 1750-99	97	104	109	103	105	105	99	103	90	86	100	96	26,906
URBAN 1800-49	100	103	105	103	110	98	103	98	97	96	97	92	50,047
URBAN 1850-99	100	99	92	100	110	103	106	99	102	103	94	91	33,929
OTHER 1750-99	93	100	99	102	112	113	118	102	83	90	96	92	35,539
OTHER 1800-49	97	90	102	106	106	108	115	109	92	92	94	88	53,596
OTHER 1850-49	85	79	97	104	117	106	117	112	98	96	100	89	39,377

Table 9c: Nottinghamshire baptism seasonality by settlement type, 1750-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
RURAL 1750-99	95	107	117	116	112	98	91	88	87	94	100	96	55,076
RURAL 1800-49	97	100	108	111	108	102	98	94	95	96	96	95	83,927
RURAL 1850-99	99	92	104	106	105	104	99	96	99	103	97	96	32,666
NOTTINGHAM 1750-99	102	106	109	111	108	97	96	93	91	91	100	94	34,068
NOTTINGHAM 1800-49	96	104	109	111	107	101	98	97	97	91	93	95	60,423
NOTTINGHAM 1850-99	90	91	114	98	121	110	95	89	103	97	103	88	10,185
OTHER URBAN 1750-99	99	104	113	114	117	101	94	93	87	87	93	98	48,217
OTHER URBAN 1800-49	94	101	109	111	109	104	100	96	98	96	92	90	107,259
OTHER URBAN 1850-99	94	93	102	105	104	118	110	98	98	95	94	87	42,646
OTHER 1750-99	93	103	107	110	112	110	95	90	88	85	98	108	19,343
OTHER 1800-49	99	106	110	112	107	105	95	93	94	93	93	94	30,631
OTHER 1850-99	97	92	105	120	111	114	87	101	93	93	90	97	10,585

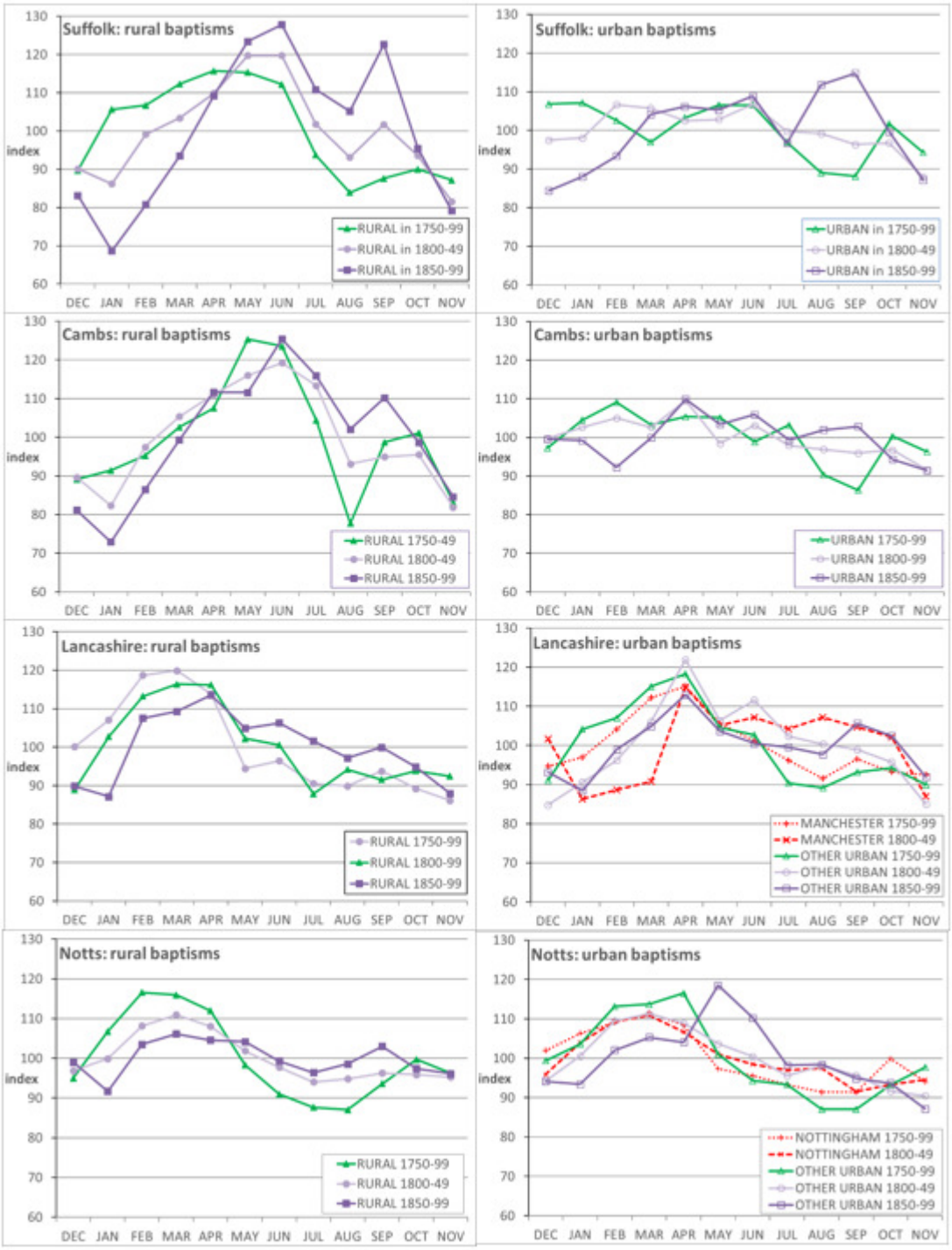
Table 10: Infant burial seasonality by settlement type, selected counties 1750-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
SUFFOLK RURAL 1750-99	85	99	109	112	109	104	95	92	97	103	100	95	17,813
SUFFOLK RURAL 1800-49	81	95	108	123	121	107	97	84	90	113	99	82	24,856
SUFFOLK RURAL 1850-99	80	93	113	128	128	110	99	83	87	112	87	79	10,701
SUFFOLK URBAN 1750-99	88	94	101	101	98	98	94	95	118	110	111	91	8,711
SUFFOLK URBAN 1800-49	92	104	115	118	110	95	85	77	99	123	103	80	14,322
SUFFOLK URBAN 1850-99	86	101	104	117	101	84	80	79	120	133	102	92	10,162
CAMBS RURAL 1750-99	83	92	102	87	102	111	117	92	110	119	89	95	3,606
CAMBS RURAL 1800-49	85	90	107	117	117	103	88	84	107	127	95	81	10,451
CAMBS RURAL 1850-99	87	99	123	123	115	96	84	82	99	127	94	71	8,606
CAMBS URBAN 1750-99	109	115	103	92	121	93	88	94	104	110	87	86	2,420
CAMBS URBAN 1800-49	82	99	118	116	110	92	80	89	104	130	95	87	8,515
CAMBS URBAN 1850-99	95	96	119	118	92	79	76	77	141	144	87	76	6,206
LANCS RURAL 1750-99	118	88	118	157	132	78	96	78	83	71	64	116	240
LANCS RURAL 1800-49	107	108	141	149	128	102	95	61	65	80	91	72	1,365
LANCS RURAL 1850-99	84	115	132	130	110	98	92	102	90	81	70	97	1,049
MANCHESTER 1750-99	106	108	90	102	96	88	66	76	114	144	105	105	1,681
MANCHESTER 1800-49	94	110	102	104	89	93	84	89	125	123	97	91	12,469
MANCHESTER 1850-99	100	105	110	100	67	59	69	127	146	120	108	88	799
LANCS OTHER URBAN 1750-99	101	102	116	114	126	110	91	85	86	68	92	110	2,929
LANCS OTHER URBAN 1800-49	104	116	122	125	117	105	92	80	84	85	85	85	31,094
LANCS OTHER URBAN 1850-99	106	109	108	106	104	96	81	92	112	103	89	94	29,417
NOTTS RURAL 1750-99	101	144	113	115	121	103	84	69	84	91	76	99	1,027
NOTTS RURAL 1800-49	91	107	128	128	112	102	93	86	92	98	83	81	8,436
NOTTS RURAL 1850-99	98	112	129	119	108	99	81	88	94	100	89	83	4,355
NOTTINGHAM 1750-99	87	106	110	106	117	97	87	90	84	100	110	107	365
NOTTINGHAM 1800-49	87	97	99	101	90	78	73	106	152	136	105	75	9,792
NOTTINGHAM 1850-99	91	104	94	91	89	82	80	130	162	118	79	80	4,200
NOTTS OTHER URBAN 1750-99	108	116	105	118	139	107	80	101	91	71	74	90	989
NOTTS OTHER URBAN 1800-49	90	108	122	120	112	98	81	82	102	112	90	84	14,423
NOTTS OTHER URBAN 1850-99	99	104	120	114	104	91	82	90	118	112	86	82	9,530

Source: FHS burials dataset

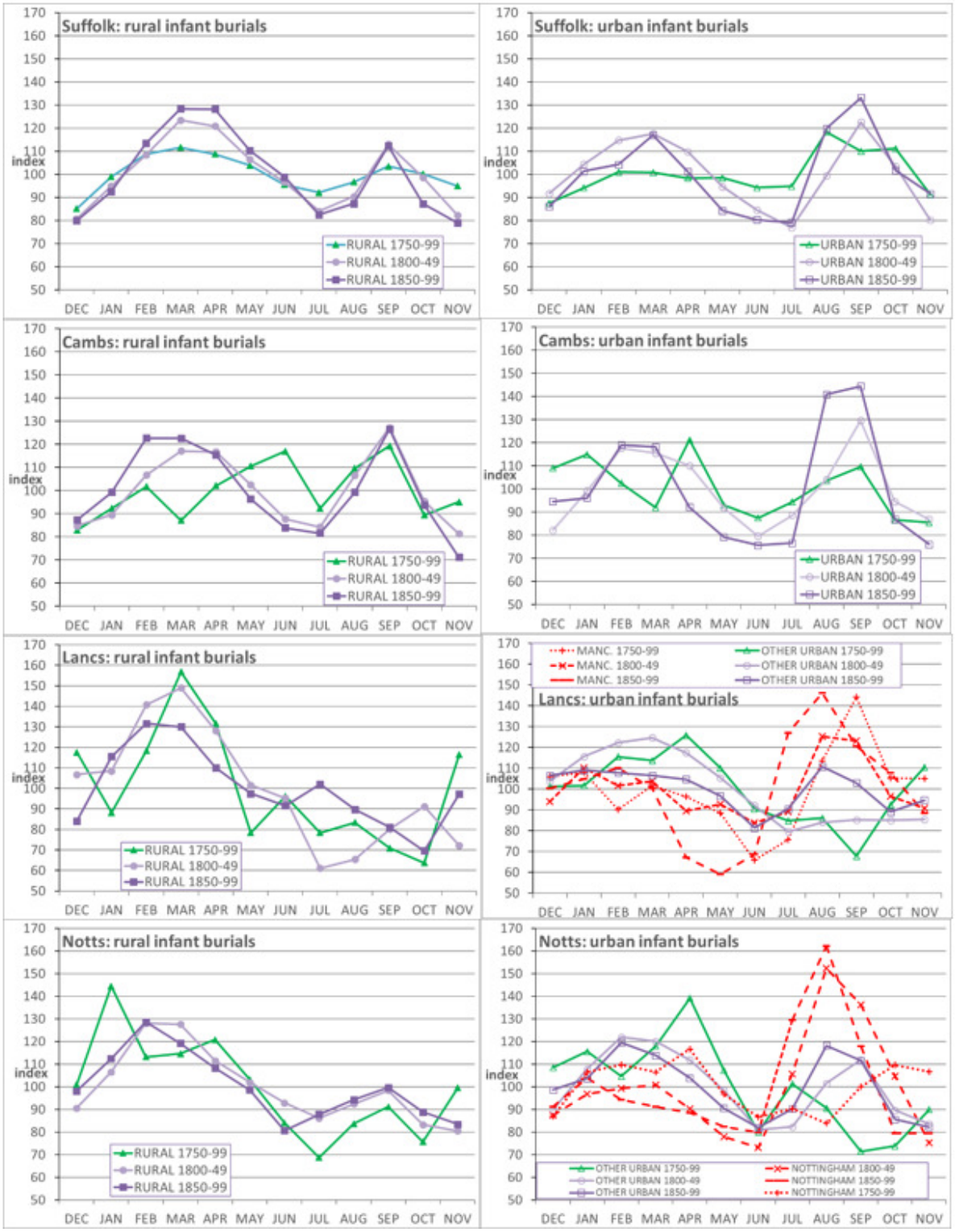
Note: Suffolk and Nottinghamshire baptisms and burials end before 1899. The last period labelled 1850-99 in each case in effect covers 1850-69 or 1850-70, for Suffolk and Nottinghamshire respectively

Figure 6a: Suffolk, Cambridgeshire, Lancashire and Nottinghamshire baptism seasonality indices for urban and rural settlements compared, 1750-1899



Source: FHS baptisms; Manchester Collegiate Church baptisms as abstracted by John Black for Romola Davenport, CAMPOP; see also Tables 8b and 9a to 9c

Figure 6b: Suffolk, Cambridgeshire, Lancashire and Nottinghamshire infant burial seasonality indices for urban and rural settlements compared, 1750-1899



Source: FHS burials dataset; see also Table 9d

In the rural Suffolk baptisms there is a switch in seasonal pattern between the first period before 1800 and subsequent periods, with an erosion of late winter baptisms pushing the April spring peak later to May or June, and a strong secondary peak in September after 1850. In rural Cambridgeshire the pattern is similar, with peaks in June and September to October, but there is a smaller proportion of winter baptisms even before 1850. Urban baptism seasonality is flatter than rural seasonality in both Suffolk and Cambridgeshire, especially the latter, but after 1850 a September *main* peak emerges in urban Suffolk settlements, with a similar pattern for other settlement types, and in Cambridgeshire a secondary September peak. In rural Lancashire and Nottinghamshire there are earlier main spring peaks in February or March which continue to dominate, albeit in diminished form, in each successive fifty year period, with an emerging secondary September peak in Nottinghamshire. Urban Lancashire, separated into gargantuan Manchester and other urban settlements, has more pronounced baptism seasonality than any of the other counties' urban areas, and retains a main peak in April in all periods, while losing its winter baptisms in favour of a modest secondary August or September excess after 1800. An April peak is also apparent in urban Nottinghamshire, again separated into its largest city of Nottingham and other urban areas, which pushes later after 1850, to May. Urban Nottinghamshire baptism seasonality is subdued compared to Lancashire, but in this simply echoes its rural areas and is not flattened by comparison. It is clear that baptism and birth seasonality is not geographically uniform, and therefore that the component of burial seasonality that relates to young infant children, especially neonates dying of endogenous causes, will not be either. Being an urban resident has a muting effect on birth/baptism seasonality in East Anglia, with less monthly variation in urban settlements and more in rural areas, but urbanisation in Nottingham and Lancashire has less effect, with more seasonal variance in baptisms persisting in urban areas.

Figure 6b and Table 10 show the corresponding infant burial seasonality for urban and rural settlements in the same counties sampled for baptisms, namely Suffolk, Cambridgeshire, Lancashire and Nottinghamshire, with the large cities of Manchester and Nottingham in the latter two counties separately presented where data permit, as with the baptisms. The earliest series for 1750-99 is often erratic, both because fewer infants or individuals aged under 1 year are reported (see Table 10 for the number of infants per series), and because "infant" rather than a precisely reported numeric age is common and may denote individuals up to about 2 years. The most striking feature of these plots compared to the seasonality of baptisms is the spatially and temporally consistent association of urban areas, and large cities in particular, with August or September peaks in infant burials. This is especially evident in places such as Nottingham, as attested by the baptismal troughs in these months. However, in the southeastern counties of Suffolk and Cambridgeshire, rural areas too experience these late summer or early autumn infant burial peaks, which may reflect the bimodal seasonality of baptism in the East Anglian region. The seasonality of infant burials is discussed further in later sections below.

Suffolk is predominantly arable, and thus in Kussmaul's terms a region of autumn marriages (only two of her 29 Suffolk parish sample are the alternative agricultural type of pastoral in any period[28]). This might suggest June or July births predominate, on the crude assumption of a preponderance of conceptions near the time of marriage (and notwithstanding lags from birth to baptism, prenuptial pregnancy, and relative timings of conceptions subsequent to the first), but insofar as the FHS

[28] Kussmaul (1990) Table A.1, p.191.

baptisms data do display such peaks, baptisms in Suffolk are becoming more strongly loaded onto June in each successive fifty year period, rather than evolving from a longstanding traditional pattern into something else. Cambridgeshire, also in arable East Anglia to the east of Suffolk, again displays no erosion of its rural midsummer baptism seasonality peak over time. Rural Lancashire and Nottinghamshire are quite different from Suffolk and Cambridgeshire, neither having a marked autumnal baptism peak even in the latest period after 1850, and both having earlier February to March main peaks. Lancashire is predominantly pastoral, and Nottinghamshire is a mixed county of both arable and pastoral land in what the 1851 Census termed the northern midlands, with coal mining settlements in its northern parts (these are categorised to type 'other' and not included in Figure 6). It is tempting to infer a possible relationship between agricultural type and baptism seasonality that might explain the geographical differences especially in rural baptism seasonality observed, connecting Kussmaul's theories of the geography of marriage seasonality, work type and the seasonality of baptisms revealed by the FHS dataset.

Other researchers have observed that the timing of the spring surge in baptisms in Europe and North American locations moves later in the year at higher latitudes, echoing Wrigley's conclusion on the timing of the spring peak in burial seasonality in European countries at more northerly latitudes.[29] To examine this phenomenon in eighteenth and nineteenth century industrialising Britain would ideally require more extensive birthdate data than is presently available, and also greater variation in latitude than the four counties studied here. Further work is needed to explore geographical connections between topography, latitude or other signifiers of climatic conditions on baptism seasonality, but from this explorative four county English sample it may be noted that any relationship that does exist will be nuanced by settlement type.

Child burial seasonality by settlement type

In evaluating child burial seasonality, it is informative to begin by considering the effect of settlement type on child burials over the long run. Child burials here include any burial with a child-indicative relationship or status indicator (son, daughter, infant etc) or where there is a stated age at death of less than 14 years.

Considering each fifty year period from 1550 onwards, the seasonality of child burials in urban settlements is distinctive (see Figure 7 and Table 11). Disregarding pre-1550 and post-1900 when there are few places or burials in observation, peaks and troughs in seasonal variation are more muted in urban settlements in every fifty year time period, with standard deviations ranging from 3.6 to 8.9 in urban areas, but 8.6 to 13.2 in rural settlements. Excluding Manchester makes little difference to these seasonal indices, despite the prominence of Manchester in the urban settlement type in some periods (see Part I Settlement Typology section and Table 4b). Other settlements show an intermediate degree of seasonal variance that more closely resembles rural than urban settlement types. Note also that there are not more urban burials than rural burials in observation for the three earliest full fifty year periods before 1700, which might, other things being equal, make the urban series smoother. Urban variance increases after 1700 even as the number of urban burials grow and outstrip the rural burials, but it never reaches or exceeds seasonal variance in rural or other settlements. From Figure 9, observing the differences between series plotted for successive

[29] Martinez-Bakker et al (2014); Wrigley and Schofield (1981) p. 296 and Table 8.4, p. 297.

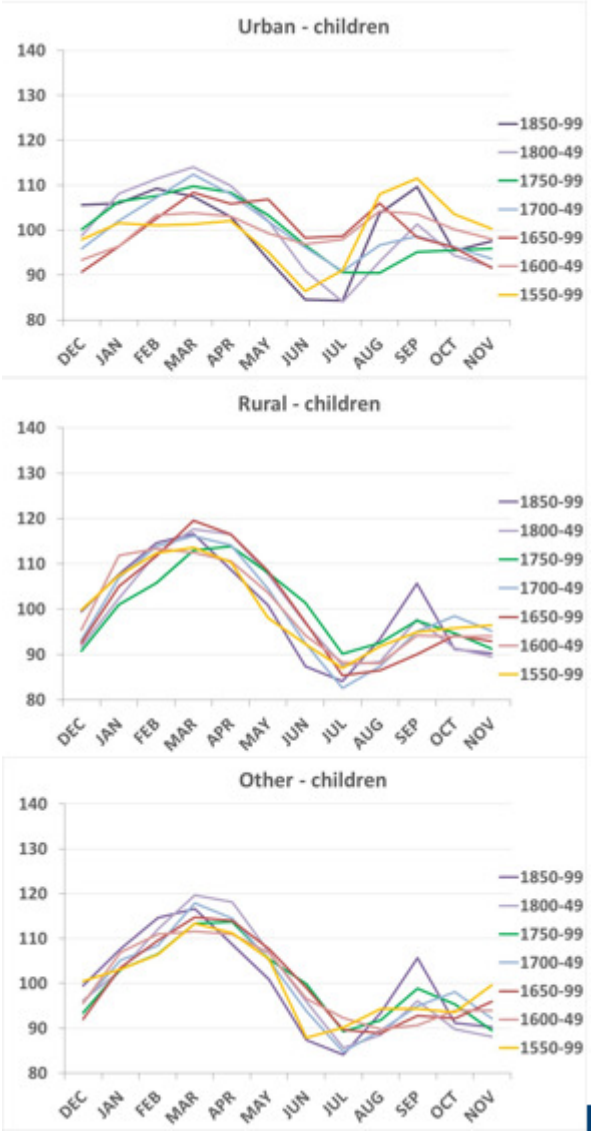
time periods within each settlement type, it is also apparent that there is more divergence over time in the seasonality of child burials in urban settlements than exists in rural or other settlements.

Table 11: Child burial seasonality by settlement type in fifty year periods 1550-1899, indexed to 100

Settlement type	period	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs	SD
OTHER	1538-49	90	94	92	106	133	83	68	106	109	132	90	96	985	
OTHER	1550-99	100	103	106	113	111	105	88	90	94	94	94	100	18,124	8.2
OTHER	1600-49	96	107	111	112	111	107	97	92	90	91	94	94	44,841	8.6
OTHER	1650-99	92	103	110	115	114	108	99	90	89	93	92	96	58,720	9.5
OTHER	1700-49	96	105	108	118	114	105	94	85	90	95	98	92	72,785	10.2
OTHER	1750-99	93	103	107	113	114	105	100	89	92	99	95	89	89,591	8.6
OTHER	1800-49	96	103	112	120	118	107	96	86	88	96	90	88	156,267	11.9
OTHER	1850-99	99	108	115	117	109	101	87	84	93	106	91	90	84,117	10.8
OTHER	1900-49	103	112	129	127	106	93	82	76	86	119	80	86	6,481	
RURAL	1538-49	118	108	87	90	103	83	87	90	94	133	98	110	1,843	
RURAL	1550-99	100	107	112	114	110	98	92	87	92	95	96	97	32,996	8.8
RURAL	1600-49	95	112	113	112	111	104	94	88	88	94	94	94	76,866	9.7
RURAL	1650-99	93	105	112	119	117	108	97	85	87	90	94	93	98,718	11.8
RURAL	1700-49	93	107	114	116	114	105	92	83	87	95	98	95	163,246	11.0
RURAL	1750-99	91	101	106	113	114	108	101	90	93	97	95	91	185,277	8.6
RURAL	1800-49	92	102	112	118	116	108	97	88	88	98	91	89	277,171	11.1
RURAL	1850-99	92	105	117	124	116	104	91	85	91	101	88	87	122,561	13.2
RURAL	1900-49	93	114	143	139	116	100	85	73	81	87	82	86	8,015	
URBAN	1538-49	85	90	74	79	83	103	79	97	112	123	154	122	1,211	
URBAN	1550-99	98	102	101	101	102	95	86	91	108	112	104	100	24,882	6.8
URBAN	1600-49	93	96	103	104	103	99	97	98	104	104	100	98	70,184	3.6
URBAN	1650-99	91	96	103	108	106	107	98	99	106	98	96	92	105,299	5.9
URBAN	1700-49	96	102	107	112	108	102	96	91	97	99	96	94	171,285	6.5
URBAN	1750-99	100	106	108	110	108	103	97	91	91	95	96	96	288,798	6.9
URBAN	1800-49	99	108	111	114	110	102	91	84	93	101	94	92	590,279	9.5
URBAN	1850-99	106	106	109	108	103	94	85	84	104	110	95	98	299,200	8.9
URBAN	1900-49	95	112	133	118	102	88	78	78	100	112	97	87	20,341	
URBAN excl Manc.	1538-49	85	90	74	79	83	103	79	97	112	123	154	122	1,211	
URBAN excl Manc.	1550-99	97	101	99	101	101	94	88	93	109	113	105	100	21,868	7.0
URBAN excl Manc.	1600-49	94	98	104	104	102	99	96	96	103	104	101	99	62,628	3.7
URBAN excl Manc.	1650-99	91	96	102	107	105	106	98	99	107	100	97	92	99,450	5.6
URBAN excl Manc.	1700-49	96	102	107	112	107	102	95	91	98	100	97	93	160,866	6.2
URBAN excl Manc.	1750-99	98	106	108	110	109	104	98	91	91	95	95	94	254,229	7.2
URBAN excl Manc.	1800-49	99	107	112	114	110	102	91	84	92	101	94	92	555,702	9.5
URBAN excl Manc.	1850-99	106	106	109	108	103	94	85	84	104	110	95	98	297,047	8.9
URBAN excl Manc.	1900-49	95	112	133	118	102	88	78	78	100	112	97	87	20,341	

Source: FHS burials dataset; Manc. = Manchester

Figure 7: Child burial seasonality by settlement type in fifty year periods 1550-1899, indexed to 100



Source: FHS burials dataset; see also Table 10

The same seasonal pattern of a March to April spring peak and midsummer trough in burials is evident in each time period in rural and other settlement types until the last period when the September peak becomes more pronounced, partly in consequence of the higher proportion of infants in child burials by this date. But in urban areas although the March peak is usually the most prominent in each 50 year period, it is at times overtaken by the secondary August-September peak.

The changing nature of the urban August-September peak in child burials can be seen more clearly by looking only at infant burials rather than all child burials, relying upon the textual descriptor "infant" and not any stated age in this instance. The reason for using the infant descriptor, even though there are far fewer burials that have it than those with numeric ages, is that reported numeric ages only become widespread in the late eighteenth century. The infant descriptor permits a much longer comparison starting with the period 1600 to 1649. Before 1600 there are less than one hundred burials per settlement type with the infant descriptor, and the earliest period is therefore not suitable for analysis of infant burial seasonality. After 1600 the numbers in observation

are reasonably robust, ranging from thousands to tens of thousands per fifty year period by settlement type, as shown in Table 12. Some caution is required in interpretation as there will be differences of meaning over time: infant usually means under two years rather than under one year in earlier parish registers, meaning that it is not identical to the age category of 0 years used in the analysis of burial seasonality by age group presented in Table 5 and Figure 6. However, since the youngest infants are always most at risk of dying, they should still dominate this group even in periods where the meaning in age terms is looser. By using infant descriptors thus, we obtain a more precise means of considering the seasonality of deaths among the youngest children over the long run.

As can be seen in Figure 8, urban infant deaths trend upwards from a midsummer trough in every fifty year period, whereas for rural infants the summer trough extended through autumn in the seventeenth century, interrupted only by a slight rise in August counteracted by a September fall. Strikingly, the share of urban burials in August and September steadily rises from each fifty year period to the next, with a late summer to early autumn burial peak first emerging in the eighteenth century. Urban infant burials become increasingly bimodal thereafter, with the peaks in February-March and August-September of comparable size in the nineteenth century. In rural areas in every period it is the late winter to spring peak in infant burials which dominates, and the emerging autumn peak of the eighteenth century and later is less marked. Other settlement types (see Table 12) have a mixed pattern of infant burial seasonality, with the late winter to spring peak remaining dominant throughout, but the late summer to autumn peak apparent in earlier periods than in rural areas.

Table 12: “Infant” burial seasonality by settlement type in fifty year periods 1600-1899, indexed to 100

Settlement type	period	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
OTHER	1600-49	111	101	118	108	113	94	77	76	87	99	109	106	1,807
OTHER	1650-99	94	116	128	121	121	96	87	80	90	93	74	99	2,170
OTHER	1700-49	103	106	109	124	114	107	88	76	89	94	98	93	9,504
OTHER	1750-99	92	100	107	115	111	101	95	86	91	108	103	91	23,898
OTHER	1800-49	93	103	113	122	118	105	92	82	91	103	93	86	33,466
OTHER	1850-99	95	109	113	127	109	101	90	83	97	107	90	80	9,905
RURAL	1600-49	117	113	140	121	96	87	85	77	89	78	95	102	2,126
RURAL	1650-99	118	115	118	116	102	98	90	79	83	82	91	107	4,068
RURAL	1700-49	94	111	114	114	111	99	94	80	85	99	102	97	22,585
RURAL	1750-99	89	100	109	115	110	108	98	89	93	102	96	92	47,832
RURAL	1800-49	87	98	113	122	118	105	94	85	91	105	95	88	60,643
RURAL	1850-99	82	101	116	122	120	106	96	86	94	107	90	81	16,513
URBAN	1600-49	105	116	114	117	106	104	68	82	87	89	94	118	3,017
URBAN	1650-99	93	124	118	114	102	92	74	90	97	96	100	101	2,483
URBAN	1700-49	102	104	107	113	101	95	90	90	98	104	105	92	11,195
URBAN	1750-99	95	104	107	107	106	101	92	92	101	103	100	93	41,106
URBAN	1800-49	93	103	109	112	107	98	87	84	104	117	101	86	93,640
URBAN	1850-99	96	104	114	110	106	95	85	86	106	121	92	86	20,741

Source: FHS burials dataset

Figure 8: “Infant” burial seasonality in urban and rural areas in fifty year periods 1600-1899, indexed to 100

Source: See Table 11.

As discussed in the previous section above, infant burial seasonality is influenced by birth or baptism seasonality, which is neither chronologically nor geographically fixed. Estimating or correcting for the effect of changes in baptism seasonality on all infant burials is not possible, but for the four counties of Suffolk, Cambridgeshire, Nottinghamshire and Lancashire within the FHS dataset where births or

baptisms have been abstracted, an approximation of the effect can be gained by calculating the ratio of burial seasonality to baptism or birth seasonality, as presented in Table 12 below. In their 404 English parish sample not differentiated by settlement type, Wrigley and Schofield observe a chronological shift in overall baptism seasonality beginning after 1700, as the pronounced heaping of baptisms on February and March begins to erode, accompanied by a lessening of the midsummer trough. By their last period of 1800-1834 this results in substantial diminution in seasonal variance, but no new summer or autumn peaks emerge. Only their earliest period of 1540-99 is marked by an excess of baptisms in August or September.[30]

In Table 13 it can be seen that, taking into account the seasonality of baptisms, there is a substantial excess of infant burials in August or September in both rural and urban settlements in the southeastern counties of Suffolk and Cambridgeshire in each fifty year period from 1750 to 1899. In northern Lancashire and north midlands Nottinghamshire, by contrast, no such rural late summer or early autumn burial excess exists. The major cities of Manchester and Nottingham in these latter two counties experience the greatest August and September infant burials excesses, Nottingham especially, but other urban settlements in Lancashire and Nottinghamshire are little affected until after 1850. Nottingham, the smaller but more southerly of the two great cities, has more pronounced August and September infant burial excesses than Manchester.

[30]Wrigley and Schofield (1981), p. 286-289.

Table 13: Infant burials seasonality 1750 to 1899 as a ratio of baptisms (births) seasonality for urban and rural settlement types in Suffolk, Cambridgeshire, Lancashire and Nottinghamshire

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
SUFFOLK RURAL 1750-99	0.95	0.94	1.02	0.99	0.94	0.90	0.85	0.98	1.15	1.18	1.11	1.09
SUFFOLK RURAL 1800-49	0.94	0.96	1.05	1.12	1.01	0.89	0.95	0.90	0.89	1.21	1.21	0.91
SUFFOLK RURAL 1850-99	1.16	1.15	1.21	1.18	1.04	0.86	0.89	0.78	0.71	1.18	1.10	0.95
SUFFOLK URBAN 1750-99	0.82	0.88	0.98	1.04	0.95	0.92	0.88	0.98	1.33	1.25	1.09	0.97
SUFFOLK URBAN 1800-49	0.94	0.98	1.08	1.15	1.07	0.89	0.85	0.78	1.03	1.27	1.18	0.82
SUFFOLK URBAN 1850-99	0.98	1.09	1.00	1.10	0.96	0.77	0.83	0.71	1.04	1.34	1.17	1.09
CAMBS RURAL 1750-99	0.93	1.01	1.07	0.85	0.95	0.88	0.95	0.88	1.41	1.21	0.88	1.14
CAMBS RURAL 1800-49	1.03	0.92	1.01	1.05	1.01	0.86	0.77	0.90	1.12	1.33	1.16	0.91
CAMBS RURAL 1850-99	1.20	1.15	1.24	1.10	1.03	0.77	0.72	0.80	0.90	1.28	1.11	0.88
CAMBS URBAN 1750-99	1.12	1.10	0.94	0.89	1.15	0.88	0.89	0.91	1.15	1.27	0.86	0.89
CAMBS URBAN 1800-49	0.80	0.94	1.15	1.05	1.12	0.89	0.81	0.92	1.09	1.34	1.03	0.87
CAMBS URBAN 1850-99	0.95	1.04	1.19	1.07	0.89	0.75	0.76	0.75	1.37	1.53	0.95	0.76
LANCS RURAL 1750-99	1.17	0.82	1.00	1.31	1.16	0.83	1.00	0.87	0.93	0.76	0.71	1.35
LANCS RURAL 1800-49	1.04	0.96	1.21	1.28	1.25	1.01	1.08	0.65	0.71	0.85	0.99	0.81
LANCS RURAL 1850-99	0.96	1.07	1.20	1.15	1.05	0.92	0.90	1.05	0.90	0.86	0.79	1.08
MANCHESTER 1750-99	1.12	1.11	0.86	0.91	0.84	0.84	0.65	0.79	1.24	1.49	1.13	1.14
MANCHESTER 1800-49	1.09	1.24	1.12	0.90	0.85	0.86	0.80	0.83	1.20	1.21	1.11	0.89
MANCHESTER 1850-99	*not calculable: no baptism or birth data*											
LANCS OTHER URBAN 1750-99	1.11	0.98	1.08	0.99	1.06	1.05	0.88	0.94	0.96	0.73	0.98	1.23
LANCS OTHER URBAN 1800-49	1.14	1.20	1.15	1.02	1.10	0.95	0.90	0.79	0.85	0.89	1.00	1.01
LANCS OTHER URBAN 1850-99	1.20	1.10	1.03	0.94	1.00	0.95	0.81	0.94	1.06	1.01	0.97	1.01
(LANCS OTHER URBAN 1750-99)**	1.03	0.94	1.02	1.00	1.13	1.09	0.98	0.96	0.97	0.72	0.98	1.16
(LANCS OTHER URBAN 1800-49)**	1.02	1.14	1.10	1.06	1.02	1.00	0.93	0.88	0.96	0.94	0.97	0.92
(LANCS OTHER URBAN 1850-99)**	1.05	1.10	1.04	1.00	1.01	0.92	0.81	0.95	1.13	1.05	0.95	0.99
NOTTS RURAL 1750-99	1.06	1.35	0.97	0.99	1.08	1.05	0.92	0.78	0.96	0.97	0.76	1.03
NOTTS RURAL 1800-49	0.91	0.99	1.15	1.18	1.09	1.04	0.99	0.91	0.96	1.03	0.87	0.83
NOTTS RURAL 1850-99	1.07	1.09	1.21	1.14	1.04	0.99	0.84	0.89	0.92	1.02	0.92	0.84
NOTTINGHAM 1750-99	0.85	1.00	1.01	0.95	1.08	0.99	0.91	0.97	0.92	1.09	1.10	1.13
NOTTINGHAM 1800-49	0.84	0.89	0.90	0.94	0.89	0.79	0.75	1.08	1.66	1.46	1.11	0.79
NOTTINGHAM 1850-99	1.00	0.91	0.97	0.76	0.81	0.86	0.89	1.25	1.67	1.14	0.90	0.88
NOTTS OTHER URBAN 1750-99	1.09	1.12	0.92	1.04	1.19	1.06	0.85	1.09	1.04	0.82	0.79	0.92
NOTTS OTHER URBAN 1800-49	0.89	0.99	1.10	1.10	1.08	0.98	0.85	0.84	1.06	1.22	0.99	0.89
NOTTS OTHER URBAN 1850-99	1.06	1.02	1.14	1.09	0.88	0.82	0.83	0.92	1.25	1.19	0.98	0.87

Note: 1800-49 and 1850-99 values calculated using baptism seasonality index values with a one month lead to accommodate birth to baptism delay. Those marked ** have been calculated using birth seasonality index values, with no birth to baptism delay adjustment in any period.

Source: See tables 8 and 9

The geography of child burial peaks

The climate of England differs by region, with the north colder on average than the south, and the west wetter than the east. Temperature differences are potentially also created in urban areas when they grow large enough to create heat island effects. Increased density of settlement creates air and water pollution problems, not only in an industrial context, but from domestic fuel use and human waste. In urban areas these adverse environmental conditions interact with a greater variety of pathogens, introduced by the mixing of people and their microbiomes that migration entails. In cities these pathogens are retained for longer and transmit between individuals with greater ease because of the larger number and close proximity of human hosts. Children, with their relatively undeveloped immune systems and lower resilience to nutritional deficiencies, are more adversely affected by urban disadvantages than adults.

Seasonal patterns of child burials cannot inform us as to the level of mortality in different regions, but they may alert us to the existence of differences between regions, that may or may not relate to climate or urbanisation, which can be investigated subsequently. Comparing the peak month of mortality in each place provides a simple way to evaluate them in the context of other locations nearby. However, the number of burials recorded in each FHS burials dataset place varies considerably, and for rural parishes it is often below twenty or thirty per year. To evaluate the seasonal experience of individual places thus requires chronological aggregation. Accordingly, we calculate the peak month of burials per location per 50 year period, and restrict this to locations with at least 100 burials in a given period. The extent of variation in child peak burial month across all locations sampled, extending the coverage period further back in 50 year increments to 1550-99, can be seen in Table 14 (only 55 locations have at least 100 burials in 1900-49, so this final period is omitted). These are counts and proportions of FHS locations having the peak month indicated in each period. Late winter to spring takes an ever-larger share of child burials, but the proportion of locations with September peaks is also growing after 1650.

Table 14: Child burial peak month distribution for all FHS locations, in 50 year periods 1550-1899

Month	1550-99	%	1600-49	%	1650-99	%	1700-49	%	1750-99	%	1800-49	%	1850-99	%
DEC	8	*4*	15	*3.2*	19	*3.0*	35	*3.4*	42	*3.6*	70	*3.8*	47	*5.4*
JAN	15	*8*	55	*11.8*	68	*10.9*	94	*9.2*	93	*7.9*	139	*7.6*	90	*10.3*
FEB	20	*11*	89	*19.1*	74	*11.9*	134	*13.1*	141	*12.0*	291	*15.8*	148	*16.9*
MAR	24	*13*	64	*13.7*	121	*19.4*	189	*18.4*	188	*16.0*	368	*20.0*	170	*19.4*
APR	30	*16*	65	*13.9*	86	*13.8*	157	*15.3*	191	*16.2*	327	*17.8*	109	*12.4*
MAY	14	*7*	40	*8.6*	69	*11.1*	99	*9.7*	123	*10.4*	180	*9.8*	58	*6.6*
JUN	3	*2*	23	*4.9*	42	*6.7*	40	*3.9*	91	*7.7*	73	*4.0*	25	*2.9*
JUL	9	*5*	19	*4.1*	22	*3.5*	25	*2.4*	50	*4.2*	43	*2.3*	10	*1.1*
AUG	16	*9*	17	*3.6*	23	*3.7*	47	*4.6*	48	*4.1*	54	*2.9*	49	*5.6*
SEP	17	*9*	28	*6.0*	31	*5.0*	65	*6.3*	96	*8.1*	173	*9.4*	106	*12.1*
OCT	14	*7*	27	*5.8*	34	*5.4*	87	*8.5*	66	*5.6*	67	*3.6*	31	*3.5*
NOV	17	*9*	25	*5.4*	35	*5.6*	53	*5.2*	49	*4.2*	55	*3.0*	34	*3.9*
Total	**187**	*100*	**467**	*100*	**624**	*100*	**1025**	*100*	**1178**	*100*	**1840**	*100*	**877**	*100*

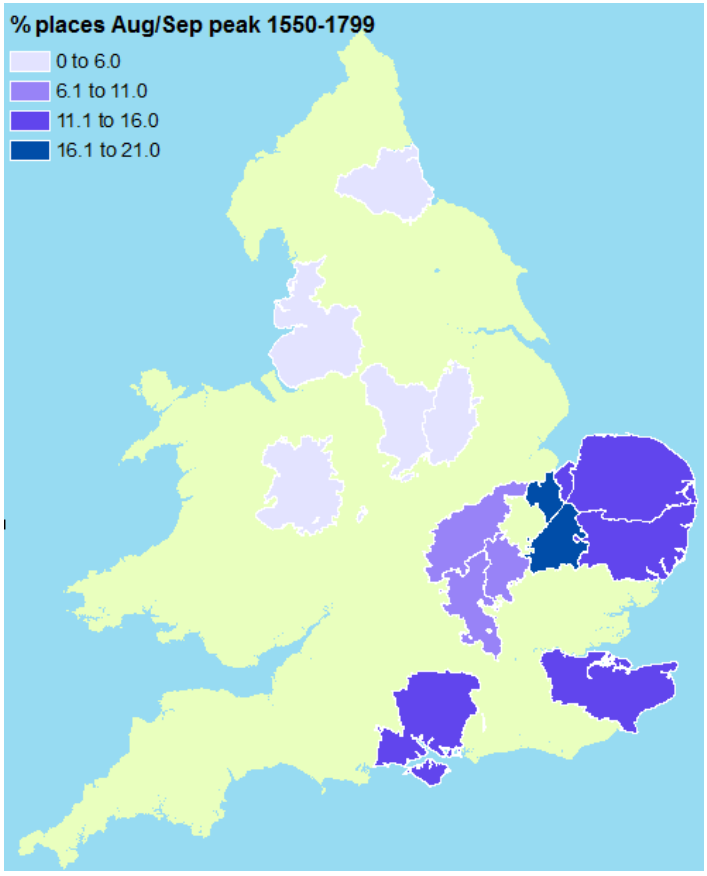
Note: counts per mappable unit exclusive of locations with fewer than 100 child burials in period
Source: FHS Burials

For the three central periods 1700-49, 1750-99 and 1800-49 which have a wide geographical spread of locations in observation, it is convenient to consider regional variations by representing the peak month per location as points on a map, as in Figure 10. By visual inspection, it is possible to pick out quickly any distinctive patterns worthy of further consideration.

Each location in observation is marked with a point of equal size, in colours varying according to the peak burial month. Red and purple points indicative of locations where summer or early autumn peaks are common are most prevalent in the east, whereas the turquoises and greens indicative of later winter to spring peaks dominate the north and central regions.

A more detailed examination of the geography of August and September child burial peaks though mapping the distribution by county of the proportion of locations which experienced August or September peaks in child burials per period reveals a striking north-western/south-eastern divide before 1800, as can be seen in Figure 9. This measures for each fifty year subperiod within 1550 to 1799 the proportion of all observed mappable FHS locations (ie mappable units built up from FHS places) that have August or September main burial peaks, and ranks the counties against each other. Counties with few (<30) period-locations in observation, or which did not have good chronological coverage across the five 50 year subperiods, are excluded from the figure (this comprises: Leicestershire, Wiltshire, Gloucestershire, Westmorland, Northumberland, Devon, Northumberland and Rutland, as bracketed and italicised in Table 15).

Figure 9: The geography of Aug-Sep child burial peaks by county before 1800



Source: see Table 15

Figure 10: Child burial peak month per FHS location in three fifty year periods 1700-1849

1700-49 1750-99 1800-49

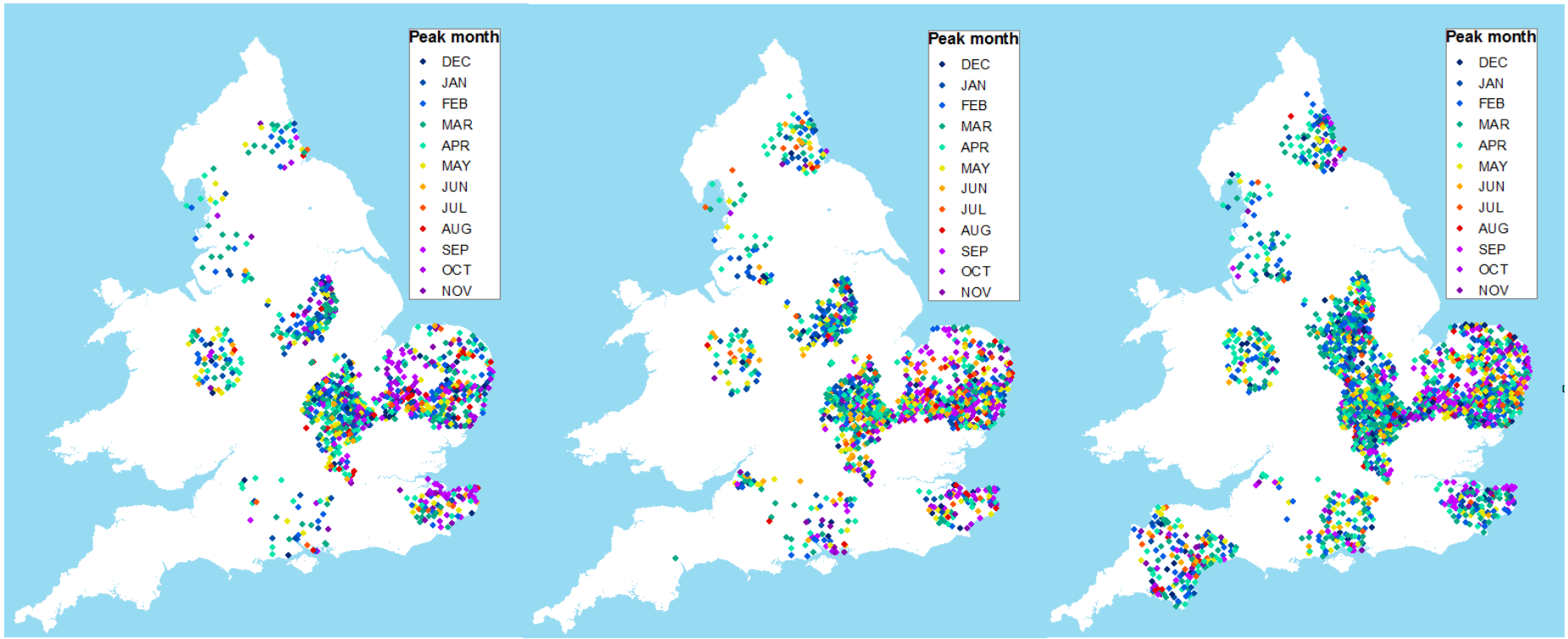


Table 15: Proportion of 50 year period-locations with Aug-Sep child burial by county, 1550-1799

County	period-location observations	% Aug-Sep peak
Cambridgeshire	386	20.5
Kent	363	14.6
Suffolk	640	14.5
Norfolk	263	14.4
(Leicestershire	*22*	*13.6)*
(Wiltshire	*31*	*12.9)*
Hampshire	142	11.3
Buckinghamshire	241	8.3
Bedfordshire	308	8.1
Northamptonshire	254	7.1
Durham	121	5.8
(Gloucestershire	*18*	*5.6)*
Westmoreland	*18*	*5.6*
Derbyshire	73	4.1
Lancashire	96	3.1
Shropshire	213	1.9
Nottinghamshire	257	0.4
(Devon	*1*	*0.0)*
(Northumberland	*11*	*0.0)*
(Rutland	*23*	*0.0)*

Note: brackets/italics indicate counties with few observations or poor chronological coverage

Source: FHS burials dataset

The geographical pattern of child Aug-Sep burial peaks per county over the following 50 years changed most in Durham and Derbyshire, both northern counties where few rural locations were represented in the FHS burials, as can be seen in Figure 11 and from Table 16, which also gives the urban: rural ratio per county, according to the settlement typology discussed above. This single fifty year period 1800 to 1849 was one of great economic and social change. Notably, however, Lancashire, despite being the main locus of new urban settlement consequent on the industrial revolution, and comprising mostly urban places in our FHS sample by this date, did not experience much increase in its proportion of August to September child burial peaks, and compares interestingly in this respect with Durham, also highly urban in our FHS sample by this date, where the proportion of August to September child burial peaks did rise.

Figure 11: The geography of Aug-Sep child burial peaks per county 1800-49

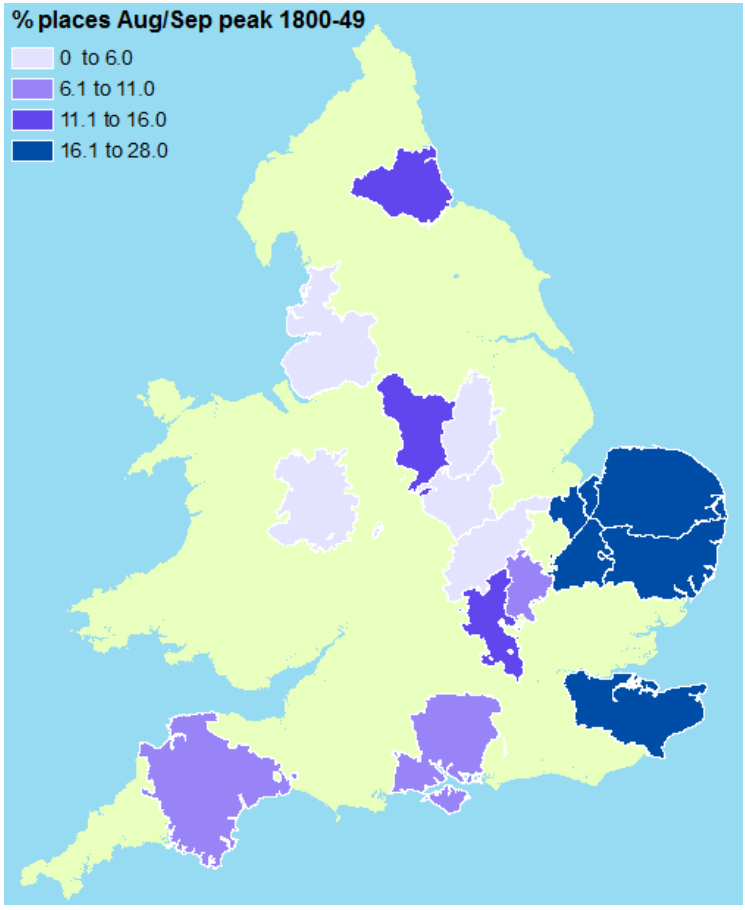


Table 16: Proportion of 50 year period-locations with Aug-Sep child burial by county, 1800-1849

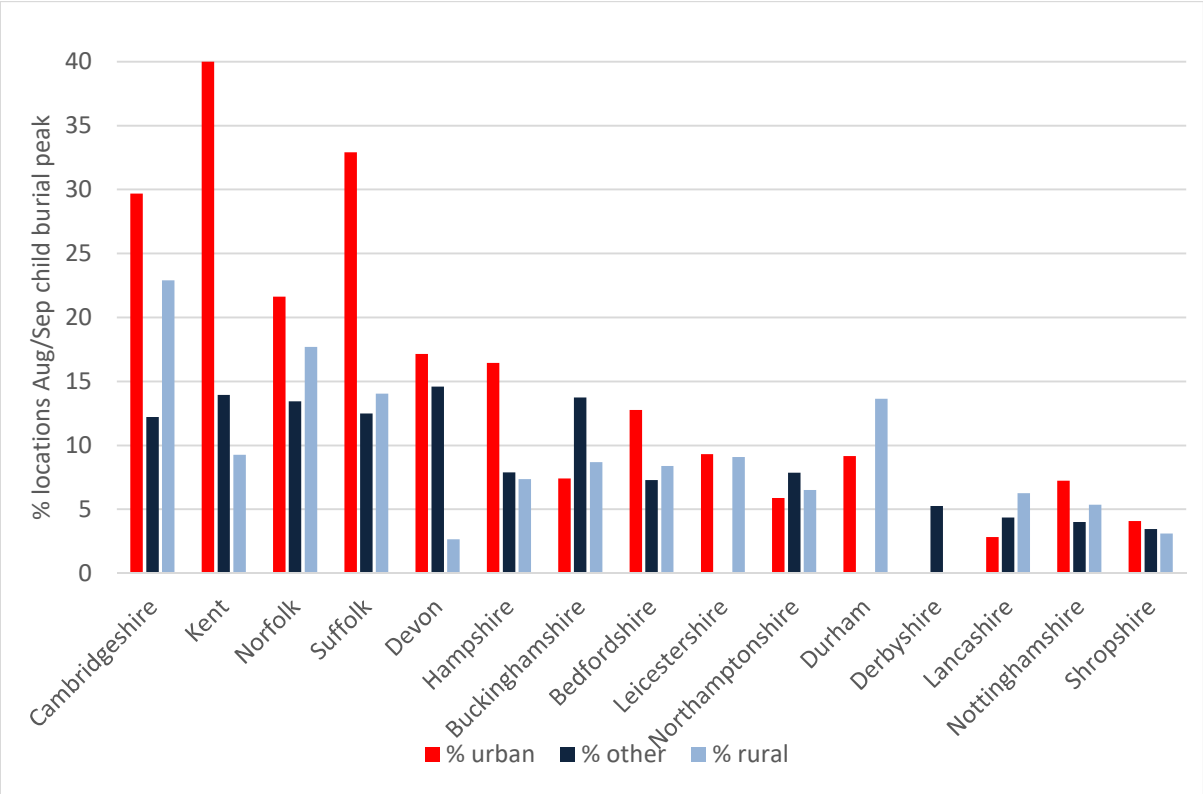
County	period-location observations	urban: rural ratio	% Aug/Sep peak
(Gloucestershire	*6*	*0*	*33.3)*
Cambridgeshire	113	0.2	28.0
Kent	113	0.4	21.9
Norfolk	162	0.1	20.6
Suffolk	256	0.1	17.1
(Northumberland	*12*	*8*	*15.4)*
Derbyshire	41	0.5	14
Durham	65	**4.7**	**12**
Buckinghamshire	115	0.1	12.2
Bedfordshire	95	0.1	10.3
Devon	154	0.4	9.6
Hampshire	99	0.4	9
Northamptonshire	153	0.2	6.1
Leicestershire	104	0.5	5
Lancashire	48	**5.5**	**4**
Nottinghamshire	122	0.3	0
(Rutland	*10*	*0.125*	*0)*
Shropshire	80	0.4	0
(Westmoreland	*12*	*0.2*	*0)*
(Wiltshire	*7*	*0*	*0)*

Note: brackets/italics indicated counties with few observations or poor chronological coverage

Source: FHS burials dataset

The contribution of urban settlement type to locations with August or September peak child mortality per county can be seen more clearly in Figure 12, over the whole period 1750 to 1899. Again there is a geographical divide. On the plot, the counties are ordered so that northern counties are at the right, and southern counties at the left. In southern-eastern counties it is urban locations which are most susceptible to these late summer and early autumn peak in child mortality, although even rural locations are more susceptible than any location type in northern counties. In northern-midlands counties by contrast, urban locations are less important to Aug-Sep peaks, and in some counties (Northamptonshire, Derbyshire, Lancashire) urban locations are actually less likely than rural locations to experience their main peak in child burials in August or September.

Figure 12: Proportion of period-locations experiencing Aug-Sep child burial peaks by settlement type for fifty year periods 1550-1849



Note: counties with few locations in observation or poor chronological coverage excluded; see also Table 12.

Table 17: Period-locations experiencing Aug-Sep child burial peaks by settlement type over six fifty year periods 1550-1849

	FHS mappable units in observation in six 50 year periods 1550-1849			FHS mappable units with Aug/Sep peak					
county	OTHER	RURAL	URBAN	OTHER	RURAL	URBAN	% other	% rural	% urban
Cambridgeshire	90	323	91	11	74	27	12	23	30
Kent	165	227	85	23	21	34	14	9	40
Norfolk	119	277	37	16	49	8	13	18	22
Suffolk	224	612	79	28	86	26	13	14	33
Devon	48	75	35	7	2	6	15	3	17
Hampshire	76	95	73	6	7	12	8	7	16
Buckinghamshire	80	230	54	11	20	4	14	9	7
Bedfordshire	96	262	47	7	22	6	7	8	13
Leicestershire	42	44	43	0	4	4	0	9	9
Northamptonshire	89	277	51	7	18	3	8	6	6
Durham	33	22	131	0	3	12	0	14	9
Derbyshire	57	44	14	3			5	0	0
Lancashire	23	16	106	1	1	3	4	6	3
Nottinghamshire	75	224	83	3	12	6	4	5	7
Shropshire	87	161	49	3	5	2	3	3	4
(Wiltshire	*12*	*26*	*0*	*3*	*1*	*0*	*25*	*4*	*0)*
(Westmoreland	*12*	*16*	*3*	*0*	*1*	*0*	*0*	*6*	*0)*
(Rutland	*6*	*26*	*1*	*0*	*2*	*0*	*0*	*8*	*0)*
(Northumberland	*4*	*7*	*13*	*1*	*0*	*1*	*25*	*0*	*8)*
(Gloucestershire	*13*	*5*	*6*	*1*	*0*	*2*	*8*	*0*	*33)*

Note: brackets/italics indicate counties with few observations or poor chronological coverage

Source: FHS burials dataset

The reasons why this pattern should exist are more opaque. We have seen that there is also geographical variation in the seasonality of baptisms and births, which will affect the seasonality of neonatal infant mortality. How far the variation in births and baptisms is a reflection of social behaviour or whether some component of it is exogenous to human agency is itself unclear, and more than two contrasting counties would be required to investigate this further. For burial seasonality, it is also tempting to speculate on the exogenous effects of climate variations between the North West, the midlands and the south east and south west. It is often argued that late summer child mortality is indicative of diarrhoeal disease resulting from consuming contaminated food or water, and that within the larger geographical context of Europe as a whole, warmer southern

locations are most susceptible to summer excesses of mortality[31]. In England August and September follow on from the warmest part of the year in which food and water-borne pathogens thrive in the greatest numbers, but the average monthly temperature in the summer months in, say, Lancashire or Derbyshire in the north, is considerably lower than in Devon, Kent or Suffolk in the south. The UK meteorological office provide regionally disaggregated seasonal mean temperature series from 1910, and in the earliest twenty years available, 1910-29, the mean summer temperature in June, July and August was 13.8 degrees Centigrade in northern England, whereas southern England at 15.2 degrees Centigrade was 1.4 degrees warmer on average.[32] Seasonal maximum and minimum temperatures vary more, by 2-3 degrees Centigrade for summer on average. The effect of topography and altitude on drainage is also likely to be a factor, with rugged upland counties less susceptible to water contamination than low-lying and flat coastal regions. However, that the geographical divide in child burial peaks is not constant over time does suggest that social or demographic factors form at least part of the explanation.

Urban topography and child burial seasonality

For FHS places also in the Towns Database of locations ever considered urban (plus other locations entailed in their suburban spread), altitude and ruggedness data permit a comparison of burial seasonality in locations that are low-lying and flat at one extreme, or elevated and hilly at the other. Places were assigned to five topographical categories: elevated, low lying, moderate, moderate: flat or moderate: hilly, according to the definitions given in Table 18.

Table 18: Topographical categories for FHS urban locations

Topographical category	Number of FHS towns (places)	Altitude/m	Ruggedness/SD
Elevated	87 (110)	>112	Any
Low lying	68 (152)	<35 OR <10	<4 OR <7
Moderate	115 (189)	>10 AND <112	>4 AND <8
Moderate: flat	47 (62)	>35 and <112	<4
Moderate: hilly	101 (309)	>10 and <112	>8

Ruggedness is calculated from the variation between contour lines at 100m intervals that intersect polygons associated with urban areas. This can be somewhat problematic in coastal regions, where cliffs or other sudden drops to sea level exist, but are not necessarily located where houses are built or where the population is concentrated. Elevation is based on an average of the values of contour lines at 100m intervals intersecting polygons associated with urban areas. Of these two measures, elevation seems to be associated with the most variation in burial seasonality, particularly for child burials.

Table 19 shows the monthly seasonal indices for child burials per topographical category indexed to 100, in fifty year periods from 1550 to 1949, although there are far fewer burials observed in the first and last period which makes these indices more volatile and less comparable with the other periods. The most striking contrast is between elevated and low lying towns, as can be seen in Figure 13. Low

[31] For example Wrigley and Schofield (1981) p. 296-7.
[32] http://www.metoffice.gov.uk/pub/data/weather/uk/climate/datasets/Tmean/ranked/England_N.txt
http://www.metoffice.gov.uk/pub/data/weather/uk/climate/datasets/Tmean/ranked/England_S.txt

lying towns have a pronounced August to September secondary peak in child mortality that is absent in elevated towns, which have only a slight upswing in these months that over time is slowly growing larger. This lends support to the nineteenth century epidemiologist William Farr's notion that elevated areas have a natural advantage in health terms over their low lying counterparts, and on our evidence from well before the advent of cholera in Britain.[33] It is interesting to note from previous work on late eighteenth century parish registers with causes of death that the diarrhoeal diseases associated with late summer and early autumn are virtually absent in Leeds (elevation 60m to 340m) but a major component of causes of death in Liverpool (elevation below 60m) and London (elevation below 15m).[34] Dobson's 1997 study of south-eastern early modern England also concluded that the seasonal experience of low-lying and elevated communities was very different, and underlined the unhealthiness of marshland in particular, with associated malarial disease.[35] However, from the evidence of the FHS burials dataset it is not only south-eastern low-lying areas that have a distinctive seasonal burial pattern. The role of ruggedness, if any, is harder to interpret from the Family History Society burials. Moderate: hilly towns actually have slightly more late summer and autumnal secondary peaking in the seasonality of child mortality than moderate: flat towns. It may be that it is not drainage but rather temperature, which tends to be lower in elevated and exposed urban areas, that is the more important environmental factor, since disease vectors such as flies and bacteriological pathogens all reproduce at higher rates in warm conditions.

[33]Farr (1852), 155-183.

[34] See https://www.campop.geog.cam.ac.uk/research/projects/epidemiologicaltransition/results.html

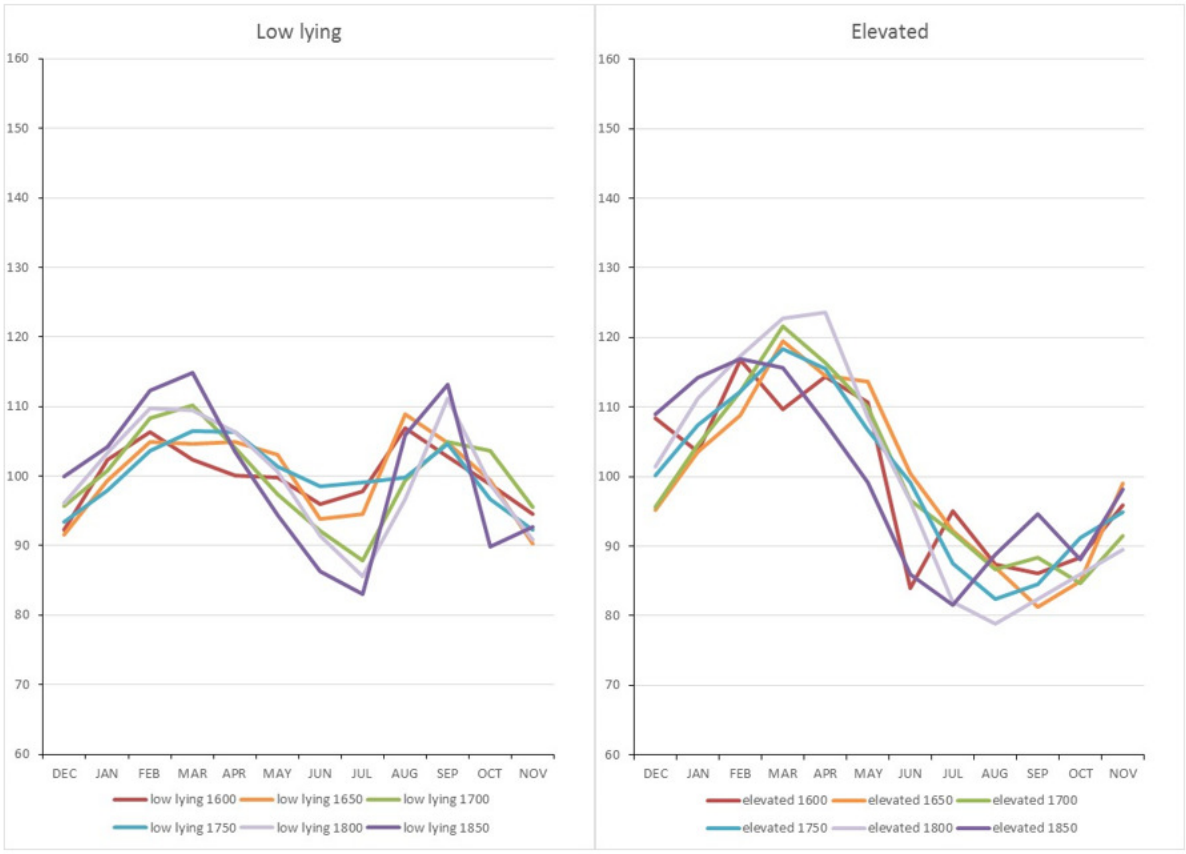
[35]Dobson (1997).

Table 19: Child burial seasonality in 50 year periods for topographical categories, indexed to 100

Topographical category/50 year period starting	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
elevated 1550	109	111	107	111	120	112	74	92	89	93	85	97	2,368
elevated 1600	108	104	117	110	114	111	84	95	87	86	88	96	10,633
elevated 1650	95	104	109	119	115	114	100	92	87	81	85	99	15,431
elevated 1700	96	105	112	122	116	110	97	92	87	88	85	92	24,095
elevated 1750	100	107	112	118	116	107	99	88	82	85	91	95	40,318
elevated 1800	101	111	117	123	124	109	96	82	79	82	86	90	80,868
elevated 1850	109	114	117	116	108	99	86	81	89	95	88	98	55,166
elevated 1900	120	109	133	105	98	89	95	82	78	105	88	98	1,742
low lying 1550	100	106	101	101	104	88	83	90	101	113	110	103	6,727
low lying 1600	92	102	106	102	100	100	96	98	107	103	99	95	23,060
low lying 1650	92	99	105	105	105	103	94	95	109	105	99	90	34,962
low lying 1700	96	101	108	110	104	97	92	88	99	105	104	96	42,403
low lying 1750	93	98	104	106	106	101	98	99	100	105	97	92	46,939
low lying 1800	96	103	110	109	106	101	91	86	97	111	99	91	87,960
low lying 1850	100	104	112	115	103	94	86	83	106	113	90	93	39,507
low lying 1900	95	117	135	124	114	92	80	72	94	108	89	80	5,509
moderate 1550	95	99	104	102	104	97	87	92	110	108	97	104	9,831
moderate 1600	96	99	105	105	104	101	99	93	97	99	101	100	22,138
moderate 1650	89	100	103	111	110	109	102	94	96	95	97	96	33,500
moderate 1700	96	102	107	113	110	103	93	88	94	102	100	93	47,316
moderate 1750	95	106	107	112	112	104	100	92	91	95	94	93	59,349
moderate 1800	98	109	114	121	115	106	93	83	86	94	91	90	102,763
moderate 1850	104	104	116	109	105	96	87	83	97	106	96	97	51,262
moderate 1900	98	136	133	123	102	88	86	70	85	83	89	107	1,490
moderate:flat 1550	105	100	106	109	100	97	88	96	107	96	99	96	3,373
moderate:flat 1600	87	100	108	108	104	108	112	100	97	97	93	85	8,941
moderate:flat 1650	93	96	112	114	107	108	104	98	95	91	90	91	11,473
moderate:flat 1700	95	100	100	115	118	103	96	91	93	97	97	93	16,244
moderate:flat 1750	97	101	105	113	110	112	104	91	92	96	91	89	17,221
moderate:flat 1800	97	111	111	120	117	109	93	83	88	93	86	92	28,760
moderate:flat 1850	106	103	104	109	108	96	87	86	105	103	96	97	22,613
moderate:flat 1900	95	109	120	112	99	92	83	79	110	117	98	86	3,963
moderate:hilly 1550	98	101	101	100	101	102	89	90	109	110	102	98	11,291
moderate:hilly 1600	93	91	100	101	105	98	98	99	105	106	103	99	28,382
moderate:hilly 1650	89	92	102	107	106	104	98	105	110	101	96	90	38,701
moderate:hilly 1700	95	103	103	110	106	103	100	96	100	96	95	94	64,178
moderate:hilly 1750	102	106	106	107	106	102	94	89	91	98	100	98	135,497
moderate:hilly 1800	98	108	108	112	107	99	89	84	100	105	97	93	254,172
moderate:hilly 1850	103	105	104	104	99	90	82	85	111	119	102	97	78,747
moderate:hilly 1900	81	101	146	127	93	85	69	77	97	127	103	94	3,432

Source: FHS burials dataset. For topographical category definitions see Table 13.

Figure 13: Child burial seasonality in elevated and low lying towns compared, in six 50 year periods 1600 to 1899, indexed to 100



Source: see Table 14.

It is, however, prudent to consider the composition of the town topographical categories, and to what extent this exercise in topographical comparisons might be replicating the effects of latitude and the same northwest/southeast split in burial seasonality explored above, or alternatively be skewed by the differing coverage dates of FHS burials subdatasets by county. It is true that elevated towns are predominantly found in northern counties and low lying towns in southern counties within the FHS burials dataset, but Newark in Nottinghamshire, Stockton in Durham, and Luton in Bedfordshire are all major contributors to the elevated or low lying categories that buck this trend. Table 20 names the ten largest urban contributors to the low lying and elevated topographical categories in terms of number of burials, which together constitute some 55-60 per cent of all burials so categorised in each case. The average year of burial coverage is slightly later in elevated areas than in low lying areas, which means that chronological coverage is unlikely to be producing the distinction as, overall, as we have seen, the late summer and autumn peak in child burials tends to amplify towards the end of the period, in the nineteenth century in particular. Even though low-lying towns are composed of slightly more early dated burials than elevated towns, the distinction exists.

Table 20: Composition of low lying and elevated topographical categories: most populous towns and mean burial coverage years

	Town	County	n child burs 1600-1899	mean year	% contribution to elevation category
Rank	**Low lying elevation category**				
1	Cambridge	Cambridgeshire	33,171	1777	13.1
2	Portsmouth & Gosport	Hampshire	26,698	1755	10.5
3	Wisbech	Cambridgeshire	17,918	1738	7.5
4	Great Yarmouth	Norfolk	10,641	1826	4.2
5	Sandwich	Kent	10,446	1708	4.1
6	Bedford	Bedfordshire	9,826	1753	3.9
7	Newark	Nottinghamshire	9,392	1786	3.7
8	Stockton	Durham	9,001	1837	3.5
9	March	Cambridgeshire	8,370	1776	3.3
10	Great Marlow	Buckinghamshire	7,370	1750	2.9
	all 68 low lying towns		*253,555*	*1772*	
Rank	**Elevated elevation category**				
1	Blackburn	Lancashire	51,901	1816	23.4
2	Burnley	Lancashire	17,219	1796	7.8
3	Whickham	Durham	12,198	1760	5.5
4	Colne	Lancashire	10,515	1795	4.7
5	Oswestry	Shropshire	9,483	1741	4.3
6	Mansfield	Nottinghamshire	7,931	1804	3.6
7	Ashton under Lyne	Lancashire	7,059	1794	3.2
8	Luton	Bedfordshire	6,968	1748	3.1
9	Accrington	Lancashire	5,731	1842	2.6
10	Sutton in Ashfield	Nottinghamshire	5,656	1820	2.6
	all 87 elevated towns		*221,633*	*1796*	

Buckinghamshire provides a useful case study of a centrally located county with both elevated and low lying (small) towns. This makes it possible to evaluate whether the distinction in terms of late summer and autumn burial seasonality between elevated and low lying towns exists when latitude is relatively invariant. Indeed this does appear to be the case, as Table 21 shows. Elevated Buckinghamshire towns (such as Wendover or Beaconsfield) have only a spring peak centred on March in child burial seasonality, and no particular upswing at all in August or September, whereas low lying towns in the same county (such as Great Marlow and Eton in the Thames Valley) have a bimodal distribution of child burials, with peaks in March and August.

Table 21: Buckinghamshire elevated and low lying towns child burial seasonality 1600-1899, indexed to 100

	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs
elevated 1600-1899	94	99	104	122	107	109	105	93	82	96	96	93	8,434
low lying 1600-1899	94	98	108	112	106	101	90	90	108	104	99	89	15,406

Adult burial seasonality and individual town burial seasonality

The nature of relationships recording in burial registers makes accurate detection of all adults problematic, even assuming a perfectly complete transcription. An adult male who dies is not usually given any relationship, but in some periods a burial register may have few details for individuals of any age or sex (Wrigley and Schofield termed this 'short-form' registration). Accurately determining which relationship-less burials are adults and which are simply missing information and may therefore be children or adults is not straightforward. Adult women are most often described as wives or widows and are therefore easier to identify positively through relationships information than adult men.

Various threshold measures of minimum proportions of sons/daughters or wives/widows per period or per moving average window could be adopted to judge for what periods it is safe to assume no relationship is indicative of adults and not of missing relationships information in each FHS place. The problem with this approach is that many FHS places record only small numbers of events, and are subject to considerable natural variation in the frequency of recording burials with or without relationships. The proportion of burials with relationships is subject to wide variations by time and place, relating in part to the (unknown) age and sex breakdown of the population at risk of dying, and in part to changing hazards of dying. For example, from Figure 3 it can be seen that the variation in the proportion of FHS burials with child relationships in each county varies from between just over 20% to just over 50%. A more detailed summary of the number of burials per county and one hundred year period having each standardised relationship indicator, or none, is given in Table 22. The decline in relationships information after Rose's Act in 1813 means there are few in the final period in any county except Lancashire, where Manchester relationships continue, but across other periods the variation is considerable.

Table 22: Proportion of burials with selected relationships by county and period, 1550-1949

County and period		% burials with relationship						
1550-1649	**N burials**	**DAUGHTER**	**SON**	**WIFE**	**HUSBAND**	**WIDOW**	**WIDOWER**	**NONE**
Bedfordshire	61395	13.1	14.6	12.3	0.1	6.8	0.1	49.1
Buckinghamshire	79466	11.7	13.1	10.8	0.1	4.5	0.1	58.6
Cambridgeshire	112596	14.7	15.8	12.0	0.2	0.0	0.0	56.3
Derbyshire	7361	12.6	15.4	14.4	0.1	5.7	0.5	50.2
Devon	0							
Durham	35948	9.1	9.6	6.7	0.0	3.3	0.0	67.7
Gloucestershire	0							
Hampshire	80138	5.0	5.2	5.9	0.0	4.4	0.0	76.2
Kent	140619	14.2	15.8	13.1	0.0	4.4	0.1	48.8
Lancashire	46768	15.2	16.4	14.2	0.0	3.0	0.0	45.4
Leicestershire	6073	18.9	19.5	12.0	0.0	3.6	0.0	45.2
Norfolk	54876	13.3	14.9	11.5	0.1	5.6	0.1	50.8
Northamptonshire	0							
Northumberland	0							
Nottinghamshire	11394	14.7	16.5	12.4	0.1	5.1	0.0	49.9
Rutland	5541	14.3	16.3	11.6	0.1	0.4	0.0	57.3
Shropshire	81966	14.8	16.4	12.3	0.0	0.1	0.0	55.6
Suffolk	195222	13.4	14.8	13.6	0.2	0.0	0.2	56.7
Westmoreland	2891	23.8	23.4	26.9	0.0	0.1	0.0	25.8
Wiltshire	5113	11.7	12.3	11.5	0.0	6.8	0.0	55.8
1650-1749	**All burials**	**DAUGHTER**	**SON**	**WIFE**	**HUSBAND**	**WIDOW**	**WIDOWER**	**NONE**
Bedfordshire	126059	16.2	17.5	13.8	0.1	9.3	0.1	36.0
Buckinghamshire	174733	13.2	14.1	11.5	0.1	6.7	0.1	52.0
Cambridgeshire	209194	14.3	15.7	11.1	0.1	0.1	0.0	57.3
Derbyshire	31294	13.7	15.5	12.4	0.1	6.6	0.0	49.5
Devon	1407	9.0	9.4	2.7	0.0	2.6	0.0	74.6
Durham	88740	13.6	15.6	7.7	0.0	3.0	0.0	58.1
Gloucestershire	4	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Hampshire	233625	5.8	6.3	5.9	0.0	5.0	0.0	72.3
Kent	188570	12.1	13.5	11.6	0.1	6.4	0.1	49.9
Lancashire	95340	18.8	20.9	13.4	0.0	0.4	0.0	44.4
Leicestershire	17048	21.8	23.7	11.5	0.0	7.5	0.0	33.4
Norfolk	163116	13.7	15.5	9.7	0.5	5.8	0.3	46.7
Northamptonshire	117324	11.7	13.0	9.6	0.1	5.5	0.1	51.6
Northumberland	2335	14.2	12.4	9.7	0.0	5.6	0.0	55.9

Nottinghamshire	130709	17.2	18.6	12.2	0.1	6.0	0.0	44.4
Rutland	10964	16.9	19.1	12.4	0.0	1.7	0.1	48.6
Shropshire	176360	14.1	15.4	11.3	0.1	0.1	0.0	57.5
Suffolk	348941	13.3	14.6	12.0	0.1	0.0	0.4	54.3
Westmoreland	10965	15.1	17.5	15.2	0.0	7.7	0.0	43.9
Wiltshire	16157	13.7	14.1	12.1	0.0	7.4	0.0	50.9
1750-1849	**All burials**	**DAUGHTER**	**SON**	**WIFE**	**HUSBAND**	**WIDOW**	**WIDOWER**	**NONE**
Bedfordshire	155057	9.4	9.7	7.1	0.0	4.6	0.1	60.0
Buckinghamshire	250187	5.3	5.3	5.3	0.1	3.0	0.1	75.8
Cambridgeshire	238537	8.9	9.8	6.8	0.2	0.4	0.0	66.9
Derbyshire	60217	7.4	8.5	5.0	0.0	2.3	0.2	71.4
Devon	222942	0.7	1.0	0.3	0.0	0.4	0.0	94.7
Durham	377793	8.3	9.0	4.9	0.0	2.8	0.1	70.5
Gloucestershire	113848	3.0	3.2	1.8	0.0	1.0	0.0	82.3
Hampshire	388551	2.5	2.7	2.0	0.0	1.5	0.0	81.9
Kent	301363	2.7	3.2	3.3	0.0	1.9	0.1	79.9
Lancashire	430504	18.1	19.6	7.1	0.0	0.8	0.0	52.3
Leicestershire	109386	8.2	9.3	4.3	0.0	1.2	0.0	70.0
Norfolk	309166	8.1	9.1	6.0	2.4	4.3	1.2	52.9
Northamptonshire	280214	6.5	6.9	5.5	0.5	3.5	0.3	68.0
Northumberland	53608	11.9	13.6	7.2	0.0	4.1	0.0	60.9
Nottinghamshire	313507	10.5	11.2	6.3	0.0	2.2	0.1	65.5
Rutland	16735	7.5	7.8	4.9	0.0	1.0	0.0	69.2
Shropshire	230195	6.2	6.7	4.2	0.0	0.1	0.0	82.5
Suffolk	452377	7.8	8.4	6.9	0.6	0.0	1.2	64.9
Explanation								
Westmoreland	26422	12.1	13.5	8.4	0.0	4.4	0.0	58.6
Wiltshire	19975	9.2	9.0	7.8	0.0	3.0	0.0	68.2
1850-1959	**All burials**	**DAUGHTER**	**SON**	**WIFE**	**HUSBAND**	**WIDOW**	**WIDOWER**	**NONE**
Bedfordshire	15756	1.0	1.1	0.8	0.0	0.4	0.1	92.5
Buckinghamshire	61731	0.0	0.0	0.0	0.0	0.0	0.0	98.7
Cambridgeshire	163859	0.1	0.2	0.2	0.0	0.1	0.0	97.3
Derbyshire	83198	0.2	0.3	0.2	0.0	0.1	0.0	95.8
Devon	1509	0.3	0.1	0.0	0.0	0.0	0.0	98.0
Durham	163778	2.4	2.6	0.8	0.0	0.4	0.0	89.2
Gloucestershire	2	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Hampshire	17	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Kent	193291	0.7	1.3	1.2	0.0	1.1	0.0	94.3
Lancashire	168738	9.4	12.1	3.1	0.4	1.3	0.0	72.4

Leicestershire	109636	3.4	3.9	2.3	0.0	1.6	0.0	83.2
Norfolk	153774	0.2	0.3	0.2	0.1	0.2	0.0	94.7
Northamptonshire	51360	1.0	1.0	0.7	0.2	0.4	0.0	91.3
Northumberland	5078	0.0	0.0	0.0	0.0	0.0	0.0	99.2
Nottinghamshire	91126	0.4	0.6	0.4	0.0	0.2	0.0	92.3
Rutland	10265	0.1	0.1	0.2	0.0	0.3	0.0	95.3
Shropshire	19083	6.1	3.4	6.1	0.0	0.0	0.0	77.1
Suffolk	131052	2.1	2.3	1.4	0.3	0.0	0.1	87.7
Westmoreland	2530	0.1	0.0	0.0	0.0	0.1	0.0	95.5
Wiltshire	0							

Source: FHS burials dataset

A simpler method of obtaining a sample of adults is to mirror the method used for children and use only those burials where an adult relationship is positively stated, without making inferences for those burials without relationship. In consequence, it is primarily adult females whose burial seasonality may be measured in this way, from wife and widow relationships. This need not be such a severe limitation as it may seem: Wrigley and Schofield assert that sex differences in burial seasonality were negligible across their England sample.[36] However, this does not preclude the possibility that there are county, period or settlement type differences in burial seasonality by sex that remain unobservable.

Adult women thus form the basis for the rest of the analysis in this section for periods before 1813. Men and young women yet to marry are largely excluded, because there are few relationships or status indicators that specify those individuals. The young adult contribution to overall burials is usually low because their rates of mortality are the lowest of all, so this should make little difference to the overall picture. After 1813 and where stated ages permit before this date, all persons aged 20 years and over and of both sexes are used.

The monthly indices for adult burials by settlement type are shown in Table 23 and Figure 16. Here unlike for children the picture is largely a uniform one, with the peaks occurring in late winter in February or March, and midsummer troughs in July. Urban settlements are somewhat different before 1750, with less seasonal variation accompanied by greater loading onto the late summer and early autumn months of August and September. For all settlements types after 1750 there is remarkable homogeneity in the seasonal pattern of adult burials, a situation quite unlike that of the child burials analysed in earlier sections. This also provides reassurance that the use of relationships to identify adults that restricts us predominantly to wives and widows in earlier periods has not biased burial seasonality in some way, since the change from mostly relationship identified adults before 1800 to mostly age identified adults after 1800 is not accompanied by apparent change in adult burial seasonality.[37]

[36] Wrigley et al (1997), p. 330.

[37] The ratio of relationship-identified burials to age-identified burials in 1750-1799 is 1.7

Table 23: Adult burials by settlement type in 50 year periods 1550 to 1899, indexed to 100

		DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs	SD
RURAL	1550-99	102	119	120	117	120	104	86	78	83	81	90	100	15,930	16.3
RURAL	1600-49	100	114	115	114	115	101	87	77	88	95	95	98	48,213	12.7
RURAL	1650-99	102	111	109	114	111	103	89	75	90	94	98	102	60,342	11.3
RURAL	1700-49	101	112	113	111	114	103	88	80	84	93	102	100	86,086	11.7
RURAL	1750-99	99	113	111	113	114	110	98	87	81	86	92	95	119,242	11.8
RURAL	1800-49	100	118	118	113	111	104	96	87	83	85	88	96	427,601	12.7
RURAL	1850-99	103	117	118	116	109	102	96	87	82	84	89	97	222,287	12.8
URBAN	1550-99	97	100	110	106	113	98	94	88	103	103	90	97	9,997	7.5
URBAN	1600-49	103	109	107	108	109	97	91	88	96	96	101	96	31,187	7.1
URBAN	1650-99	103	108	109	110	105	98	90	84	93	98	101	99	45,492	8.0
URBAN	1700-49	106	110	112	112	108	99	87	80	87	97	102	102	69,401	10.6
URBAN	1750-99	107	116	112	111	112	105	98	86	82	84	88	98	141,725	12.3
URBAN	1800-49	104	119	117	111	107	101	94	86	88	89	89	95	594,456	11.7
URBAN	1850-99	109	117	113	112	106	101	93	86	85	88	91	98	314,671	11.5
OTHER	1550-99	103	115	112	118	122	105	88	82	81	89	86	100	8,187	14.6
OTHER	1600-49	98	113	112	114	119	105	91	80	84	89	96	99	25,940	12.7
OTHER	1650-99	102	110	106	111	111	105	86	81	88	95	98	105	34,669	10.2
OTHER	1700-49	103	115	111	113	112	104	88	78	83	93	100	101	40,168	12.4
OTHER	1750-99	102	115	114	113	114	108	99	85	82	82	91	96	59,236	12.9
OTHER	1800-49	102	119	119	113	110	104	95	88	82	85	88	94	221,506	13.1
OTHER	1850-99	105	116	115	112	109	103	96	87	84	87	90	96	130,513	11.6

Source: FHS burials dataset

Figure 16a: Adult burial seasonality by settlement type in 50 year periods 1550-1949, indexed to 100

Source: See Table 18.

For selected towns, meaning those with the largest number of burials per 50 year period in each county available within the FHS burials dataset, it is possible to consider towns individually, to evaluate seasonal divergences particularly before 1750 (see Table 24a). As smaller numbers of burials produce unreliably erratic indices, only towns recording more than 1,000 adult burials In a 50 year period are considered. Population estimates of each town are also given in the table. This allows a comparison of adult burial seasonality in ten towns in 1650 to 1699 and greater numbers of individual towns thereafter, rising to a maximum of 76 towns in 1800 to 1849. Prior to 1650 there are only five towns whose adult burials may be observed in sufficient numbers.

The burial seasonality index has the potential to appear more erratic for individual towns than for the urban settlement type in aggregate even where there is little real seasonal difference, because of the far smaller number of burials available. This is especially the case where there are localised discontinuities in parochial registration. For these reasons, in considering differences in the burial seasonality indices of individual towns, small monthly peaks or troughs may be unreliable indicators of real differences, but larger differences of 10% above or below the expected monthly value hold more interest. However, there is another factor that potentially drives towards greater seasonal variation in early periods. Before about 1670 burial seasonality is liable to the influence of periodic plague epidemics, with certain years carrying huge mortality burdens of at least two or three times the usual death toll in affected localities, and these deaths will usually be concentrated in the late summer and early autumn months.[38] Plague affects burial seasonality in varying degrees depending on the frequency and magnitude of local mortality crises and the number of non-epidemic years also observed, with the first half of the seventeenth century more affected than the second half. Since town size is on average far smaller in the earliest periods, the 1000 burial threshold unavoidably favours the inclusion of places experiencing (and recording the burials from) high numbers of epidemic outbreaks. Later we shall consider child burial seasonality in individual towns in these early periods, where the effect of plague might be expected to be less marked because infants who are otherwise the main component of child deaths are thought to be less susceptible to the disease, which in London at least affected older children and young adults, although plague also seemed to kill more males than females, and nearly all our adult sample are female in these early periods whereas the child burials are of both sexes.[39]

Adult burial seasonality in 1650 to 1699 varies considerably between the ten towns with sufficient burials to make the comparison. None of these towns exceed 2,000 burials in total in this period except Norwich, which has little seasonal variation in its burials, and a standard deviation of only 4.3 between its monthly burial indices, as compared to around 11.3 to 18.3 for the other nine towns except Bury St Edmunds, which has a standard deviation of 7.9. Focussing on larger differences of 10% and more, half of these ten towns, Cambridge, Wymondham, Ipswich, Maidstone and Sandwich, experience substantial peaks of more than 110% of the expected September burden. September is the most common month for substantial burial excesses in this period, and two of the five towns with a September excess, Ipswich and Sandwich, have their main burial peak in August or September. These five towns are all in the southern counties of Cambridgeshire, Suffolk and Kent, as

[38] The 17th century plague crisis mortality in component parishes of the major cities of Norwich, Exeter and Bristol rose as high as 10, 12 or even 15 times the normal level, resulting in Norwich in a loss of perhaps 15% of all inhabitants, and plague deaths reached crisis point from August to October. Slack (1985), 111-143.
[39] Hollingsworth and Hollingsworth (1971), 131-146.

is Bury St Edmunds, which also experiences only a small August peak, but then there are few northern towns producing sufficient burials to be observed as single cases in this period. The northerly towns that are in observation, Manchester, Nottingham and Leicester, experience a trough of 80-81% and 88-93% respectively of an even distribution of burials in August and September, but Leicester in the East Midlands has a small 105% peak in August. In the preceding period of 1600 to 1650 Manchester in the North does experience an August peak of 114%, similar to the 117% September peak of the most southerly town in the same period, Sandwich in Kent, though Maidstone, further inland at a similar latitude, has no August or September peak.

In the first half of the eighteenth century, so far as can be observed the same towns as in the preceding period continue to experience substantial September burial excesses of at least 110% of the expected monthly burden. Of fourteen towns compared, Bury St Edmunds, Maidstone and Wymondham experience substantial September peaks, and no town has any August peak. For all three of these towns September remains the main burial peak month despite the disappearance of plague. Ipswich, Sandwich and Cambridge are not in observation. Of the other southerly towns that can be observed, Chesham in Buckinghamshire and Portsmouth in Hampshire have small peaks, but Gosport and Bedford do not. Among the northerly towns, Nottingham and Manchester again both have troughs at least 10% below an even distribution of burials in August and September, as does Whickham in county Durham, but Darlington and Chesham also have small September peaks.

In the fifty years after 1750, of 36 towns compared there are no longer any with substantial adult burial excesses in August and September, although small September peaks exist in the coastal communities of Lowestoft, Margate and Gosport. After 1800 when 76 towns may be compared, there are five towns that emerge with renewed substantial August or September burial excesses that are coincident with the month of peak burial in that town in each case. August rather than September is now the more common peak month, and at this date any geographical association of August and September peaks with southern towns breaks is absent. Both northern and southern England towns experience substantial August peaks: Newcastle-upon-Tyne and Stockton in the north, and Plymouth and Margate in the south also have such peaks. Neither Lowestoft nor Gosport retain their earlier burial excess in 1800 to 1849, but after 1850 Lowestoft is the single remaining town with a substantial August excess.

From adult burials there seems, then, to be some tendency for individual large towns of southeastern England to be most likely to experience burial peaks in August and September before 1750, while northern towns experienced fewer such peaks. If this proves statistically robust in further work yet to be undertaken, it could lend more credence to the possibility that there were geographical effects augmenting urban perturbations of burial seasonality prior to industrialisation, putatively driven by underlying differences of climate. Whether such effects influence child burials has been explored in earlier sections, but for children it is difficult to control for seasonality of birth, also geographically varied, which influences the seasonality of child burial since the children at greatest risk of dying are neonatal infants. We cannot know in most cases which child burials are of non-infants before the early nineteenth century when age at death reporting became near-universal, for the infant relationship descriptor is too patchily given to use its absence to identify older children with confidence. A second problem is that we only know the seasonality of birth, or of baptism as a (not unproblematic) proxy for birth, in some regions. With adult burials these difficulties do not pertain and the seasonality of birth is for the most part inconsequential. Since our

sample of adults before 1800 are primarily wives and widows, some will have died in childbirth, but this was not a major cause of death even among women in the prime childbearing years.[40] Seasonal patterns of migration into towns may differ by town and could potentially result in sudden influxes causing month-to-month differences in the size of the adult pool of town dwellers who are at risk of dying, but any such effect will be minimised by the composition of the adult sample as primarily wives and widows, which excludes those most likely to migrate since recruitment to towns is highest in the earlier, pre-marriage lifecycle stages of servant or apprentice.

Individual town level seasonality of burial may also be calculated for children (meaning those which child relationships or aged under 14 where an age is given), so as to compare the experience of children and adults in individual towns. Table 24b gives the burial seasonality indices for children in selected towns with large numbers of burials from 1550 until 1849 in six fifty year periods, with a threshold for inclusion of a town in a given period of at least 1000 child burials, as for adults discussed previously.

Typically in the early periods towns with adult burial excesses in August and September also have child burial excesses in those months, but with many additional towns experiencing such excesses in child burials besides. Southern port and coastal (or formerly coastal) towns such as Portsmouth, Sandwich, Margate and Dover have particularly large peaks in child burial seasonality in August or September that persist from 1650 to 1750 and beyond, joined by Eastern ports such as Ipswich and Lowestoft. To go by its annual totals of burials, Dover appears to experience several epidemic outbreaks in the 1650 to 1699 period, continuing post-1670 and the disappearance of plague. There are no northern coastal or port towns in observation before 1750 but the most westerly port, Bristol, experiences no marked peak in burials in 1750 to 1799, nor does South Shields in the northeast. Large southern cities further from the coast such as Norwich also have pronounced September child burial peaks, but also smaller low-lying southern fenland towns such as March and Chatteris.

[40] Schofield (1986), p. 231-60.

Table 24a: Adult burial seasonality for individual towns in 50 year periods 1550-1899, indexed to 100, with Langton/Law & Robson population estimates

Period begins	TOWN.COUNTY	Region	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs	C17th pop	1801 pop	1891 pop
1550	MANCHESTER.LANCASHIRE	N/W/Mid	86	89	116	106	128	104	99	94	102	112	77	87	1,243	2,356	94,876	835,628
1600	CAMBRIDGE.CAMBRIDGESHIRE	S/E	115	115	109	102	104	90	71	102	79	108	109	96	1,087	10,574	10,087	44,509
1600	MAIDSTONE.KENT	S/E	96	89	100	105	91	120	91	101	88	96	133	89	1,018	3,703	8,027	32,145
1600	MANCHESTER.LANCASHIRE	S/E	88	98	106	104	116	89	95	104	114	98	93	95	2,734	2,356	94,876	835,628
1600	NORWICH.NORFOLK	S/E	99	101	81	95	112	107	107	86	104	99	108	101	1,107	14,216	36,238	103,066
1600	SANDWICH.KENT	N/W/Mid	88	97	97	85	106	75	85	119	113	117	110	108	1,030	3,958	2,452	2,796
1650	BURY ST EDMUNDS.SUFFOLK	S/E	107	93	102	105	93	100	103	90	107	92	115	93	1,232	4,264	7,655	16,300
1650	CAMBRIDGE.CAMBRIDGESHIRE	S/E	97	133	93	92	83	92	82	93	98	120	108	109	1,055	10,574	10,087	44,509
1650	IPSWICH.SUFFOLK	S/E	85	95	105	91	72	97	100	96	93	133	123	110	1,374	9,774	11,277	57,433
1650	LEICESTER.LEICESTERSHIRE	S/E	130	111	79	114	102	115	93	79	105	92	94	86	1,160	3,014	17,005	174,624
1650	MAIDSTONE.KENT	S/E	104	94	109	94	85	77	86	82	105	114	136	115	1,381	3,703	8,027	32,145
1650	MANCHESTER.LANCASHIRE	N/W/Mid	93	112	120	121	118	107	94	88	80	81	102	84	1,524	2,356	94,876	835,628
1650	NORWICH.NORFOLK	S/E	94	106	103	99	94	101	95	104	102	104	98	100	2,403	14,216	36,238	103,066
1650	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	120	108	116	114	114	96	88	84	93	88	86	94	1,092	4,264	28,801	216,422
1650	SANDWICH.KENT	N/W/Mid	117	93	88	107	86	83	75	80	127	123	103	120	1,171	3,958	2,452	2,796
1650	WYMONDHAM.NORFOLK	N/W/Mid	92	96	95	100	92	105	89	87	100	118	104	123	1,193	2,290	2,046	NA
1700	BEDFORD.BEDFORDSHIRE	N/W/Mid	109	125	93	96	98	113	83	87	87	77	114	120	1,193	2,130	3,948	32,012
1700	BURY ST EDMUNDS.SUFFOLK	N/W/Mid	107	108	109	114	109	92	87	71	85	122	106	91	1,869	4,264	7,655	16,300
1700	CHESHAM.BUCKINGHAMSHIRE	N/W/Mid	102	111	98	109	115	95	100	90	80	109	106	85	1,107	570	1,625	6,075
1700	DARLINGTON.DURHAM	S/E	105	105	124	104	112	103	91	64	74	104	100	112	1,049	1,403	4,527	38,060
1700	GOSPORT.HAMPSHIRE	S/E	111	109	84	113	104	102	117	91	81	93	95	101	1,416	1,100	6,796	NA
1700	LEICESTER.LEICESTERSHIRE	S/E	117	113	112	108	105	110	70	80	85	96	98	106	3,015	3,014	17,005	174,624
1700	MAIDSTONE.KENT	N/W/Mid	98	101	101	108	107	95	74	65	92	111	119	128	1,307	3,703	8,027	32,145
1700	MANCHESTER.LANCASHIRE	S/E	110	104	119	101	104	103	88	98	90	86	95	101	2,170	2,356	94,876	835,628
1700	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	110	115	96	123	103	102	107	80	84	84	96	100	1,462	2,959	7,020	75,075
1700	NORWICH.NORFOLK	S/E	100	117	108	102	100	92	97	91	93	99	93	108	4,171	14,216	36,238	103,066

1700	NOTTINGHAM.NOTTINGHAMSHIRE	N/W/Mid	109	103	109	114	102	96	89	88	79	90	108	113	2,649	4,264	28,801	216,422
1700	PORTSMOUTH.HAMPSHIRE	S/E	102	109	113	107	97	94	82	70	82	107	121	117	1,369	5,007	33,226	184,683
1700	WYMONDHAM.NORFOLK	S/E	112	97	90	117	87	101	94	99	94	113	100	96	1,025	2,290	2,046	NA
1750	BEDFORD.BEDFORDSHIRE	S/E	90	122	115	114	112	99	92	86	92	93	76	109	1,097	2,130	3,948	32,012
1750	BLACKBURN.LANCASHIRE	N/W/Mid	109	113	116	125	113	107	94	77	83	80	91	93	2,905	990	11,980	120,064
1750	BRISTOL.GLOUCESTERSHIRE	N/W/Mid	115	119	109	116	102	107	89	79	80	81	92	110	5,610	13,482	61,153	307,694
1750	BURY ST EDMUNDS.SUFFOLK	S/E	110	124	101	107	122	107	91	88	81	73	88	107	2,403	4,264	7,655	16,300
1750	CAMBRIDGE.CAMBRIDGESHIRE	N/W/Mid	99	110	128	112	113	113	99	73	81	97	96	79	1,558	10,574	10,087	44,509
1750	CANTERBURY.KENT	N/W/Mid	120	121	97	103	119	104	95	86	65	90	100	101	2,664	7,671	9,000	23,026
1750	CHESTER-LE-STREET.DURHAM	S/E	96	121	113	115	119	123	111	79	75	76	89	85	1,343	NA	NA	8,623
1750	DARLINGTON.DURHAM	N/W/Mid	106	126	121	104	112	115	85	79	83	88	77	104	1,736	1,403	4,527	38,060
1750	DURHAM.DURHAM	S/E	105	121	109	108	114	111	106	92	91	76	86	82	2,060	2,223	5,416	14,863
1750	ECCLES.LANCASHIRE	S/E	105	93	126	121	121	110	111	91	89	72	74	86	1,261	NA	NA	29,606
1750	ELY.CAMBRIDGESHIRE	S/E	117	103	117	101	109	115	86	75	81	90	97	107	1,358	3,026	3,013	8,017
1750	GATESHEAD.DURHAM	S/E	96	121	102	110	117	100	101	86	84	81	96	106	1,263	2,983	8,597	NA
1750	GOSPORT.HAMPSHIRE	N/W/Mid	110	111	108	108	91	94	84	93	93	108	101	98	1,586	1,100	6,796	NA
1750	GREAT MARLOW.BUCKINGHAMSHIRE	S/E	95	109	111	97	103	110	111	94	90	93	76	110	1,113	1,800	3,236	4,212
1750	HIGH WYCOMBE.BUCKINGHAMSHIRE	N/W/Mid	105	106	96	119	98	99	102	88	107	69	91	121	1,080	1,000	1,899	13,435
1750	IPSWICH.SUFFOLK	S/E	109	110	104	110	108	101	106	86	88	84	88	105	2,517	9,774	11,277	57,433
1750	LEICESTER.LEICESTERSHIRE	S/E	112	116	123	108	119	100	97	79	83	87	79	96	4,933	3,014	17,005	174,624
1750	LOWESTOFT.SUFFOLK	N/W/Mid	96	115	115	113	103	101	96	86	85	105	92	92	1,143	920	2,263	23,347
1750	MAIDSTONE.KENT	S/E	92	109	117	96	116	104	89	82	78	87	105	125	1,699	3,703	8,027	32,145
1750	MANCHESTER.LANCASHIRE	S/E	109	131	116	118	114	97	98	83	81	83	82	90	7,223	2,356	94,876	835,628
1750	MANSFIELD.NOTTINGHAMSHIRE	S/E	110	108	105	115	129	97	108	90	72	86	84	96	1,791	1,290	5,641	15,925
1750	MARGATE.KENT	S/E	112	108	101	104	97	84	99	75	93	107	108	111	1,683	1,170	4,298	20,504
1750	NORWICH.NORFOLK	N/W/Mid	110	122	116	113	110	104	98	88	78	80	86	95	15,285	14,216	36,238	103,066
1750	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	102	119	108	104	118	100	93	91	84	88	93	99	3,958	4,264	28,801	216,422
1750	PORTSMOUTH.HAMPSHIRE	N/W/Mid	121	120	117	84	97	93	95	86	77	100	109	101	1,465	5,007	33,226	184,683
1750	RAMSGATE.KENT	S/E	113	108	104	100	108	102	84	84	74	100	113	110	1,762	700	3,110	24,733
1750	SANDWICH.KENT	S/E	101	114	127	107	102	96	91	78	92	102	88	102	1,157	3,958	2,452	2,796

1750	SHREWSBURY.SHROPSHIRE	S/E	110	128	110	99	118	105	93	92	76	92	89	88	1,816	6,867	14,739	26,967
1750	SOUTH SHIELDS.DURHAM	N/W/Mid	107	104	113	116	112	106	98	94	94	88	77	90	1,447	NA	11,011	73,391
1750	STOCKTON.DURHAM	N/W/Mid	117	117	114	123	120	116	88	77	81	81	75	93	1,192	1,198	3,866	65,368
1750	SUDBURY.SUFFOLK	S/E	98	120	110	116	119	89	90	87	85	81	105	100	1,288	1,750	3,813	7,059
1750	SUNDERLAND.DURHAM	N/W/Mid	94	103	125	126	120	117	103	92	74	80	69	97	1,695	1,147	24,998	144,649
1750	WELLS NEXT THE SEA.NORFOLK	S/E	99	104	124	103	103	120	89	96	72	93	99	96	1,301	1,400	2,290	2,555
1750	WOODBRIDGE.SUFFOLK	S/E	96	98	123	107	133	106	110	82	86	70	83	105	1,029	1,380	3,020	4,480
1750	WYMONDHAM.NORFOLK	N/W/Mid	94	105	93	102	114	124	121	93	100	81	84	90	1,242	2,290	2,046	NA
1800	ACCRINGTON.LANCASHIRE	N/W/Mid	116	109	106	119	98	118	109	84	85	82	91	84	1,324	NA	5,787	57,769
1800	ALFRETON.DERBYSHIRE	N/W/Mid	105	112	110	105	112	116	103	88	89	96	79	84	1,255	710	815	15,355
1800	ASHTON IN MAKERFIELD.LANCASHIRE	S/E	110	123	118	107	116	97	98	90	86	84	86	84	2,366	NA	3,696	13,379
1800	AYLESBURY.BUCKINGHAMSHIRE	N/W/Mid	106	120	116	128	103	98	94	101	79	83	89	82	2,094	1,400	3,186	8,922
1800	AYLSHAM.NORFOLK	N/W/Mid	102	116	103	122	118	89	92	84	80	87	97	110	1,120	860	1,328	NA
1800	BEDFORD.BEDFORDSHIRE	N/W/Mid	108	127	129	117	101	93	85	81	78	89	88	104	3,642	2,130	3,948	32,012
1800	BLACKBURN.LANCASHIRE	S/E	105	122	118	112	113	107	98	86	84	83	83	88	12,826	990	11,980	120,064
1800	BRISTOL.GLOUCESTERSHIRE	S/E	105	111	127	128	105	94	93	78	81	90	91	97	3,886	13,482	61,153	307,694
1800	BROADSTAIRS.KENT	S/E	102	132	126	90	106	87	77	90	95	100	93	103	1,261	NA	NA	5,266
1800	BURNLEY.LANCASHIRE	N/W/Mid	101	112	127	118	116	109	103	89	79	82	77	88	5,711	350	3,918	87,058
1800	BURY ST EDMUNDS.SUFFOLK	S/E	111	123	118	115	113	96	95	79	72	84	87	105	5,893	4,264	7,655	16,300
1800	CAMBRIDGE.CAMBRIDGESHIRE	S/E	106	117	116	118	108	100	99	86	81	78	95	97	7,839	10,574	10,087	44,509
1800	CANTERBURY.KENT	S/E	100	126	123	116	110	96	91	84	76	82	95	101	9,777	7,671	9,000	23,026
1800	CHATTERIS.CAMBRIDGESHIRE	S/E	99	112	121	99	87	115	81	98	86	101	94	107	1,633	920	2,393	4,587
1800	CHESHAM.BUCKINGHAMSHIRE	S/E	112	115	119	125	124	106	92	86	78	67	74	100	1,917	570	1,625	6,075
1800	CHESTER-LE-STREET.DURHAM	S/E	103	99	113	108	113	98	106	96	92	98	89	85	5,014	NA	NA	8,623
1800	COLNE.LANCASHIRE	N/W/Mid	102	121	125	122	128	112	98	85	78	74	79	77	4,550	830	2,681	16,774
1800	DARLINGTON.DURHAM	N/W/Mid	107	112	106	113	103	120	97	86	88	89	89	90	4,592	1,403	4,527	38,060
1800	DEAL.KENT	S/E	110	113	125	102	116	95	91	85	88	96	90	88	1,300	1,940	5,420	13,363
1800	DOVER.KENT	S/E	106	121	112	109	114	98	90	88	89	90	87	96	4,961	4,299	8,028	33,503
1800	DURHAM.DURHAM	S/E	95	110	107	105	111	110	109	100	91	87	88	87	7,139	2,223	5,416	14,863
1800	ECCLES.LANCASHIRE	N/W/Mid	115	110	112	104	120	110	92	90	81	85	100	83	3,350	NA	NA	29,606

1800	ELY.CAMBRIDGESHIRE	N/W/Mid	99	109	118	113	120	101	96	83	92	95	79	95	3,128	3,026	3,013	8,017
1800	EXETER.DEVONSHIRE	S/E	107	120	122	104	95	91	81	85	117	92	86	99	9,045	10,307	17,412	52,484
1800	GATESHEAD.DURHAM	S/E	107	125	102	106	115	101	90	88	90	96	91	89	6,489	2,983	8,597	NA
1800	GOSPORT.HAMPSHIRE	S/E	101	130	116	106	98	99	90	92	88	87	89	103	4,462	1,100	6,796	NA
1800	GOUDHURST.KENT	S/E	100	114	120	112	120	100	93	82	84	99	90	84	1,186	1,160	1,782	NA
1800	GREAT MARLOW.BUCKINGHAMSHIRE	S/E	107	129	114	116	98	113	81	79	95	91	96	81	2,185	1,800	3,236	4,212
1800	GREAT YARMOUTH.NORFOLK	N/W/Mid	105	117	113	109	103	98	91	87	89	94	94	101	10,437	9,248	16,573	49,334
1800	HIGH WYCOMBE.BUCKINGHAMSHIRE	S/E	106	117	125	112	107	106	93	80	87	93	88	84	2,576	1,000	1,899	13,435
1800	HOUGHTON-LE-SPRING.DURHAM	S/E	100	129	112	105	100	109	103	91	80	88	84	98	3,568	NA	NA	6,476
1800	IPSWICH.SUFFOLK	N/W/Mid	109	115	121	118	104	97	94	84	87	86	88	99	10,625	9,774	11,277	57,433
1800	KENDAL.WESTMORELAND	N/W/Mid	99	118	131	118	127	119	90	85	72	76	75	90	4,249	5,730	8,015	14,430
1800	KINGS LYNN.NORFOLK	S/E	104	124	119	97	102	102	100	87	96	88	83	98	2,107	5,007	10,096	18,360
1800	KIRKBY LONSDALE.WESTMORELAND	S/E	99	127	145	106	117	120	94	79	81	75	78	78	1,068	1,870	1,283	NA
1800	LEICESTER.LEICESTERSHIRE	S/E	96	113	114	122	116	102	84	84	95	88	76	109	2,064	3,014	17,005	174,624
1800	LOUGHBOROUGH.LEICESTERSHIRE	S/E	106	117	116	104	99	115	91	78	84	97	92	100	2,678	1,500	4,420	18,196
1800	LOWESTOFT.SUFFOLK	S/E	124	124	117	99	109	94	85	90	84	92	84	99	1,562	920	2,263	23,347
1800	LUTON.BEDFORDSHIRE	S/E	99	119	112	102	115	103	90	90	77	92	87	115	2,293	1,150	1,950	30,006
1800	MAIDSTONE.KENT	S/E	97	122	119	112	109	101	85	84	82	92	94	104	4,871	3,703	8,027	32,145
1800	MANCHESTER.LANCASHIRE	S/E	103	130	119	103	101	98	91	84	99	94	86	92	28,257	2,356	94,876	835,628
1800	MANSFIELD.NOTTINGHAMSHIRE	N/W/Mid	106	131	114	120	111	100	97	83	80	80	87	92	4,223	1,290	5,641	15,925
1800	MARCH.CAMBRIDGESHIRE	N/W/Mid	82	110	98	104	117	100	95	95	104	101	105	90	2,184	1,340	1,680	6,988
1800	MARGATE.KENT	S/E	85	110	108	84	84	94	94	101	118	127	103	91	3,830	1,170	4,298	20,504
1800	MELTON MOWBRAY.LEICESTERSHIRE	N/W/Mid	98	115	108	131	119	95	106	95	66	72	90	106	1,045	1,450	1,749	6,392
1800	MORPETH.NORTHUMBERLAND	N/W/Mid	104	132	111	112	98	99	109	76	88	98	80	93	1,558	770	2,947	5,219
1800	NEWARK.NOTTINGHAMSHIRE	N/W/Mid	105	121	116	109	105	99	83	89	89	89	94	100	3,937	NA	6,730	14,457
1800	NEWCASTLE UPON TYNE.NORTHUMBERLAND	N/W/Mid	114	126	100	99	104	103	87	89	110	94	87	88	5,192	11,617	33,048	318,042
1800	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	108	121	111	106	114	102	87	85	87	91	91	96	5,244	2,959	7,020	75,075
1800	NORWICH.NORFOLK	N/W/Mid	108	124	124	115	113	104	89	82	78	83	89	91	21,306	14,216	36,238	103,066
1800	NOTTINGHAM.NOTTINGHAMSHIRE	N/W/Mid	106	118	114	105	98	92	91	85	89	99	99	102	18,472	4,264	28,801	216,422

1800	OSWESTRY.SHROPSHIRE	S/E	109	116	114	108	122	93	94	90	80	86	92	96	1,586	940	2,672	8,496
1800	PLYMOUTH.DEVONSHIRE	N/W/Mid	99	119	117	106	106	89	85	99	123	86	82	88	10,745	4,000	16,040	164,012
1800	PORTSMOUTH.HAMPSHIRE	S/E	105	132	121	108	97	97	78	73	96	97	92	105	3,730	5,007	33,226	184,683
1800	RAMSGATE.KENT	N/W/Mid	93	113	136	113	104	93	83	81	87	87	98	111	2,678	700	3,110	24,733
1800	SANDWICH.KENT	S/E	104	138	106	125	110	84	84	81	89	85	103	90	1,620	3,958	2,452	2,796
1800	SHREWSBURY.SHROPSHIRE	N/W/Mid	101	120	118	118	115	106	97	87	84	83	78	94	7,383	6,867	14,739	26,967
1800	SOHAM.CAMBRIDGESHIRE	S/E	106	108	116	108	112	110	88	85	88	77	103	101	1,599	1,400	1,174	NA
1800	SOUTH SHIELDS.DURHAM	S/E	103	115	111	114	109	100	90	82	89	95	94	97	10,468	NA	11,011	73,391
1800	STOCKTON.DURHAM	S/E	96	111	104	112	105	93	97	93	119	87	86	98	3,334	1,198	3,866	65,368
1800	SUDBURY.SUFFOLK	S/E	101	119	128	99	111	106	97	88	77	75	100	97	2,533	1,750	3,813	7,059
1800	SUNDERLAND.DURHAM	N/W/Mid	115	118	106	117	110	104	88	83	79	89	93	99	11,575	1,147	24,998	144,649
1800	SUTTON IN ASHFIELD.NOTTINGHAMSHIRE	S/E	94	96	133	112	134	116	116	103	81	73	59	82	1,818	NA	2,801	10,562
1800	TIVERTON.DEVONSHIRE	S/E	93	131	134	106	106	95	92	93	86	80	93	91	2,478	2,080	6,505	10,892
1800	TYNEMOUTH.NORTHUMBERLAND	N/W/Mid	100	123	117	105	106	97	90	82	93	92	96	100	7,181	270	13,171	46,588
1800	WALLSEND.NORTHUMBERLAND	N/W/Mid	114	126	111	96	92	92	98	88	102	100	99	83	1,810	NA	3,120	18,965
1800	WELLS NEXT THE SEA.NORFOLK	N/W/Mid	112	118	109	119	110	91	96	83	85	97	82	97	1,479	1,400	2,290	2,555
1800	WHICKHAM.DURHAM	N/W/Mid	99	119	112	114	103	108	97	88	90	89	84	96	2,987	NA	NA	9,343
1800	WHITTLESEY.CAMBRIDGESHIRE	N/W/Mid	89	111	114	104	103	98	111	105	80	95	87	104	2,523	1,980	2,734	3,556
1800	WISBECH.CAMBRIDGESHIRE	N/W/Mid	115	108	106	109	96	99	92	87	94	100	94	100	3,727	2,320	4,710	9,395
1800	WOODBRIDGE.SUFFOLK	N/W/Mid	115	126	115	109	116	102	93	79	69	85	88	103	2,397	1,380	3,020	4,480
1800	WORKSOP.NOTTINGHAMSHIRE	S/E	98	106	115	101	105	104	103	87	88	97	99	96	2,360	810	2,740	12,734
1800	WYMONDHAM.NORFOLK	N/W/Mid	102	116	115	107	104	112	105	93	86	81	88	90	1,759	2,290	2,046	NA
1850	ACCRINGTON.LANCASHIRE	N/W/Mid	113	138	109	114	94	103	80	88	82	90	92	97	2,271	NA	5,787	57,769
1850	ALFRETON.DERBYSHIRE	N/W/Mid	102	125	111	115	96	95	99	88	79	93	103	96	1,168	710	815	15,355
1850	ASHTON IN MAKERFIELD.LANCASHIRE	S/E	109	128	113	109	106	105	105	85	80	86	84	90	4,505	NA	3,696	13,379
1850	AYLESBURY.BUCKINGHAMSHIRE	S/E	116	132	123	117	123	93	75	82	71	83	95	89	1,306	1,400	3,186	8,922
1850	AYLSHAM.NORFOLK	N/W/Mid	108	110	100	120	116	95	100	82	77	94	101	98	1,061	860	1,328	NA
1850	BLACKBURN.LANCASHIRE	S/E	107	134	125	119	113	104	88	89	81	73	77	91	6,180	990	11,980	120,064
1850	BROADSTAIRS.KENT	N/W/Mid	112	118	99	128	104	90	86	88	98	94	86	97	2,300	NA	NA	5,266
1850	BURNLEY.LANCASHIRE	S/E	95	115	114	123	119	113	103	80	91	88	73	86	2,083	350	3,918	87,058

1850	BURY ST EDMUNDS.SUFFOLK	S/E	104	116	106	115	103	96	105	87	83	89	92	103	4,994	4,264	7,655	16,300
1850	CAMBRIDGE.CAMBRIDGESHIRE	N/W/Mid	112	120	119	116	110	104	94	80	82	83	84	96	15,745	10,574	10,087	44,509
1850	CANTERBURY.KENT	S/E	101	117	128	111	109	92	93	80	91	90	89	99	2,529	7,671	9,000	23,026
1850	CHATTERIS.CAMBRIDGESHIRE	S/E	100	109	114	129	120	98	98	85	81	100	75	92	1,034	920	2,393	4,587
1850	CHESTER-LE-STREET.DURHAM	N/W/Mid	94	110	97	108	103	103	112	106	84	101	85	96	1,883	NA	NA	8,623
1850	COLNE.LANCASHIRE	S/E	106	125	108	132	118	98	85	84	89	74	88	94	1,885	830	2,681	16,774
1850	DARLINGTON.DURHAM	N/W/Mid	103	106	103	112	112	95	92	88	91	99	96	102	3,562	1,403	4,527	38,060
1850	DEAL.KENT	S/E	107	117	123	113	109	98	91	83	93	87	88	92	4,669	1,940	5,420	13,363
1850	DOVER.KENT	N/W/Mid	105	119	111	119	106	101	85	83	84	89	97	101	8,502	4,299	8,028	33,503
1850	DURHAM.DURHAM	N/W/Mid	126	120	103	107	103	94	98	90	90	81	86	103	1,376	2,223	5,416	14,863
1850	ELY.CAMBRIDGESHIRE	N/W/Mid	108	138	119	108	106	98	97	87	81	85	83	91	2,691	3,026	3,013	8,017
1850	GATESHEAD.DURHAM	N/W/Mid	111	107	100	105	96	104	93	91	97	95	90	111	3,672	2,983	8,597	NA
1850	GOUDHURST.KENT	S/E	112	117	107	111	123	104	85	80	82	84	90	105	1,030	1,160	1,782	NA
1850	HOUGHTON-LE-SPRING.DURHAM	N/W/Mid	102	86	122	106	104	122	103	95	75	70	116	98	1,003	NA	NA	6,476
1850	IPSWICH.SUFFOLK	S/E	100	113	116	111	102	97	96	89	81	95	93	106	8,964	9,774	11,277	57,433
1850	KINGS LYNN.NORFOLK	S/E	122	124	128	120	89	96	88	82	81	84	78	107	2,605	5,007	10,096	18,360
1850	LOUGHBOROUGH.LEICESTERSHIRE	S/E	120	125	126	112	103	96	86	80	76	82	88	107	8,455	1,500	4,420	18,196
1850	LOWESTOFT.SUFFOLK	S/E	96	112	105	91	100	93	95	90	75	122	106	115	1,454	920	2,263	23,347
1850	MAIDSTONE.KENT	N/W/Mid	108	110	120	120	107	110	92	101	81	77	96	79	1,062	3,703	8,027	32,145
1850	MANCHESTER.LANCASHIRE	S/E	121	145	128	111	104	98	86	74	67	73	86	107	3,824	2,356	94,876	835,628
1850	MARCH.CAMBRIDGESHIRE	S/E	100	117	124	115	104	102	92	87	75	89	87	107	1,145	1,340	1,680	6,988
1850	MARGATE.KENT	N/W/Mid	102	100	111	101	99	101	96	99	97	102	102	90	5,933	1,170	4,298	20,504
1850	MELTON MOWBRAY.LEICESTERSHIRE	N/W/Mid	118	122	111	90	124	104	86	83	81	100	82	100	1,574	1,450	1,749	6,392
1850	NEWARK.NOTTINGHAMSHIRE	S/E	105	128	102	100	126	104	97	81	85	84	84	102	1,715	NA	6,730	14,457
1850	NORTHAMPTON.NORTHAMPTONSHIRE	N/W/Mid	113	120	116	109	110	98	95	77	82	85	94	102	2,821	2,959	7,020	75,075
1850	NORWICH.NORFOLK	N/W/Mid	114	120	120	106	104	88	93	80	86	92	95	102	13,666	14,216	36,238	103,066
1850	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	116	124	108	115	106	97	89	85	82	83	90	105	7,101	4,264	28,801	216,422
1850	OAKHAM.RUTLANDSHIRE	S/E	118	108	125	97	115	119	117	76	80	72	77	98	1,070	1,040	1,535	3,327
1850	OSWESTRY.SHROPSHIRE	N/W/Mid	118	115	118	116	114	106	91	87	83	81	84	86	3,406	940	2,672	8,496
1850	RAMSGATE.KENT	S/E	92	115	116	105	112	97	96	86	97	100	90	94	2,517	700	3,110	24,733

1850	SANDWICH.KENT	S/E	89	125	116	119	116	91	94	81	83	93	98	95	1,112	3,958	2,452	2,796
1850	SOHAM.CAMBRIDGESHIRE	N/W/Mid	91	101	123	120	120	116	93	90	86	73	90	97	1,602	1,400	1,174	NA
1850	SOUTH SHIELDS.DURHAM	S/E	102	127	117	122	98	103	89	83	77	88	96	100	2,824	NA	11,011	73,391
1850	STOCKTON.DURHAM	N/W/Mid	115	118	108	105	99	98	97	106	90	89	85	89	3,478	1,198	3,866	65,368
1850	SUDBURY.SUFFOLK	N/W/Mid	96	123	118	129	96	106	104	87	72	95	89	84	1,421	1,750	3,813	7,059
1850	SUNDERLAND.DURHAM	N/W/Mid	115	111	107	109	102	96	90	86	92	96	95	101	8,742	1,147	24,998	144,649
1850	SUTTON IN ASHFIELD.NOTTINGHAMSHIRE	S/E	102	103	109	107	103	112	103	99	81	84	91	106	1,518	NA	2,801	10,562
1850	WALLSEND.NORTHUMBERLAND	S/E	110	101	106	101	90	113	92	90	96	106	107	88	1,238	NA	3,120	18,965
1850	WELLS NEXT THE SEA.NORFOLK	N/W/Mid	99	118	110	106	112	104	101	76	88	81	94	111	1,671	1,400	2,290	2,555
1850	WHICKHAM.DURHAM	S/E	116	96	104	92	101	108	96	118	95	92	85	97	1,313	NA	NA	9,343
1850	WHITTLESEY.CAMBRIDGESHIRE	S/E	114	129	107	104	105	98	93	77	88	88	100	98	1,635	1,980	2,734	3,556
1850	WORKSOP.NOTTINGHAMSHIRE	N/W/Mid	108	116	109	117	106	116	92	87	78	94	83	94	1,649	810	2,740	12,734
1850	WYMONDHAM.NORFOLK	N/W/Mid	107	111	119	109	116	111	94	86	93	86	80	89	1,374	2,290	2,046	NA

Source: FHS burials dataset; population estimates for 17th century Langton; population estimates for 1801 from Langton or Law and Robson where no Langton estimate available; population estimates for 1891 from Law and Robson.

Table 24b: Child burial seasonality for individual towns in 50 year periods 1550-1899, indexed to 100, with Langton/Law & Robson population estimates

Period begins	TOWN.COUNTY	Region	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	n burs	C17th pop	1801 pop	1891 pop
1550	BURY ST EDMUNDS.SUFFOLK	N/W/Mid	84	87	96	87	104	84	77	113	122	134	110	102	1,241	4,264	7,655	16,300
1550	IPSWICH.SUFFOLK	N/W/Mid	92	109	84	90	86	92	92	92	119	121	105	118	1,063	9,774	11,277	57,433
1550	KENDAL.WESTMORELAND	S/E	90	96	108	111	103	125	103	102	92	97	92	83	1,258	5,730	8,015	14,430
1550	MANCHESTER.LANCASHIRE	S/E	105	105	116	105	111	104	77	80	102	98	97	100	3,014	2,356	94,876	835,628
1550	SANDWICH.KENT	S/E	98	78	82	90	76	83	113	100	99	133	146	102	1,060	3,958	2,452	2,796
1600	BEDFORD.BEDFORDSHIRE	N/W/Mid	109	95	115	89	69	93	107	106	121	109	109	81	1,171	2,130	3,948	32,012
1600	BLACKBURN.LANCASHIRE	S/E	124	128	131	124	114	120	78	65	67	79	79	91	1,481	990	11,980	120,064
1600	BURY ST EDMUNDS.SUFFOLK	S/E	87	91	91	93	107	96	95	105	115	117	109	92	2,749	4,264	7,655	16,300
1600	CAMBRIDGE.CAMBRIDGESHIRE	S/E	81	89	105	99	104	112	104	112	105	103	98	90	4,350	10,574	10,087	44,509
1600	DOVER.KENT	S/E	75	77	107	87	92	87	98	92	108	111	118	149	1,399	4,299	8,028	33,503
1600	GATESHEAD.DURHAM	S/E	109	88	92	97	108	90	96	88	103	117	119	93	1,126	2,983	8,597	NA
1600	GOUDHURST.KENT	S/E	91	93	122	107	114	99	98	96	97	87	98	100	1,155	1,160	1,782	NA
1600	IPSWICH.SUFFOLK	S/E	92	82	96	93	96	103	94	100	114	121	108	101	1,959	9,774	11,277	57,433
1600	LEICESTER.LEICESTERSHIRE	N/W/Mid	78	104	99	104	95	90	99	97	98	106	120	109	1,784	3,014	17,005	174,624
1600	MAIDSTONE.KENT	N/W/Mid	102	93	103	100	107	94	110	94	96	102	109	88	2,382	3,703	8,027	32,145
1600	MANCHESTER.LANCASHIRE	N/W/Mid	92	86	98	99	110	103	103	114	110	100	94	92	7,556	2,356	94,876	835,628
1600	NORWICH.NORFOLK	N/W/Mid	88	86	82	89	86	89	89	94	124	154	118	101	2,860	14,216	36,238	103,066
1600	OSWESTRY.SHROPSHIRE	S/E	110	96	140	100	120	109	95	87	96	72	88	86	1,629	940	2,672	8,496
1600	SANDWICH.KENT	S/E	86	78	83	79	80	80	85	133	159	131	105	101	2,954	3,958	2,452	2,796
1600	SHREWSBURY.SHROPSHIRE	N/W/Mid	96	83	83	106	81	83	112	101	101	107	108	140	1,551	6,867	14,739	26,967
1600	WISBECH.CAMBRIDGESHIRE	S/E	90	121	108	116	102	91	102	82	91	104	92	100	2,458	2,320	4,710	9,395
1650	AYLESBURY.BUCKINGHAMSHIRE	N/W/Mid	91	97	111	119	109	100	92	109	96	93	79	102	1,057	1,400	3,186	8,922
1650	BEDFORD.BEDFORDSHIRE	S/E	78	90	104	125	102	129	101	98	97	84	102	89	1,313	2,130	3,948	32,012
1650	BLACKBURN.LANCASHIRE	S/E	87	90	111	109	122	130	119	104	82	79	84	85	2,022	990	11,980	120,064
1650	BURY ST EDMUNDS.SUFFOLK	S/E	85	97	116	101	104	101	107	106	109	91	94	88	3,473	4,264	7,655	16,300
1650	CAMBRIDGE.CAMBRIDGESHIRE	N/W/Mid	88	102	93	100	92	95	98	110	129	111	91	91	4,024	10,574	10,087	44,509

1650	DOVER.KENT	S/E	94	66	53	62	75	76	104	120	149	178	146	78	1,071	4,299	8,028	33,503
1650	DURHAM.DURHAM	S/E	98	71	101	113	116	109	115	100	83	100	100	94	1,035	2,223	5,416	14,863
1650	GATESHEAD.DURHAM	N/W/Mid	103	96	119	126	97	110	75	80	96	92	113	94	1,057	2,983	8,597	NA
1650	GOSPORT.HAMPSHIRE	S/E	102	105	125	114	122	105	91	97	96	90	84	70	1,441	1,100	6,796	NA
1650	GREAT MARLOW.BUCKINGHAMSHIRE	S/E	112	99	95	119	120	105	96	89	87	88	104	86	1,259	1,800	3,236	4,212
1650	IPSWICH.SUFFOLK	N/W/Mid	81	88	89	104	108	100	103	97	112	115	111	95	3,074	9,774	11,277	57,433
1650	LEICESTER.LEICESTERSHIRE	S/E	92	94	106	119	113	106	89	97	103	113	89	80	2,390	3,014	17,005	174,624
1650	LUTON.BEDFORDSHIRE	N/W/Mid	114	98	101	122	118	115	99	84	79	85	100	87	1,026	1,150	1,950	30,006
1650	MAIDSTONE.KENT	N/W/Mid	101	89	93	87	97	89	101	93	110	119	125	97	3,247	3,703	8,027	32,145
1650	MANCHESTER.LANCASHIRE	S/E	93	96	112	129	126	117	101	93	88	74	83	87	5,849	2,356	94,876	835,628
1650	MARCH.CAMBRIDGESHIRE	N/W/Mid	83	105	112	108	98	90	87	84	91	122	123	96	1,354	1,340	1,680	6,988
1650	MARGATE.KENT	S/E	112	94	70	96	75	96	64	97	140	127	119	110	1,086	1,170	4,298	20,504
1650	NEWARK.NOTTINGHAMSHIRE	S/E	92	105	117	107	95	101	97	105	92	100	95	93	1,697	NA	6,730	14,457
1650	NORWICH.NORFOLK	S/E	70	86	93	98	90	101	106	133	148	107	89	80	7,193	14,216	36,238	103,066
1650	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	99	98	111	112	109	98	99	96	103	100	82	93	2,848	4,264	28,801	216,422
1650	OSWESTRY.SHROPSHIRE	S/E	107	102	92	120	122	123	115	84	102	72	75	85	2,363	940	2,672	8,496
1650	PORTSMOUTH.HAMPSHIRE	S/E	78	87	101	85	103	117	96	101	150	105	93	82	2,185	5,007	33,226	184,683
1650	SANDWICH.KENT	S/E	89	90	75	90	79	77	70	90	172	138	138	92	2,663	3,958	2,452	2,796
1650	SHREWSBURY.SHROPSHIRE	S/E	91	96	79	109	105	121	108	94	93	95	105	104	3,294	6,867	14,739	26,967
1650	SOHAM.CAMBRIDGESHIRE	S/E	101	94	85	92	98	98	110	83	102	117	121	100	1,099	1,400	1,174	NA
1650	WELLS NEXT THE SEA.NORFOLK	S/E	95	107	98	86	114	109	126	87	93	109	89	88	1,081	1,400	2,290	2,555
1650	WHICKHAM.DURHAM	N/W/Mid	90	95	109	116	111	126	81	79	87	86	85	135	1,640	NA	NA	9,343
1650	WISBECH.CAMBRIDGESHIRE	N/W/Mid	95	104	105	96	107	101	88	101	116	101	94	92	3,598	2,320	4,710	9,395
1650	WOODBRIDGE.SUFFOLK	S/E	89	73	109	91	107	80	85	132	136	111	101	86	1,116	1,380	3,020	4,480
1650	WYMONDHAM.NORFOLK	S/E	97	107	116	110	88	112	94	108	103	99	76	89	1,644	2,290	2,046	NA
1700	AYLESBURY.BUCKINGHAMSHIRE	N/W/Mid	86	88	78	117	113	107	97	112	115	94	98	96	1,535	1,400	3,186	8,922
1700	BEDFORD.BEDFORDSHIRE	N/W/Mid	116	116	113	99	96	96	78	80	87	96	111	112	2,182	2,130	3,948	32,012
1700	BLACKBURN.LANCASHIRE	N/W/Mid	88	110	126	138	122	118	100	107	86	71	62	71	3,128	990	11,980	120,064
1700	BURNLEY.LANCASHIRE	S/E	81	114	122	115	138	121	93	90	80	92	81	75	1,326	350	3,918	87,058
1700	BURY ST EDMUNDS.SUFFOLK	S/E	97	104	94	108	103	101	102	90	98	110	101	90	4,454	4,264	7,655	16,300

1700	CAMBRIDGE.CAMBRIDGESHIRE	S/E	108	104	111	111	108	102	91	93	98	103	84	87	3,848	10,574	10,087	44,509
1700	CHESHAM.BUCKINGHAMSHIRE	S/E	89	105	101	106	106	93	94	100	93	122	102	89	1,612	570	1,625	6,075
1700	CHESTER-LE-STREET.DURHAM	S/E	100	113	134	124	112	111	82	68	87	108	91	70	1,816	NA	NA	8,623
1700	COLNE.LANCASHIRE	S/E	97	95	107	110	108	115	107	83	86	74	102	116	1,058	830	2,681	16,774
1700	DARLINGTON.DURHAM	S/E	92	89	98	106	102	102	97	88	108	105	109	104	1,939	1,403	4,527	38,060
1700	DOVER.KENT	N/W/Mid	95	87	83	89	85	105	110	97	128	126	98	99	1,996	4,299	8,028	33,503
1700	DURHAM.DURHAM	N/W/Mid	110	106	127	115	108	109	105	75	83	86	81	97	1,006	2,223	5,416	14,863
1700	ELY.CAMBRIDGESHIRE	N/W/Mid	103	104	110	87	113	93	100	86	111	107	98	88	1,302	3,026	3,013	8,017
1700	GOSPORT.HAMPSHIRE	N/W/Mid	97	92	104	106	100	103	93	93	115	95	113	90	3,593	1,100	6,796	NA
1700	GREAT MARLOW.BUCKINGHAMSHIRE	S/E	93	89	111	119	119	87	83	87	101	111	102	98	1,436	1,800	3,236	4,212
1700	HIGH WYCOMBE.BUCKINGHAMSHIRE	S/E	104	122	106	97	113	96	100	99	90	97	95	82	1,589	1,000	1,899	13,435
1700	IPSWICH.SUFFOLK	S/E	88	108	90	111	95	98	93	93	119	109	101	94	3,320	9,774	11,277	57,433
1700	LEICESTER.LEICESTERSHIRE	S/E	95	102	103	111	107	108	91	88	99	98	101	97	5,722	3,014	17,005	174,624
1700	LOWESTOFT.SUFFOLK	N/W/Mid	112	108	94	81	78	82	75	103	124	125	113	104	1,292	920	2,263	23,347
1700	LUTON.BEDFORDSHIRE	N/W/Mid	101	109	111	113	123	87	83	91	98	97	93	94	1,472	1,150	1,950	30,006
1700	MANCHESTER.LANCASHIRE	S/E	88	111	119	119	116	108	108	92	78	79	81	100	10,419	2,356	94,876	835,628
1700	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	100	100	106	114	102	89	115	86	102	96	101	89	3,502	2,959	7,020	75,075
1700	NORWICH.NORFOLK	S/E	89	90	91	101	101	105	101	112	120	104	96	90	11,016	14,216	36,238	103,066
1700	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	104	103	106	108	102	96	99	103	102	92	95	90	7,866	4,264	28,801	216,422
1700	OSWESTRY.SHROPSHIRE	S/E	90	95	118	130	125	121	90	84	80	87	91	90	2,301	940	2,672	8,496
1700	PORTSMOUTH.HAMPSHIRE	S/E	84	94	102	119	94	91	87	91	122	125	100	91	3,761	5,007	33,226	184,683
1700	RAMSGATE.KENT	N/W/Mid	78	77	82	77	92	100	92	103	135	140	106	117	1,189	700	3,110	24,733
1700	SANDWICH.KENT	S/E	81	80	90	92	105	98	105	92	123	131	112	93	1,775	3,958	2,452	2,796
1700	SHREWSBURY.SHROPSHIRE	S/E	104	87	102	99	101	99	85	90	108	102	124	98	3,128	6,867	14,739	26,967
1700	SUDBURY.SUFFOLK	S/E	104	101	94	102	100	104	96	76	96	125	107	97	2,168	1,750	3,813	7,059
1700	WELLS NEXT THE SEA.NORFOLK	S/E	79	100	89	104	108	108	118	106	110	99	95	84	1,321	1,400	2,290	2,555
1700	WHICKHAM.DURHAM	S/E	105	98	108	115	104	100	99	89	93	91	92	105	3,266	NA	NA	9,343
1700	WISBECH.CAMBRIDGESHIRE	N/W/Mid	90	99	109	110	96	97	96	84	104	121	104	89	4,639	2,320	4,710	9,395
1700	WOODBRIDGE.SUFFOLK	N/W/Mid	100	94	105	98	108	107	76	106	116	103	97	91	1,121	1,380	3,020	4,480
1700	WYMONDHAM.NORFOLK	N/W/Mid	98	105	92	104	103	83	86	100	108	108	115	97	2,208	2,290	2,046	NA

1750	ASHTON IN MAKERFIELD.LANCASHIRE	S/E	118	117	109	106	96	115	104	80	80	81	87	108	1,413	NA	3,696	13,379
1750	AYLESBURY.BUCKINGHAMSHIRE	N/W/Mid	84	94	101	112	118	113	93	98	99	96	98	95	1,377	1,400	3,186	8,922
1750	BEDFORD.BEDFORDSHIRE	S/E	83	105	116	120	140	105	108	94	83	79	82	86	1,917	2,130	3,948	32,012
1750	BLACKBURN.LANCASHIRE	N/W/Mid	97	101	103	124	122	102	105	95	80	83	92	96	6,896	990	11,980	120,064
1750	BRISTOL.GLOUCESTERSHIRE	N/W/Mid	100	109	102	104	104	95	97	88	101	101	104	94	11,495	13,482	61,153	307,694
1750	BURNLEY.LANCASHIRE	N/W/Mid	105	113	123	134	117	106	98	85	66	76	88	89	2,982	350	3,918	87,058
1750	BURY ST EDMUNDS.SUFFOLK	S/E	99	108	100	113	105	104	94	95	94	99	100	90	3,481	4,264	7,655	16,300
1750	CAMBRIDGE.CAMBRIDGESHIRE	N/W/Mid	106	100	95	104	103	98	95	95	106	114	91	92	3,984	10,574	10,087	44,509
1750	CANTERBURY.KENT	S/E	93	78	96	101	100	99	85	92	93	127	145	93	2,297	7,671	9,000	23,026
1750	CHATTERIS.CAMBRIDGESHIRE	N/W/Mid	77	76	97	92	123	94	106	121	119	114	98	83	1,055	920	2,393	4,587
1750	CHESHAM.BUCKINGHAMSHIRE	S/E	109	98	93	104	113	98	112	105	84	90	99	96	1,145	570	1,625	6,075
1750	CHESTER-LE-STREET.DURHAM	N/W/Mid	87	120	132	132	125	109	103	89	70	72	82	79	4,068	NA	NA	8,623
1750	COLNE.LANCASHIRE	S/E	94	113	116	108	128	107	82	91	92	64	103	101	2,216	830	2,681	16,774
1750	DARLINGTON.DURHAM	N/W/Mid	91	99	109	102	110	115	111	100	90	97	88	88	2,765	1,403	4,527	38,060
1750	DOVER.KENT	N/W/Mid	91	96	94	111	101	105	99	80	105	116	100	103	2,494	4,299	8,028	33,503
1750	DURHAM.DURHAM	N/W/Mid	106	115	118	109	122	107	108	80	80	81	81	92	3,107	2,223	5,416	14,863
1750	ECCLES.LANCASHIRE	S/E	103	112	111	108	106	102	97	95	88	91	94	92	6,533	NA	NA	29,606
1750	ELY.CAMBRIDGESHIRE	N/W/Mid	81	67	97	86	108	104	99	86	114	136	130	92	1,829	3,026	3,013	8,017
1750	GATESHEAD.DURHAM	N/W/Mid	106	104	112	121	98	102	90	96	92	92	92	94	3,519	2,983	8,597	NA
1750	GOSPORT.HAMPSHIRE	S/E	94	84	108	92	101	99	104	100	102	103	104	109	2,873	1,100	6,796	NA
1750	GREAT MARLOW.BUCKINGHAMSHIRE	S/E	96	92	99	101	90	107	113	104	110	106	102	82	1,614	1,800	3,236	4,212
1750	HIGH WYCOMBE.BUCKINGHAMSHIRE	N/W/Mid	81	94	110	96	121	100	124	111	99	85	92	88	1,866	1,000	1,899	13,435
1750	HOUGHTON-LE-SPRING.DURHAM	S/E	106	100	100	118	107	102	97	80	92	97	90	110	1,203	NA	NA	6,476
1750	IPSWICH.SUFFOLK	N/W/Mid	88	94	90	98	96	106	86	102	124	117	109	88	4,090	9,774	11,277	57,433
1750	KINGS LYNN.NORFOLK	S/E	105	88	86	106	92	111	80	93	86	101	133	120	1,425	5,007	10,096	18,360
1750	LEICESTER.LEICESTERSHIRE	S/E	98	106	114	117	119	111	98	80	77	89	100	92	9,228	3,014	17,005	174,624
1750	LOWESTOFT.SUFFOLK	S/E	78	102	81	102	85	99	113	104	114	112	97	114	1,191	920	2,263	23,347
1750	LUTON.BEDFORDSHIRE	S/E	103	108	95	114	106	103	89	83	96	96	92	115	1,595	1,150	1,950	30,006
1750	MANCHESTER.LANCASHIRE	S/E	116	110	104	104	102	98	87	84	85	97	102	113	34,569	2,356	94,876	835,628
1750	MANSFIELD.NOTTINGHAMSHIRE	S/E	101	103	105	121	109	112	94	89	89	91	89	98	2,575	1,290	5,641	15,925

1750	MARGATE.KENT	N/W/Mid	78	86	87	82	80	113	101	113	126	133	123	77	1,925	1,170	4,298	20,504
1750	NEWARK.NOTTINGHAMSHIRE	S/E	74	85	92	125	109	121	110	97	115	86	90	97	1,571	NA	6,730	14,457
1750	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	125	104	103	117	105	103	78	83	81	96	96	108	1,365	2,959	7,020	75,075
1750	NORWICH.NORFOLK	N/W/Mid	97	102	105	100	105	105	100	97	100	96	98	96	17,782	14,216	36,238	103,066
1750	NOTTINGHAM.NOTTINGHAMSHIRE	S/E	97	106	110	110	114	100	97	88	91	98	96	92	14,794	4,264	28,801	216,422
1750	PORTSMOUTH.HAMPSHIRE	S/E	86	94	109	103	96	98	96	102	112	115	95	94	5,553	5,007	33,226	184,683
1750	RAMSGATE.KENT	N/W/Mid	82	84	85	108	110	109	96	91	102	123	107	105	1,529	700	3,110	24,733
1750	SANDWICH.KENT	S/E	80	98	107	111	90	65	86	100	123	136	106	99	1,271	3,958	2,452	2,796
1750	SHREWSBURY.SHROPSHIRE	N/W/Mid	92	101	103	99	106	106	115	112	102	102	83	79	2,375	6,867	14,739	26,967
1750	SOHAM.CAMBRIDGESHIRE	S/E	80	95	90	84	125	86	95	106	107	134	106	91	1,129	1,400	1,174	NA
1750	SOUTH SHIELDS.DURHAM	S/E	125	125	105	98	89	101	84	77	90	106	93	106	5,109	NA	11,011	73,391
1750	STOCKTON.DURHAM	S/E	101	87	97	109	117	113	102	125	68	92	91	97	1,651	1,198	3,866	65,368
1750	SUDBURY.SUFFOLK	N/W/Mid	103	117	111	96	102	81	98	92	98	101	104	96	2,435	1,750	3,813	7,059
1750	SUTTON IN ASHFIELD.NOTTINGHAMSHIRE	S/E	118	85	142	126	115	97	94	70	78	78	83	117	1,374	NA	2,801	10,562
1750	WELLS NEXT THE SEA.NORFOLK	S/E	111	96	106	118	88	97	96	98	89	109	103	90	1,353	1,400	2,290	2,555
1750	WHICKHAM.DURHAM	S/E	115	107	114	118	116	118	92	68	76	85	100	91	3,204	NA	NA	9,343
1750	WISBECH.CAMBRIDGESHIRE	S/E	106	117	121	113	110	99	82	106	87	94	80	86	2,059	2,320	4,710	9,395
1750	WOODBRIDGE.SUFFOLK	S/E	97	93	116	102	87	96	101	95	89	109	115	99	1,015	1,380	3,020	4,480
1750	WYMONDHAM.NORFOLK	N/W/Mid	85	100	104	129	112	118	115	97	90	89	89	74	1,850	2,290	2,046	NA
1800	ACCRINGTON.LANCASHIRE	N/W/Mid	102	108	124	132	131	122	94	82	69	84	74	79	2,414	NA	5,787	57,769
1800	ALFRETON.DERBYSHIRE	N/W/Mid	101	117	142	123	117	117	103	71	70	67	75	96	1,137	710	815	15,355
1800	ASHTON IN MAKERFIELD.LANCASHIRE	S/E	100	116	129	123	117	121	88	79	76	82	79	92	3,744	NA	3,696	13,379
1800	AYLESBURY.BUCKINGHAMSHIRE	N/W/Mid	99	101	123	125	97	101	79	75	101	92	100	106	1,698	1,400	3,186	8,922
1800	BEDFORD.BEDFORDSHIRE	N/W/Mid	116	111	127	104	97	94	88	79	90	111	102	81	2,943	2,130	3,948	32,012
1800	BLACKBURN.LANCASHIRE	N/W/Mid	111	118	117	120	127	109	95	74	72	78	84	95	19,407	990	11,980	120,064
1800	BRISTOL.GLOUCESTERSHIRE	S/E	108	107	105	104	98	93	79	72	106	97	110	120	4,198	13,482	61,153	307,694
1800	BURNLEY.LANCASHIRE	S/E	112	121	129	131	116	109	93	82	73	74	78	82	9,060	350	3,918	87,058
1800	BURY ST EDMUNDS.SUFFOLK	N/W/Mid	88	109	107	115	116	110	92	80	96	97	102	89	3,748	4,264	7,655	16,300
1800	CAMBRIDGE.CAMBRIDGESHIRE	S/E	94	103	117	110	108	97	81	86	93	120	96	94	8,025	10,574	10,087	44,509
1800	CANTERBURY.KENT	S/E	90	108	112	118	114	98	89	80	96	101	103	91	7,991	7,671	9,000	23,026

1800	CHATTERIS.CAMBRIDGESHIRE	S/E	105	97	106	108	100	113	95	85	93	87	110	102	2,183	920	2,393	4,587
1800	CHESHAM.BUCKINGHAMSHIRE	S/E	122	92	120	117	95	120	70	88	71	103	95	107	1,381	570	1,625	6,075
1800	CHESTER-LE-STREET.DURHAM	N/W/Mid	82	118	116	123	113	105	95	79	84	104	92	89	3,912	NA	NA	8,623
1800	COLNE.LANCASHIRE	N/W/Mid	97	113	119	127	140	110	95	81	76	75	82	84	4,702	830	2,681	16,774
1800	DARLINGTON.DURHAM	S/E	106	95	120	123	99	102	98	87	91	104	87	89	3,735	1,403	4,527	38,060
1800	DOVER.KENT	N/W/Mid	88	99	117	107	113	93	92	78	92	120	109	94	4,214	4,299	8,028	33,503
1800	DURHAM.DURHAM	N/W/Mid	103	107	110	113	97	108	85	91	80	99	101	106	5,040	2,223	5,416	14,863
1800	ECCLES.LANCASHIRE	N/W/Mid	111	119	121	124	111	106	86	73	74	85	89	100	11,916	NA	NA	29,606
1800	ELY.CAMBRIDGESHIRE	S/E	92	113	127	117	129	92	93	81	85	101	83	85	3,012	3,026	3,013	8,017
1800	EXETER.DEVONSHIRE	S/E	84	85	105	119	105	99	83	85	130	118	99	86	7,827	10,307	17,412	52,484
1800	GATESHEAD.DURHAM	S/E	105	107	102	109	97	96	81	87	97	118	100	101	6,114	2,983	8,597	NA
1800	GOSPORT.HAMPSHIRE	N/W/Mid	96	102	102	90	102	100	107	89	113	116	99	84	3,011	1,100	6,796	NA
1800	GREAT MARLOW.BUCKINGHAMSHIRE	N/W/Mid	78	104	101	114	102	92	86	85	96	110	116	116	1,667	1,800	3,236	4,212
1800	GREAT YARMOUTH.NORFOLK	S/E	106	98	94	95	94	92	88	89	106	120	122	96	10,393	9,248	16,573	49,334
1800	HIGH WYCOMBE.BUCKINGHAMSHIRE	N/W/Mid	104	97	105	116	101	114	103	76	84	97	101	102	2,407	1,000	1,899	13,435
1800	HOUGHTON-LE-SPRING.DURHAM	S/E	92	118	95	115	117	101	100	85	94	107	91	87	3,778	NA	NA	6,476
1800	IPSWICH.SUFFOLK	N/W/Mid	96	108	109	116	100	99	89	81	101	118	99	84	8,785	9,774	11,277	57,433
1800	KENDAL.WESTMORELAND	S/E	100	117	133	125	129	110	98	81	74	58	79	95	3,529	5,730	8,015	14,430
1800	KINGS LYNN.NORFOLK	N/W/Mid	104	102	109	123	120	103	99	91	74	89	88	98	2,304	5,007	10,096	18,360
1800	LEICESTER.LEICESTERSHIRE	N/W/Mid	99	103	110	125	113	102	86	80	83	97	99	104	3,202	3,014	17,005	174,624
1800	LOUGHBOROUGH.LEICESTERSHIRE	N/W/Mid	86	122	105	123	120	102	100	90	90	98	80	84	3,419	1,500	4,420	18,196
1800	LOWESTOFT.SUFFOLK	S/E	105	95	118	98	96	82	75	93	95	128	111	104	2,030	920	2,263	23,347
1800	LUTON.BEDFORDSHIRE	N/W/Mid	94	103	112	116	94	95	95	89	91	96	111	104	1,863	1,150	1,950	30,006
1800	MAIDSTONE.KENT	N/W/Mid	85	114	116	111	108	90	85	92	109	114	100	78	3,949	3,703	8,027	32,145
1800	MANCHESTER.LANCASHIRE	N/W/Mid	98	119	107	109	103	100	87	80	102	105	95	94	34,577	2,356	94,876	835,628
1800	MANSFIELD.NOTTINGHAMSHIRE	N/W/Mid	109	106	103	104	126	101	94	84	80	102	96	95	3,953	1,290	5,641	15,925
1800	MARCH.CAMBRIDGESHIRE	S/E	91	94	113	103	105	101	92	93	100	114	99	95	3,491	1,340	1,680	6,988
1800	MARGATE.KENT	S/E	73	95	80	83	88	99	103	95	129	160	107	89	2,780	1,170	4,298	20,504
1800	NEWARK.NOTTINGHAMSHIRE	S/E	92	113	145	122	104	102	79	84	95	99	84	82	4,052	NA	6,730	14,457

1800	NEWCASTLE UPON TYNE.NORTHUMBERLAND	S/E	105	120	95	108	104	91	83	85	112	108	100	88	3,242	11,617	33,048	318,042
1800	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	113	114	115	116	107	97	83	85	85	90	92	105	6,004	2,959	7,020	75,075
1800	NORWICH.NORFOLK	S/E	95	97	97	101	106	97	99	91	107	117	104	90	18,937	14,216	36,238	103,066
1800	NOTTINGHAM.NOTTINGHAMSHIRE	N/W/Mid	95	111	114	110	103	86	77	86	114	116	102	85	26,487	4,264	28,801	216,422
1800	OSWESTRY.SHROPSHIRE	N/W/Mid	70	106	98	119	144	122	102	99	93	79	96	70	1,175	940	2,672	8,496
1800	PLYMOUTH.DEVONSHIRE	S/E	87	102	107	114	108	107	100	95	116	98	81	85	10,175	4,000	16,040	164,012
1800	PORTSMOUTH.HAMPSHIRE	S/E	105	107	107	95	89	95	96	86	101	115	110	93	3,890	5,007	33,226	184,683
1800	RAMSGATE.KENT	S/E	84	80	88	110	111	95	93	84	110	140	113	91	2,517	700	3,110	24,733
1800	SANDWICH.KENT	S/E	94	127	81	110	116	91	93	95	94	122	102	75	1,290	3,958	2,452	2,796
1800	SHREWSBURY.SHROPSHIRE	N/W/Mid	95	124	122	121	120	115	96	85	83	77	83	81	4,676	6,867	14,739	26,967
1800	SOHAM.CAMBRIDGESHIRE	N/W/Mid	92	102	103	112	136	96	101	81	98	100	98	81	1,477	1,400	1,174	NA
1800	SOUTH SHIELDS.DURHAM	S/E	110	111	108	103	102	95	80	77	88	113	108	104	11,126	NA	11,011	73,391
1800	STOCKTON.DURHAM	S/E	92	92	114	100	107	99	98	79	109	122	100	87	3,181	1,198	3,866	65,368
1800	SUDBURY.SUFFOLK	S/E	87	103	107	120	115	103	110	80	94	100	92	90	2,190	1,750	3,813	7,059
1800	SUNDERLAND.DURHAM	S/E	107	108	107	116	109	103	83	83	98	104	94	87	12,799	1,147	24,998	144,649
1800	SUTTON IN ASHFIELD.NOTTINGHAMSHIRE	N/W/Mid	92	115	119	129	125	103	105	82	103	89	65	74	2,426	NA	2,801	10,562
1800	TIVERTON.DEVONSHIRE	S/E	107	75	101	140	135	98	97	91	83	101	74	98	1,967	2,080	6,505	10,892
1800	TYNEMOUTH.NORTHUMBERLAND	S/E	99	113	116	106	104	102	86	78	95	106	98	99	7,168	270	13,171	46,588
1800	WALLSEND.NORTHUMBERLAND	S/E	85	103	108	117	114	96	109	71	90	101	128	79	1,734	NA	3,120	18,965
1800	WELLS NEXT THE SEA.NORFOLK	S/E	115	104	78	111	79	111	105	93	106	112	100	86	1,833	1,400	2,290	2,555
1800	WHICKHAM.DURHAM	S/E	104	109	119	118	115	94	88	80	87	98	98	88	2,130	NA	NA	9,343
1800	WHITTLESEY.CAMBRIDGESHIRE	S/E	98	99	89	117	102	92	103	80	112	119	103	86	2,913	1,980	2,734	3,556
1800	WISBECH.CAMBRIDGESHIRE	S/E	84	105	111	115	111	107	89	77	89	112	98	101	4,619	2,320	4,710	9,395
1800	WOODBRIDGE.SUFFOLK	N/W/Mid	92	118	128	141	128	104	83	75	88	74	89	79	1,720	1,380	3,020	4,480
1800	WORKSOP.NOTTINGHAMSHIRE	N/W/Mid	92	97	102	119	114	113	92	88	89	110	97	88	2,061	810	2,740	12,734
1800	WYMONDHAM.NORFOLK	N/W/Mid	94	107	85	114	102	110	102	87	87	111	104	95	1,499	2,290	2,046	NA
1850	ACCRINGTON.LANCASHIRE	N/W/Mid	117	110	107	113	118	98	99	85	76	82	83	112	2,849	NA	5,787	57,769
1850	ASHTON IN MAKERFIELD.LANCASHIRE	S/E	114	113	105	106	105	100	95	91	91	83	90	108	5,118	NA	3,696	13,379
1850	BLACKBURN.LANCASHIRE	N/W/Mid	112	124	118	114	112	95	83	78	88	91	88	98	18,966	990	11,980	120,064

1850	BROADSTAIRS.KENT	N/W/Mid	94	77	122	115	95	77	82	77	152	139	78	92	1,072	NA	NA	5,266
1850	BURNLEY.LANCASHIRE	S/E	105	112	116	122	136	126	89	68	79	74	75	97	2,001	350	3,918	87,058
1850	BURY ST EDMUNDS.SUFFOLK	N/W/Mid	117	107	110	115	114	109	98	65	96	85	86	100	3,648	4,264	7,655	16,300
1850	CAMBRIDGE.CAMBRIDGESHIRE	S/E	106	106	114	111	94	84	80	78	126	122	87	91	8,840	10,574	10,087	44,509
1850	CANTERBURY.KENT	N/W/Mid	82	104	129	105	129	93	73	73	120	116	93	81	1,127	7,671	9,000	23,026
1850	CHESTER-LE-STREET.DURHAM	S/E	98	125	128	100	92	88	86	88	95	108	95	97	1,954	NA	NA	8,623
1850	COLNE.LANCASHIRE	N/W/Mid	115	118	125	109	113	128	100	74	70	72	77	99	1,540	830	2,681	16,774
1850	DARLINGTON.DURHAM	N/W/Mid	113	109	111	98	94	80	83	95	108	119	93	96	4,329	1,403	4,527	38,060
1850	DEAL.KENT	S/E	103	95	120	102	104	93	89	82	108	134	81	90	2,533	1,940	5,420	13,363
1850	DOVER.KENT	S/E	101	101	105	121	109	96	76	70	99	123	100	100	5,091	4,299	8,028	33,503
1850	DURHAM.DURHAM	N/W/Mid	128	104	95	104	102	93	68	89	103	135	95	85	1,583	2,223	5,416	14,863
1850	ELY.CAMBRIDGESHIRE	N/W/Mid	125	114	130	104	86	92	74	80	87	84	114	109	1,833	3,026	3,013	8,017
1850	GATESHEAD.DURHAM	S/E	111	102	103	97	81	76	82	83	110	129	111	115	5,667	2,983	8,597	NA
1850	IPSWICH.SUFFOLK	S/E	92	102	99	105	97	90	83	80	115	137	108	91	7,579	9,774	11,277	57,433
1850	KINGS LYNN.NORFOLK	S/E	87	113	129	114	103	87	80	86	97	105	85	115	1,291	5,007	10,096	18,360
1850	LOUGHBOROUGH.LEICESTERSHIRE	N/W/Mid	104	102	88	107	111	89	79	83	126	120	100	91	7,610	1,500	4,420	18,196
1850	LOWESTOFT.SUFFOLK	N/W/Mid	83	92	108	106	97	84	84	80	119	138	111	97	2,205	920	2,263	23,347
1850	MANCHESTER.LANCASHIRE	N/W/Mid	104	112	113	92	86	64	80	111	116	117	104	101	2,153	2,356	94,876	835,628
1850	MARCH.CAMBRIDGESHIRE	N/W/Mid	89	92	114	173	135	82	68	66	98	116	93	74	1,053	1,340	1,680	6,988
1850	MARGATE.KENT	S/E	86	80	95	88	92	73	75	91	168	159	107	86	4,053	1,170	4,298	20,504
1850	MELTON MOWBRAY.LEICESTERSHIRE	S/E	91	85	140	122	102	86	79	108	122	103	79	82	1,118	1,450	1,749	6,392
1850	NEWARK.NOTTINGHAMSHIRE	N/W/Mid	83	142	132	94	106	84	99	85	99	111	91	74	1,164	NA	6,730	14,457
1850	NORTHAMPTON.NORTHAMPTONSHIRE	S/E	99	111	116	99	108	114	84	74	96	109	98	93	2,757	2,959	7,020	75,075
1850	NORWICH.NORFOLK	N/W/Mid	93	104	107	108	103	95	80	87	110	124	104	87	5,666	14,216	36,238	103,066
1850	NOTTINGHAM.NOTTINGHAMSHIRE	N/W/Mid	104	108	102	100	98	94	83	107	127	104	87	86	7,727	4,264	28,801	216,422
1850	OSWESTRY.SHROPSHIRE	N/W/Mid	104	111	98	116	129	101	91	78	89	93	90	101	2,009	940	2,672	8,496
1850	RAMSGATE.KENT	S/E	87	104	107	103	102	84	67	63	153	154	91	86	1,794	700	3,110	24,733
1850	SOHAM.CAMBRIDGESHIRE	N/W/Mid	87	108	115	128	107	118	90	77	76	103	82	108	1,534	1,400	1,174	NA
1850	SOUTH SHIELDS.DURHAM	S/E	109	133	98	88	94	75	89	83	94	112	122	103	3,171	NA	11,011	73,391
1850	STOCKTON.DURHAM	S/E	114	94	89	90	97	93	88	95	109	111	101	119	4,168	1,198	3,866	65,368

1850	SUDBURY.SUFFOLK	N/W/Mid	100	112	150	130	115	93	77	73	85	73	88	104	1,347	1,750	3,813	7,059
1850	SUNDERLAND.DURHAM	N/W/Mid	106	107	96	92	93	89	81	87	112	116	112	107	11,810	1,147	24,998	144,649
1850	SUTTON IN ASHFIELD.NOTTINGHAMSHIRE	S/E	100	89	130	130	109	96	86	79	100	93	75	113	1,586	NA	2,801	10,562
1850	WALLSEND.NORTHUMBERLAND	N/W/Mid	116	99	96	107	105	93	84	77	94	114	115	98	1,684	NA	3,120	18,965
1850	WELLS NEXT THE SEA.NORFOLK	S/E	83	63	119	119	122	98	98	87	91	112	108	100	1,104	1,400	2,290	2,555
1850	WHICKHAM.DURHAM	S/E	122	115	103	114	89	98	91	82	95	83	97	112	1,276	NA	NA	9,343
1850	WHITTLESEY.CAMBRIDGESHIRE	S/E	85	125	129	121	89	115	89	74	87	115	78	93	1,620	1,980	2,734	3,556

Source: as for Table 19a

Conclusion

The FHS burials dataset has a large number of observations including both rural villages and major urban settlements that cover a long period stretching from the early sixteenth to the mid twentieth century, but there is heterogeneous chronological and geographical coverage per parish location, which can be mitigated through aggregation by settlement type. The FHS burials dataset is particularly useful both for its long overview and for investigation of mortality patterns prior to the 1841 Census and beginning of Civil Registration of births, deaths and marriages in 1837, before most contemporary national or regional mortality statistics began, whether nuanced by age category or not. Different age groups are identifiable with varying degrees of confidence prior to reported age information becoming near-universal in the early nineteenth century. Before this date a split between adults and children is possible through family relationship information. Children are easier to identify comprehensively from such relationship information than adults, and provide the largest analysable subsamples.

Using reported ages from the late eighteenth century, it is possible to observe in the FHS burials dataset at the national level the divergent experiences of rural, urban and other settlements in aggregate, and their eventual post-WW1 convergence driven primarily by rapid improvements in urban age mean at burial. The overall trend in mean age at burial across the early nineteenth century adds new contemporary evidence to fill the lacuna between values of life expectancy at age 25 estimated from family reconstitution ending in 1809, which lack a large urban component, and those derived from census data and civil registration beginning three decades later. Widows mean age at burial provides a measure that is less susceptible than all adult burials to large-scale changes underway in the age structure of the adult population at this time.

Adults and children have different seasonal patterns of burial, and for children in particular there are differences by period and settlement type, with urban locations having the most varied experience of burial seasonality by time period, although rural settlements (in aggregate) may show a greater range of seasonal fluctuation. Children, and notably Infants, are susceptible to secondary or main August or September peaks in burials that are rarely observed in adult age groups. Before 1800, there are indications of a distinct geography to the August/September child burial peak, which is seen in both rural and urban areas and more prevalent in warmer, low-lying south-eastern counties below the River Severn estuary and the Wash than in the cooler and more rugged north and north west, and particularly marked in south-eastern urban areas, but much less apparent in northern urban areas. Topography also plays a role in this August/September peaking, with low lying areas prone to it but elevated areas apparently protected from it. In particular towns, burial seasonality in early periods may be influenced by the frequency and severity of plague epidemics, but it appears that southern coastal towns are susceptible to August/September burial peaks among adults and children that persist for a century or more after the disappearance of plague in some cases. In 1750 to 1800 a new pattern of August and September burial excesses restricted to children develops that is more closely coupled to urbanisation but not found in every large town.

In later periods infant burial seasonality may be examined separately from other child burials, where it is always liable to be the larger component. Birth or baptism seasonality has a potential influence on infant burial seasonality in particular as a result of fluctuating numbers per month both of endogenous neonatal deaths, and of infants who survive long enough to become susceptible hosts

for pathogens, especially during weaning. It would be unwise to generalise too far from the contrasting evidence of four sample counties, but it is clear that there are significant geographical variations in baptism seasonality that interact with settlement type. Over time baptism seasonality reduces in amplitude and shifts away from the winter months, but appears to be surprisingly slow to do so in the more northerly sampled counties of Lancashire or Nottinghamshire, even in urban areas where relatively seasonally invariant industrial work patterns (for women and men) rather than agricultural work might be expected to produce less variation in births than is actually observed. In cities such as Manchester this may relate to the newness or rapid growth of most of the major urban settlements associated with industrialisation, concentrated in northerly parts of England, and the consequently large rural migrant segment of their populations, with a relatively low ratio of urban to rural born to influence their behaviour compared to the older, established towns of south-eastern England.

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