INFANT MORTALITY AND SEX RATIOS AT BAPTISM AS SHOWN BY RECONSTRUCTION OF WILLINGHAM, A PARISH AT THE EDGE OF THE FENS IN CAMBRIDGESHIRE

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The idea of doing the family reconstruction of a parish and subsequently the analysis of infant mortality levels and sex ratios at baptism came about during a fishing trip in Wales, when I was offered the loan of full-size photographs of the Willingham parish registers from 1559 to 1653 and a microfilm printout of the remaining years up to 1812. When I accepted this offer I little realised the full extent of the work involved in a reconstruction. Moreover, being a mathematician by training and not a historian, it must be confessed that the burden of working more or less alone on such a project weighed heavily on both mental and physical energies. Indeed, the project might never have been started if I had fully realised the magnitude of the work involved. One other documentary source, namely wills, was used alongside the material in the registers in order to produce a more complete picture. Although this documentary source was incomplete, it was of some help in reconstituting some of the earlier families in the late sixteenth century.[1]

Although the family reconstitution of this fen-edge parish was undertaken without any clear idea of the outcome, the end result was most rewarding, particularly so with respect to sex ratios at baptism and male and female infant mortality rates. The latter issue will be considered first.

Table 1. Infant mortality (1000 q_o) in Willingham and from the U.N. Specimen Life-tables (1)

	Willingham				U.N. Specimen Life-tables	
	Infant mortality rates				Expectation of life corresponding to observed rates at Willingham	
	Male		Female		Male	Female
Period	N	(1000 q_o)	N	(1000 q_o)	^oe_o	^oe_o
1559-99	262	152	294	163	47.5	42.5
1600-49	318	182	253	185	42.5	37.5
1650-99	177	186	138	224	40.0	30.0
1700-49	176	170	148	175	42.5	40.0
1750-99	307	169	251	179	45.0	37.5
1800-12	39	230	40	250	32.5	27.5

(1) The data for Willingham are based on the reconstitution data. For Life speciment tables see United Nations, **Methods for population projections by sex and age, p. 74.**

When the infant mortality rates gained from the reconstitution are compared with specimen life tables, it is evident that the average life expectancy at birth in Willingham was only about forty years and at times substantially less than forty years. It is particularly interesting that the level of female infant mortality was always higher than the level of male infant mortality for corresponding periods; in the late seventeenth century it was a good deal above the male level.

In comparing the mortality rates for Willingham with the specimen life tables, it may be argued that the specimen tables are based on theory and do not correspond to real life figures. It is possible to compare the Willingham mortality figures with those from other reconstituted parishes in various parts of the country.[2]

Table 2. Infant mortality (1000 q_o) of various English parishes [1]

Parish	Male Period			
	1550-99	1600-49	1650-99	1700-49
Willingham	152	182	186	170
Aldenham	130	119	112	153
Colyton	140	91	104	110
Gainsborough	175	243	255	284
Gedling	90	101	101	105
Terling	134	113	135	139
		Female		
Willingham	163	185	224	175
Aldenham	125	118	97	137
Colyton	118	89	100	106
Gainsborough	157	204	221	245
Gedling	78	90	103	104
Terling	118	110	145	170

(1) Taken from R. Smith, **Population and its geography in England, 1500-1730.**

Table 2 shows that the only parish which has a higher infant mortality level than Willingham is Gainsborough, a much larger parish[3] and an urban rather than a rural settlement. Also, from 1550-1749, Gainsborough exhibits a reversal of the pattern in that the male infant mortality rates are always higher than the female rates. Table 2 indicates that male infant mortality is generally higher than female infant mortality: apart from Terling for 1650-1749 Willingham provides the outstanding exception.

Table 3. Swindon child deaths [1] **(1000 q_x) by sex and occupation**

Parental occupation	Male			Female		
	Born	Died	(1000 q_x)	Born	Died	(1000 q_x)
Gentleman	18	4	222	21	3	143
Yeoman	5	0	0	13	4	308
Tradesman/Craftsman	129	22	170	103	26	252
Labourer	87	17	195	84	22	262
Miscellaneous	14	3	214	12	3	250
All	253	46	182	233	58	249

(1) Child deaths are all those born and dying before 1697 to families still existing at that date.

The pattern evident in Willingham is a much clearer one than that afforded by Swindon in the late seventeenth century.[4] But it must be emphasized that the Swindon figures are not strictly comparable with those for Willingham since they give child deaths and not just infant deaths. Nevertheless they are a clear pointer to a high female mortality level. It is noticeable that in every occupation with the exception of the gentry, females died in greater numbers than males, although with such small numbers it would be rash to single out the gentry as a special case.

As there would appear to be such a striking peculiarity in the infant mortality levels of Willingham the next step would be to try and determine whether this was due to design or pure chance. In order to do this a breakdown of the infant mortality figures by sex and age would be useful to determine whether there was any stage in the first year of life that was characterised by excessive female mortality. For if this showed itself at, say, ten months, it might suggest a difference in weaning practices.[5] But, although differences in weaning practices may have a bearing on the issue, this must remain a supposition until more research is done into the subject. What is clear, though, is the consistently higher level of female mortality; it is at its highest in the late seventeenth century.

Table 4. Sex ratio (1) at baptism (1000 q_o) with date of marriage known (2) in Willingham 1559-1812

Period	N	Sex ratio
1559-99	128	117
1600-49	271	102
1650-99	110	150
1700-49	93	132
1750-99	234	117
1800-12	51	89
1559-1812	887	115

(1) The sex ratio is calculated as sex ratio $= \left(\frac{\text{male}}{\text{female}} \times 100\right)$

(2) The data for Willingham are based on the reconstitution data.

Table 5. Sex ratio (1000 q_o) at baptism for Willingham for all baptisms (1)

Period	N	Sex ratio
1559-99	850	98
1600-49	954	114
1650-99	877	113
1700-49	593	110
1750-99	772	124
1800-12	103	94
1559-1812	4149	111

(1) Based on the reconstitution data.

For the period 1559-1812 the sex ratio at birth is 115 for all children of parents married in Willingham, whereas in most human populations it is about 105.[6] In the period 1650-99, however, when there is a substantial excess female infant mortality, it rises to the much higher level of 150. But when all baptisms are taken into account (as in Table 5), the sex

ratio at baptism is somewhat lower, although still higher than that found in most human populations. Also, the fluctuations in the sex ratio, as shown in both Table 4 and Table 5, are not so great. Since the pattern observed in the overall sex ratio of all births and the higher female infant mortality is evident throughout the whole period of the reconstitution, the question that now arises is whether this pattern is peculiar to this particular parish or whether it is also evident in any of the surrounding parishes.

This question can only be properly answered by a full reconstitution of each of the parishes concerned and this would require much time and energy. However, tracing the baptisms of the children who had died did yield some return. The procedure adopted was the simple one of listing all the burials where the relationship given was 'son of . . . ' or 'daughter of . . . ', and then searching through the baptism register in order to see how many children were baptised during the year of their death. This method can only provide a superficial check, as very few of the surrounding parishes gave the relationship of the deceased over a period of time. In fact the only parish which gave relationships consistently for more than five years at any period of time was Over.

In Over in the late seventeenth century female infant mortality was high and substantially above the level of male infant mortality. Between 1641 and 1660 there were sixty-nine infant deaths. This gives an infant mortality rate by sex of 178 for males and 190 for females. Although the results for Over suggest that we have a pattern of infant mortality similar to that of Willingham, the figures must be treated with caution for they cover only a twenty year period. However, the similarity should not be entirely disregarded since the mortality level for both Over and Willingham suggests a characteristic peculiar to this area at the edge of the fens.

From the question of similarity in the levels of mortality we turn to the investigation of whether a pattern similar to that of Willingham shows itself in the sex ratio of the surroundig parishes. The registers of these parishes covered varying periods from 1581-1760, but all except Longstanton, All Saints where the registers did not begin until 1672, covered the years 1650-99.

Table 6. The sex ratios of some Cambridgeshire and Isle of Ely parishes

Parish	Period covered	N	Overall sex ratio
Rampton	1641-1780	611	121
Over	1641-1760	2583	108
Swavesey	1621-1713	1679	110
Longstanton: All Saints (1)	1672-1700	233	108
Longstanton: St. Michael's	1641-1700	112	149
Longstanton: Combined (2)	1641-1700	345	120
Cottenham	1581-1700	3877	107
Landbeach	1636-1700	638	129
Haddenham	1641-1700	2176	102

(1) The small parish of Longstanton has two parish churches. The parish of Longstanton: All Saints parish register begins in 1672.

(2) Unless otherwise specified Longstanton will be looked at combined.

Table 6 gives the overall sex ratio for 1641-1700 for most of the parishes, but this period was extended for those parishes where the sex ratio was excessively high.[7] It is interesting to note that the parishes bordering on Willingham, namely, Over, Longstanton and Rampton, follow a pattern similar to the one observed in Willingham by showing a relatively higher than expected sex ratio at baptism. This seems to suggest that the figures obtained from the Willingham reconstitution are not peculiar to that parish.

The parish of Haddenham, also bordering on Willingham, presents a somewhat different picture, in that it lies across the river Ouse, which is known as the Old West River, and also on the 50-150 foot contour lines with spot heights of 120 feet and 116 feet marked. Those who know the area will realise that this is the highest point around, as well as being the highest point between Haddenham and Peterborough, some twenty three miles away as the crow flies. Whether Haddenham's elevation from the fens has anything to do with the issue under consideration is open to question.

Table 7. The sex ratios at baptism of some Cambridgeshire parishes (combined) for 1650-99

Parish	N		Sex ratio
Willingham	877		
Rampton	205	1403	115
Longstanton	321		
Willingham	877		
Rampton	205		
Longstanton	321	2446	110
Over	1043		
Willingham	877		
Rampton	205		
Longstanton	321	4072	113
Over	1043		
Cottenham	1626		
Willingham	877		
Rampton	205		
Longstanton	321		
Landbeach	410	5233	111
Over	1043		
Swavesey	701		
Cottenham	1626		
Willingham	877		
Rampton	205		
Longstanton	321		
Over	1043	4773	111
Swavesey	701		
Cottenham	1626		

Table 7 shows that the sex ratio increases when the area under observation is enlarged by combining a number of parishes. This is especially noticeable when the increased area takes in the larger fen-edge parishes in the vicinity of Willingham. Admittedly, the fen-edge parishes have relatively small numbers of inhabitants in comparison with some other areas of the country but the larger area covering seven

parishes brings in a substantial number of baptisms within the fifty year period with an average of just over one hundred baptisms per year. From this one could argue that if the surrounding parishes also exhibited a high sex ratio when all baptisms are accounted for, a reconstitution might show an even higher sex ratio amongst the families in which the mother was a local girl as in Table 4.

Two major issues emerge from the reconstitution data of Willingham, one being the sex ratios at baptism and the other the high female infant mortality rate as compared to the male infant mortality rate. The issue of female mortality is too important to be lightly brushed aside, but more than demographic evidence is needed to explain it. From time immemorial male children have been preferred to female children in most societies. The pattern evident in Willingham and the surrounding parishes is one that might be expected if infanticide were prevalent because female babies were in disfavour.[8]

The sex ratio at baptism would then be unbalanced as some new-born females would never appear in the record and female infant mortality might well, even after baptism, be higher than would normally be the case. The issue over female infant mortality could also be explained if there was a sex discriminating disease prevalent in the area, such as whooping cough. Also since the Fens during the early seventeenth century was a poorly drained marshy[9] area there may have been a miscellany of bacterial and viral infections which were sex discriminating.

- Looking at inheritance customs[10] within the parish of Willingham it is evident that between 1575 and 1603 land was divided between all sons more readily than among the male offspring in the upland parishes of Orwell and Chippenham. This breakdown of holdings, if continued down the centuries, would have put a great deal of pressure on the economy of the individual and on the community. And where dowries were needed in order to set up daughters for marriage, infanticide and especially female infanticide might well have been contemplated as a solution to the population problem. But this is speculation, and as such, needs to be treated with a great deal of caution since small holdings on the fens are a more viable proposition than small holdings elsewhere, because of such fenland activities as fishing and fowling.

In conclusion the question must be asked whether the pattern characteristic of Willingham and to a certain extent of the surrounding fen-edge parishes, is also found in the parishes within the fens and on the uplands around the fens. Only reconstitutions can supply adequate answers to these questions. And indeed, comparison on a wider scale with parishes in other parts of the country also depends on the reconstitution of these parishes.

All we can claim for the present study is that it has lent weight to the suggestion by Richard Wall that 'the current quest for the child in history is missing the point by not considering boys and girls separately.'[11]

NOTES

1. The original parish registers are housed in the parish chest in Willingham. I am grateful to Mr. Dennis Jeeps of Willingham for the loan of the photographs of the registers and to Dr. Peter Spufford for the loan of the microfilm printout which is now in the County Record Office, Cambridge. Dr Margaret Spufford generously lent me copies of the Willingham wills and she together with Dr Ian Fraser, University archivist, Keele gave me much assistance with the interpretation of the material. Margaret Spufford, **Contrasting Communities,** 1974, supplied the background history of the economic, educational and religious life of the parish from 1526 to 1700. Finally, I must thank the members of the SSRC Cambridge Group for the History of Population and Social Structure and especially Richard Wall for all their help and encouragement without which this article would not have been written.
2. A typescript chapter by R. Smith, 'Population and its geography in England, 1500-1730'. This is to appear in Butlin and Dogshon, (eds), **An historical geography of England and Wales,** which is at present in the press.
3. From the **Population Abstract Enumeration 1801,** 1968, Gainsborough has a population of 4506.
4. Unpublished article by Richard Wall, 'Society and the sexes in seventeenth century Swindon'. I am grateful to Richard Wall for allowing me to use this article.
5. See Alan MacFarlane, **The family life of Ralph Josselin,** 1972, p. 87, and J. E. Illick, Child rearing in seventeenth century England and America', in Lloyd de Mause, **The history of childhood,** 1974, p. 335 and notes 27-8. These suggest a weaning age considerably later than 10 months.
6. Michael S. Teitlebaum, 'Factors associated with the sex ratio in human populations', in Harrison and Boyce, (eds), **The structure of human populations,** 1975, pp. 90-109; E. A. Wrigley, 'Checking Rickman', **Local Population Studies,** 17, pp. 9-15; T. Short, **New observations on city, town and country bills of mortality,** 1750.
7. According to Gauss' Central Limit theorem, the larger the sample the more it tends towards the mean, in this case 105. This is also the theory behind the law of the average of large samples.
8. For infanticide in the ancient world see Lloyd de Mause, **The history of childhood,** 1974, p. 26. For infanticide in early medieval times see M. M. McLaughlin, 'Survivors and surrogates', in Lloyd de Mause, p. 120 and note 99. For disfavouring of seventeenth century female infants see E. Wirth Marvick, 'Nature versus nurture', in Lloyd de Mause, pp. 283-4 and note 165.
9. H. C. Darby, **The Draining of the Fens,** 1968.
10. Spufford, **Contrasting Communities,** pp. 159-167.
11. Conclusion of article on Swindon by Richard Wall.