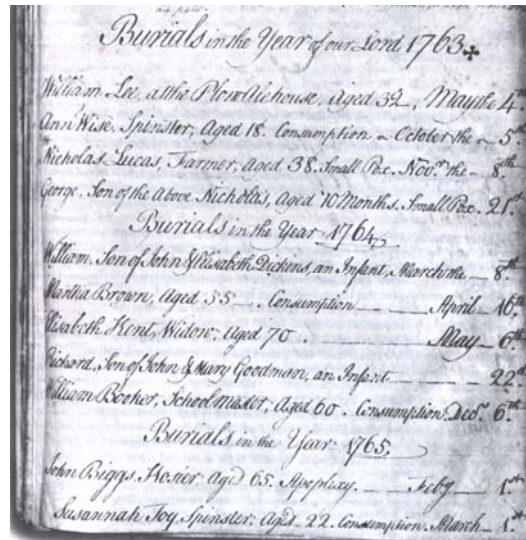


The Limitations of Family Reconstitution



Cambridge Group for the History of Population and Social Structure
27 Trumpington St.

IBM PS/2
P70 386

20 Mhz

640K
memory

21 lbs.

External Storage:

WORM Drive,
200MB Optical
Cartridges

25 lbs. with
transformer

Total weight: 46 lbs

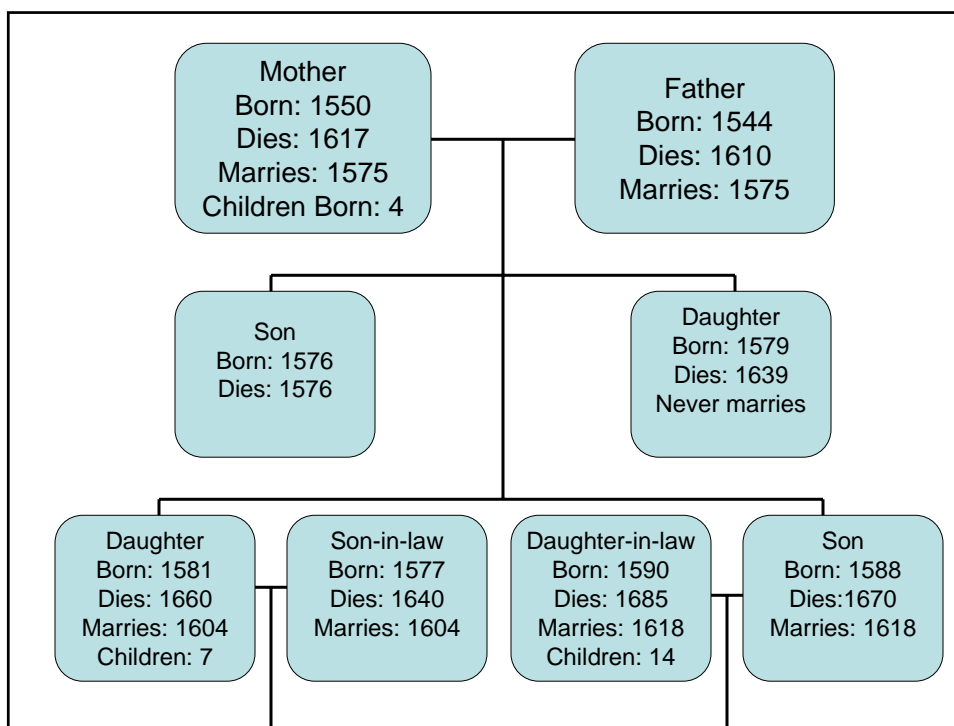
Total cost: \$9,500



Jim Oeppen



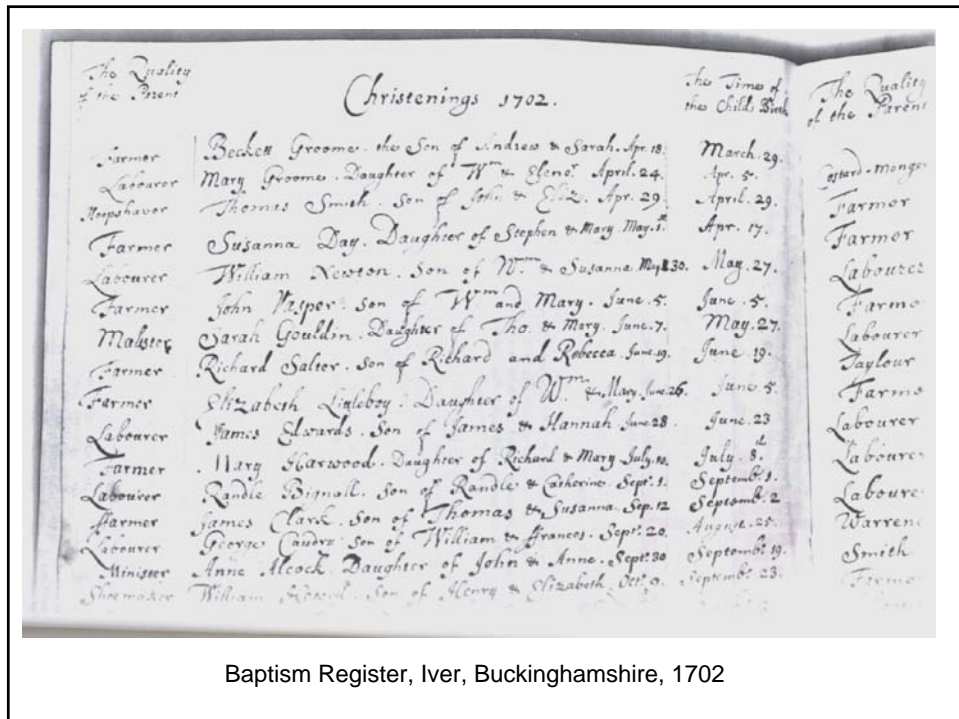
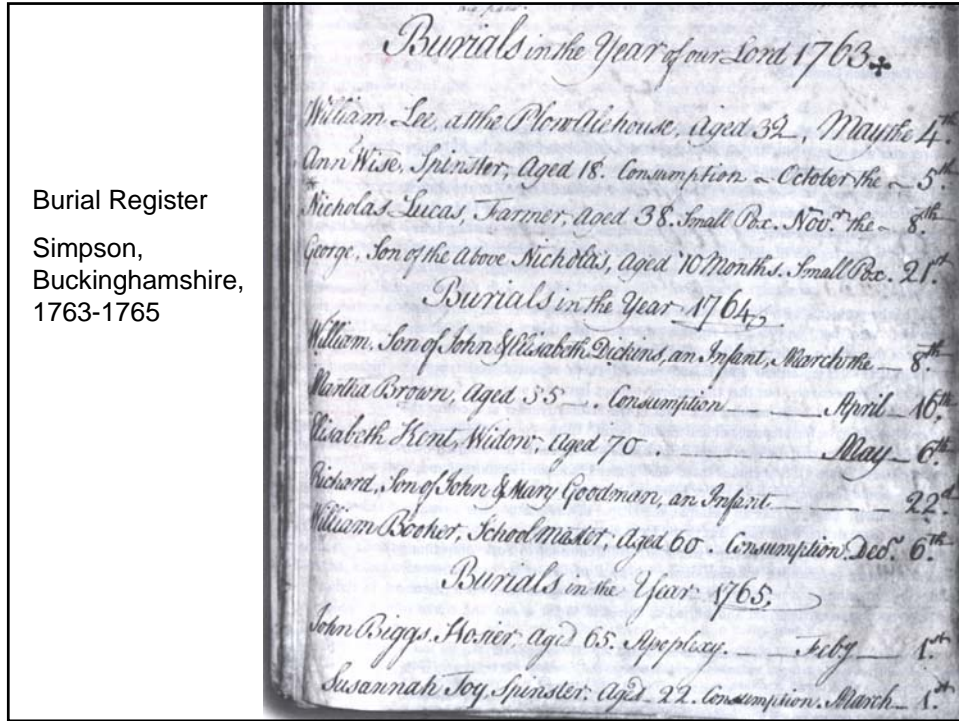
Me



Louis Henry and Family Reconstitution

1. Find a parish with at least a century of high-quality registration (no major gaps)
2. Copy all the marriages onto special family reconstitution forms, recording the names of bride and groom and the date of marriage
3. Go through each baptism and add the names and birth dates to the form for the parents marriage. If you can't find a marriage form for the parents, make a new one.
4. Go through the burial records and add the dates of death for both parents and children whenever possible.

Burial Register
Simpson,
Buckinghamshire,
1763-1765



Baptism Register, Iver, Buckinghamshire, 1702

Son Charles W. Ward 1881

HUSBAND Ward John Husband's parents' abode Norman Occupation Wagon Weaver

WIFE Vickers Mary Daughter Jane Vickers 1877 Husband's father Taylor

NOV 14 1894 Wife's parents' abode Norman wife's father Taylor

MARRIAGE	registered at	MARRIAGE		DEATH		Age at end of union	Marriage	Widowhood	Date of
		rank	sex	rank	sex				
	<u>Norman</u>	<u>I</u>	<u>F</u>	<u>2 Oct. 1894</u>	<u>13 Feb. 1897</u>	<u>32</u>			
HUSBAND	<u>Norman</u>	<u>I</u>	<u>F</u>	<u>2 Dec. 1888</u>	<u>13 Feb. 1897</u>	<u>32</u>			
WIFE	<u>Norman</u>	<u>I</u>	<u>F</u>	<u>10-0-1899</u>	<u>21 Jan. 1898</u>	<u>30</u>			

Age group	Years married	No. of births	Age of mother	Interval months	Sex	Births		Deaths		Marrriages		Name(s)	Signature of spouse
						rank	date	rank	date	date	sex		
15-19					<u>M</u>	<u>3</u>	<u>2, Nov. 1890</u>					<u>Jane</u>	
20-24					<u>F</u>	<u>2</u>	<u>24, May. 1892</u>	<u>23, Feb. 1892</u>	<u>S</u>	<u>79</u>		<u>Sarah</u>	
25-29					<u>M</u>	<u>3</u>	<u>15, Apr. 1894</u>	<u>25, Jan. 1898</u>	<u>S</u>	<u>300</u>		<u>William</u>	
30-34					<u>M</u>	<u>4</u>	<u>12, Nov. 1895</u>	<u>14, June 1898</u>	<u>S</u>	<u>900</u>		<u>William</u>	
35-39					<u>F</u>	<u>5</u>	<u>27, Jan. 1898</u>					<u>Mary</u>	
40-44					<u>F</u>	<u>6</u>	<u>15, Jan. 1898</u>					<u>Emma</u>	
45-49					<u>M</u>	<u>7</u>	<u>1, Nov. 1898</u>	<u>14, 20, 1898</u>	<u>M</u>	<u>1200</u>		<u>Isaac</u>	<u>14, 18, 20, 1898</u>
TOTAL					<u>M</u>	<u>8</u>	<u>4, Nov. 1890</u>	<u>24, Sep. 1898</u>	<u>S</u>	<u>150</u>		<u>William</u>	
					<u>M</u>	<u>9</u>	<u>20, Sep. 1898</u>					<u>Sarah</u>	
					<u>F</u>	<u>10</u>	<u>10-0-1898</u>	<u>12, Dec. 1898</u>	<u>S</u>	<u>100</u>		<u>Mary</u>	
Remarks:													

FR 11 65

Why reconstitute families?

- Henry's insight was that the limitation of parish registers is that they provide numerators, but not denominators
- He thought that the Family Reconstitution Forms would allow calculation of age-specific rates of births and deaths: the reconstituted families themselves would be the denominators

The Problem of Migration Censoring

- Yale graduates:
 - Life expectancy of graduates who migrated was much longer than graduates who did not.

BIOGRAPHICAL SKETCHES
OF THE
GRADUATES OF YALE COLLEGE
WITH
Annals of the College History

VOL. IV.

JULY, 1778—JUNE, 1792

BY
FRANKLIN BOWDITCH DEXTER, LITT.D.

Franklin Bowditch Dexter,
Biographical Sketches of the Graduates of Yale College

THOMAS BULL, the eldest child of Thomas Bull, a merchant of Hartford, Connecticut, and grandson of Captain Caleb and Martha (Cadwell) Bull, was born in Hartford on November 9, 1787. His mother was Ruth, daughter of Moses and Sarah (Howard) Butler, of East Hartford. His eldest sister married Richard E. Goodwin, of the next class.

He was occupied after graduation in his father's store until he came of age, in November, 1808, when he sought his fortune in the Western Reserve of Ohio.

About 1824 he became Secretary of the Manhattan Insurance Company in New York, and he continued for many years to be engaged in the insurance business in that city, with his residence in Brooklyn, where he died on April 1, 1850, aged 62½ years.

He married Sarah Parsons Clark, the second daughter of Russell Clark, Junior, and Content (Ward) Clark, of New Haven, who was born in June, 1786, and survived him.

The Problem of Migration Censoring

Yale graduates:

- Life expectancy of graduates who migrated was much longer than graduates who did not.
- Why? Migration was dangerous!
- The longer the graduates lived, the greater the chances they would eventually migrate.
- People who died young had less opportunity to migrate

The Problem of Migration Censoring

Family Reconstitutions:

- Age at marriage. Only persons with a baptism and a marriage record in the same parish are counted.
- If born in one parish and married in an another, the marriage must be excluded
- Early marriages more likely to occur in parish of birth
- Late marriages more likely to occur in a different parish
- Later marriages are systematically excluded from the analysis

Age-Specific Migration Rates from witnesses in ecclesiastical courts, 1601-1707

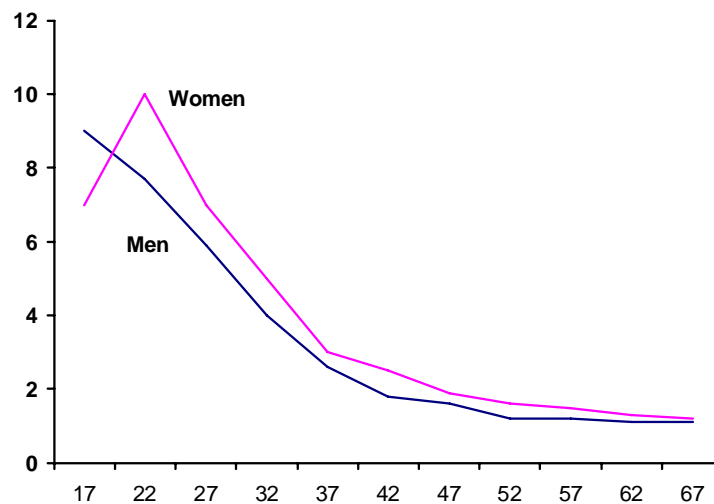


Table 4. Mean ages at first marriage in simulated popula

	Females	N	Male
All first marriages	26.0	48,700	27.1
First marriages of persons surviving beyond age 50	26.7	33,106	27.6
First marriages occurring in parish of baptism			
High-migration model	22.2	15,825	23.9
Medium-migration model	23.1	20,370	24.8
Low-migration model	24.1	27,506	25.6
First marriages of persons with an event in parish of birth beyond age 50			
High-migration model	26.7	1,435	27.5
Medium-migration model	26.6	3,491	27.6
Low-migration model	26.6	7,981	27.6

My assertion:

Assume that at the marriage pattern is *identical* for the people who will eventually move and the people who never move.

Then the marriages that can be observed in a family reconstitution will always be younger than the true marriage age.

Censoring is a Denominator Problem

- Can calculate a marital-status life table to estimate marriage age: just like a regular life table except for instead of dying, people leave the population when they marry
- The basis is age-specific marriage rates, the proportion marrying at each age.

Censoring is a Denominator Problem

Reconstitution estimate of risk of marrying at age a :

$$\frac{\text{Persons marrying in parish at age } x}{\text{Persons age } x \text{ who eventually marry in parish}}$$

True estimate of risk of marrying at age a

Persons marrying in parish at age x
Persons age x who eventually marry in parish
+ others age x who will leave or die before marriage

Censoring is a Denominator Problem

- Because risk of marriage is not measured relative to the population at risk, it is necessarily underestimated
- Any estimates of marriage age based on the reconstituted population will therefore necessarily exaggerate probability of marriage and underestimate marriage age

Illustrating the Problem

- Nobody believes microsimulations (for good reason)
- I wanted a convincing demonstration
- Jim Oeppen agreed to run me some estimates of marriage age in English Family Reconstitutions for total population and for population of women known to remain in the parish until age 50
- This excluded 97% of family reconstitution forms, but solves the problem of censoring

The Incredible Shrinking Error

	conventional	unbiased	difference
Simulation	24.8	27.6	2.8

The Incredible Shrinking Error

	conventional	unbiased	difference
Simulation	24.8	27.6	2.8
May 1990	25.3	27.7	2.4

Migration, Marriage, and Mortality: Correcting Sources of Bias in English Family Reconstitutions*

STEVEN RUGGLES†

Evaluations of the reliability of family reconstitution methods have stressed the potential for migration to bias the results. Family reconstitution is the process of linking together historical parish records of baptisms, marriages, and burials; it yields a set of demographic life-histories from which rates can be calculated. People who moved between parishes scattered their demographic life-histories across the countryside. Since these life-histories cannot usually be re-assembled, they must be excluded from most demographic analyses.

Most of the concern about the effects of the exclusion of migrants has focused on the question whether demographic behaviour of migrants and non-migrants was similar, or not.¹ It has been less commonly noted that migration can bias estimates of such measures as mean age at marriage and life expectancy, even if age-specific demographic rates of migrants and non-migrants were identical.

The Incredible Shrinking Error

	conventional	unbiased	difference
Simulation	24.8	27.6	2.8
May 1990	25.3	27.7	2.4
Sep. 1990	25.5	27.1	1.6

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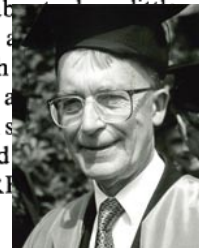
Population Studies, 48 (1994), 81–97
Printed in Great Britain

The Effect of Migration on the Estimation of Marriage Age in Family Reconstitution Studies

E. A. WRIGLEY*

Use of the technique of family reconstitution has provided a wealth of new information about the demography of communities in the past. In spite of this, there has long been a question mark hanging over reconstitution studies because of a particular problem, sometimes referred to as the problem of the reconstitutable minority. Even though it may be possible to obtain unusually detailed information about the lives of some of the inhabitants of a parish in the past, there will always be many others about whom little can be known, at least without the extreme labour of reconstituting adjacent parishes in order to reduce the problem of 'escapes' through migration.

The problem stems from a feature of reconstitution that is at once a strength and a weakness. Louis Henry turned the product of genealogical work into a series of detailed demographic information by defining clearly the period during which an individual who appears on a family reconstitution form (FR)



The Incredible Shrinking Error

	conventional	unbiased	difference
Simulation	24.8	27.6	2.8
May 1990	25.3	27.7	2.4
Sep. 1990	25.5	27.1	1.6
Jan. 1991	25.6	26.9	1.3
Jan 1994	26.0	26.8	0.8

Wrigley: 0.8 years almost the same as the effect of mortality censoring I had estimated; therefore, migration censoring does not exist!

Table 3. *Age at first marriage of women in 26 reconstitutions*

Parish	First marriages (1)	Average age (Measure A) (2)	Of col. (1) all reaching age 50 (3)	Average age (Measure B) (4)	Difference col. (4)–col. (2) (5)	Total of girl children
Alcester	225	26.2	59	28.5	2.3	1,594
Aldenham	340	25.1	85	26.0	0.9	2,055
Ash	363	25.6	92	25.0	–0.6	2,003
Austrey	73	26.9	15	25.8	–1.1	537
Banbury	999	26.1	251	27.3	1.2	6,667
Birstall	1,853	25.7	494	25.7	0.0	5,839
Bottesford	424	26.5	129	27.1	0.6	2,439
Bridford	94	26.5	22	29.4	2.9	496
Colyton	383	27.8	115	30.0	2.2	3,107
Dawlish	242	26.5	79	27.5	1.0	896
Earsdon	34	25.6	7	26.6	1.0	259
Gainsborough	1,238	25.4	342	26.3	0.9	6,756
Gedling	418	26.6	164	27.4	0.8	1,801
Great Oakley	20	23.8	2	25.5	1.7	229
Hartland	418	28.6	157	29.7	1.1	1,358
Ipplepen	35	27.7	11	30.1	2.4	181
Lowestoft	237	24.8	60	26.1	1.3	1,940
March	196	25.7	5	31.6	5.9	2,009
Methley	324	26.2	69	27.0	0.8	1,733
Morchar d Bishop	489	26.1	288	26.2	0.1	1,879
Odiham	684	25.4	227	25.9	0.5	4,231
Reigate	182	24.8	35	26.7	1.9	1,151
Sheps shed	433	26.6	151	27.0	0.4	1,892
Southill	301	25.1	49	26.0	0.9	2,664
Terling	151	24.5	32	25.0	0.5	1,324
Willingham	79	24.8	18	26.5	1.7	693
All	10,235	26.0	2,958	26.8	0.8	55,733
All weighted by female births		25.9		26.9	1.0	

Percent migrant by age at marriage: Wrigley's final estimates

Conventional measure of marriage age

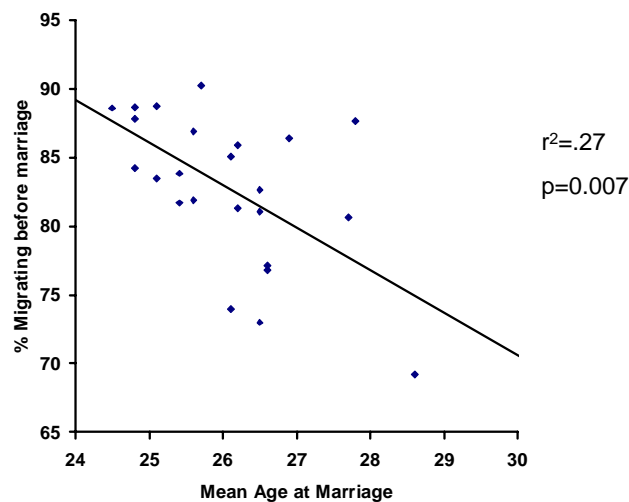
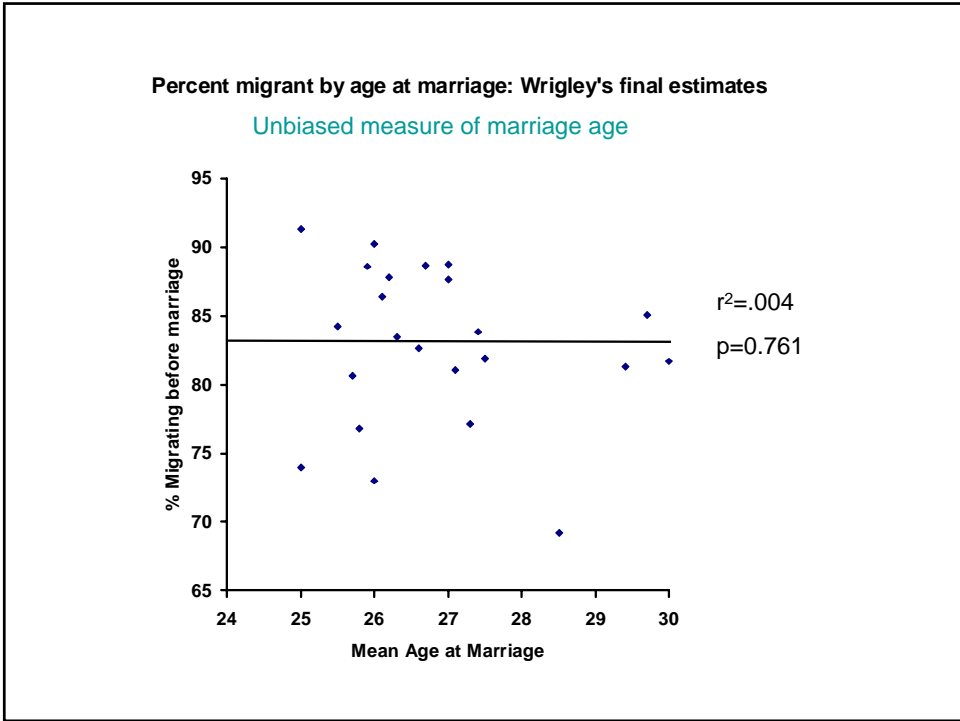


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Colyton	383	27.8	115	30.0	2.2	3,107
Dawlish	242	26.5	79	27.5	1.0	896
Earsdon	34	25.6	7	26.6	1.0	259
Gainsborough	1,238	25.4	342	26.3	0.9	6,756
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Great Oakley	20	23.8	2	25.5	1.7	229
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All weighted by female births		25.9		26.9	1.0	



How can this be?

- The relationship between migration and marriage age using the conventional measure is almost identical to the effect predicted by the microsimulation
- And yet, the conventional measure and the unbiased measure come out only 0.8 years different!

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How can this be?

- The relationship between migration and marriage age using the conventional measure is almost identical to the effect predicted by the microsimulation
- And yet, the conventional measure and the unbiased measure come out only 0.8 years different!
- Maybe the tiny population of nonmigrants were different from most people, and married younger.

The Reconstitution Volume:
Published 1997

657 pages, 2.5 pounds

26 Parishes

Three decades of work:
1966-1997

ENGLISH POPULATION
HISTORY FROM FAMILY
RECONSTITUTION
1580-1837



The limitations of English family
reconstitution: *English population
history from family reconstitution
1580-1837*

STEVEN RUGGLES*

English population history from family reconstitution 1580-1837 (Cambridge, 1997) is an impressive volume. This ambitious study represents the culmination of a quarter-century of laborious research by four of the most accomplished practitioners of English historical demography, E. A. Wrigley, R. S. Davies, J. E. Oeppen, and R. S. Schofield. The sheer volume of information is overwhelming; the book contains 121 tables and 73 graphs, and it weighs in at almost 2½ pounds. The study is a landmark

We can conveniently group the major sources of error in family reconstitution into five general categories:

- 1 Non-representativeness of selected parishes
- 2 Selection bias (non-representativeness of selected individuals because of the exclusion of migrants and nonconformists)
- 3 Censoring (mis-specification of at-risk population)
- 4 Linkage failures and under-registration of vital events
- 5 Random error.

1. Nonrepresentativeness of parishes

- 26 parishes out of 10,000
- Volunteers did the work, choosing parishes “in their neighborhood.”
- Those judged to be highest-quality were selected for reconstitution
- Despite non-random selection, authors argued results representative and reliable, can be viewed “with almost equal confidence” as the published vital statistics of more recent period.

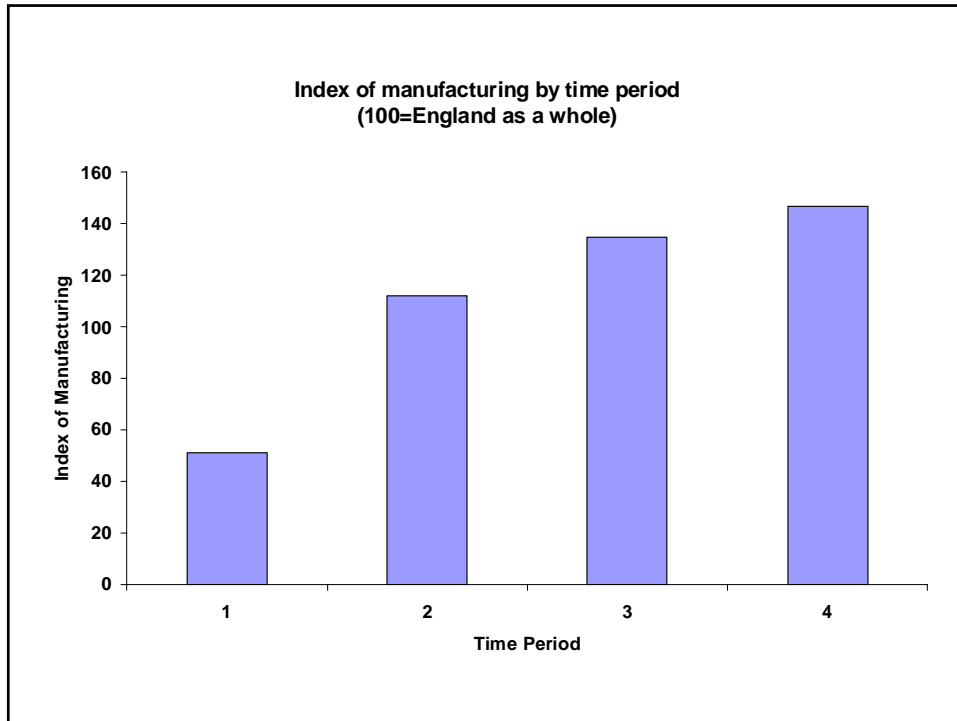
1. Nonrepresentativeness

- 34 parishes were reconstituted altogether
 - 8 rejected owing to suspicions about quality
 - 14 partially rejected
 - 12 fully included
- Criteria for rejection based on guesswork

TABLE 1
Population density in 1801 of family reconstitution parishes and England as a whole

<i>Place</i>	<i>Persons per square mile</i>	<i>Total persons</i>
26 included parishes	235.56	56,867
12 fully included parishes	288.18	38,175
14 partially rejected parishes	171.54	18,682
8 fully rejected parishes	136.30	17,227
England	172.18	8,671,439
England without Greater London	150.73	7,556,795

Sources: Wrigley et al., English population, 22–3, 614; Karl Gustav Grytzell, County of London: population changes 1801–1901 (Lund, 1969), 123–5.



1. Nonrepresentativeness

- Reconstitution parishes were much larger and denser than England as a whole, and had much more growth in manufacturing
- They grew far more quickly than England as a whole
 - Baptisms grew 48.6% faster
 - Marriages grew 80.4% faster
 - Burials grew 130% faster
- Cannot be used to generalize about the country as a whole

2. Selection bias

- Last section described nonrepresentiveness of *parishes*; selection bias refers to nonrepresentativeness of the *individuals* within each parish.
- This is different from censoring: censoring can occur even if migrants and non-migrants had identical demographic behavior
- But what if they didn't?

2. Selection Bias

Population excluded

Percent lost before marriage: 79.2

Percent lost from marriage to death: 56.3

Percent with baptism, marriage, and some event
at age 50 or older: 4.6

Percent excluded: 95.4

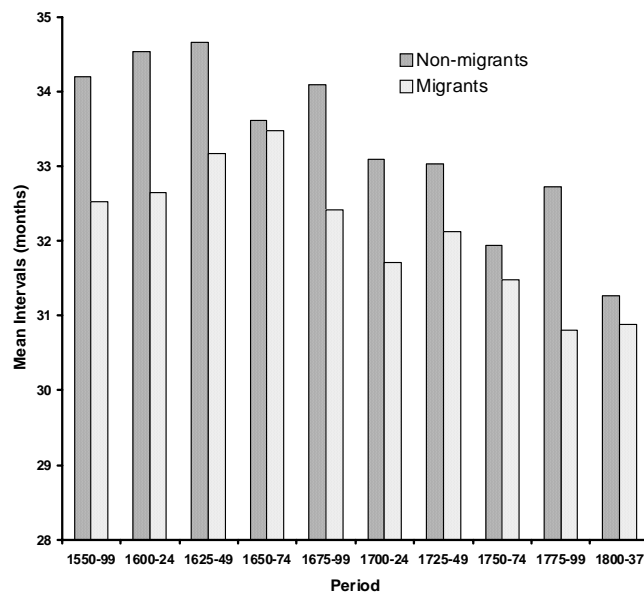
2. Selection Bias

Wrigley's proof that reconstitution population was representative

For some measures comparison is possible between those in a given parish who were born there, and those in the same parish who were born elsewhere, that is between migrant and non-migrant families. The levels of infant and child mortality in these two groups were virtually identical in the twenty-six parishes contributing data to the family reconstitution study. Similarly the average interval between births in the two groups was almost identical. If mortality in the first fifteen years of life and marital fertility were effectively the same in the two groups, it is probable that they were little different in other respects, since these are two of the most important measures helping to define their demography generally.¹⁶

No comparison of the infant and child mortality between migrants and non-migrants was given, but there is a table that compares birth intervals of the two groups

Mean intervals between successive births:
Wrigley's proof that reconstitution population was representative

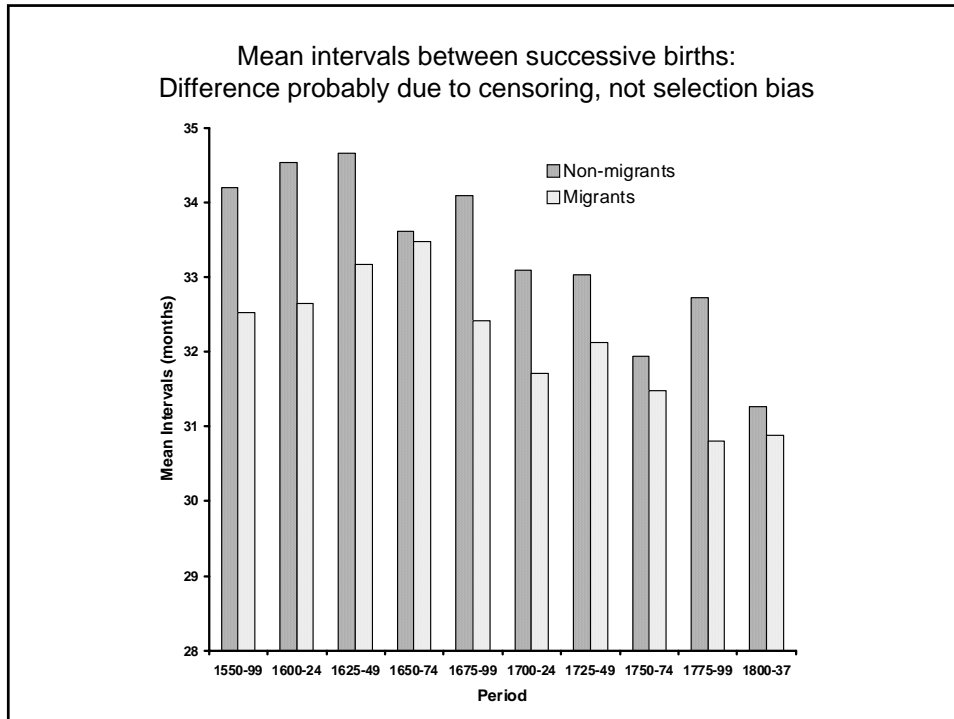


3. Censoring

- Censoring bias is different from selection bias
- **Selection** means that the reconstitutable population behaves differently from the whole population: Migrants were not typical
- **Censoring** means that even if migrants *were* typical, the reconstitution would give biased results because you never know the true denominator: at any moment, there are people in the village who would be counted if they had something happen to them (marriage, birth, death) but not otherwise. They are part of the *population at risk* but not observable.

3. Censoring

- My “Marriage, migration, and mortality” article was not just about marriage
 - Demonstrated systematic bias in conventional reconstitution estimates of mortality
 - Proposed a new unbiased measure
 - Wrigley et al. chose the biased measure, understated life expectancy by 1.5 to 6.5 years
- Censoring also affects fertility
 - Birth intervals for non-migrants tend to be longer because people with long intervals are likely to leave town between births



4. Linkage failures and underregistration

- Entries may be illegible; old manuscripts may be damaged; researchers transcribing the records may make a mistake; parish priest may omit someone
- Failures for any reason lead to bias in one direction: fertility, mortality, and marriage are underestimated.
- Unlike Louis Henry, the English family reconstitutions assume perfection: no attempt to adjust the numbers for under registration or linkage failure

5. Random error

- No estimates of sampling error
- Often no N's or standard deviations that would allow calculation of error

Conclusion:

We should be wary of virtually every estimate in the book

ENGLISH POPULATION
HISTORY FROM FAMILY
RECONSTITUTION
1580-1837



Some reconstitutions are better

- France, Sweden, Quebec have much better data
- Most studies in those countries use more conservative methods and make less outlandish claims
- But there are two intrinsic problems common to both family reconstitution and microsimulation:
 - Both take enormous amounts of time and effort, and nobody really understands them other than their creators
 - If you invest that amount of time, you are unlikely to be extremely critical
- Conclusion: treat results of both with great caution